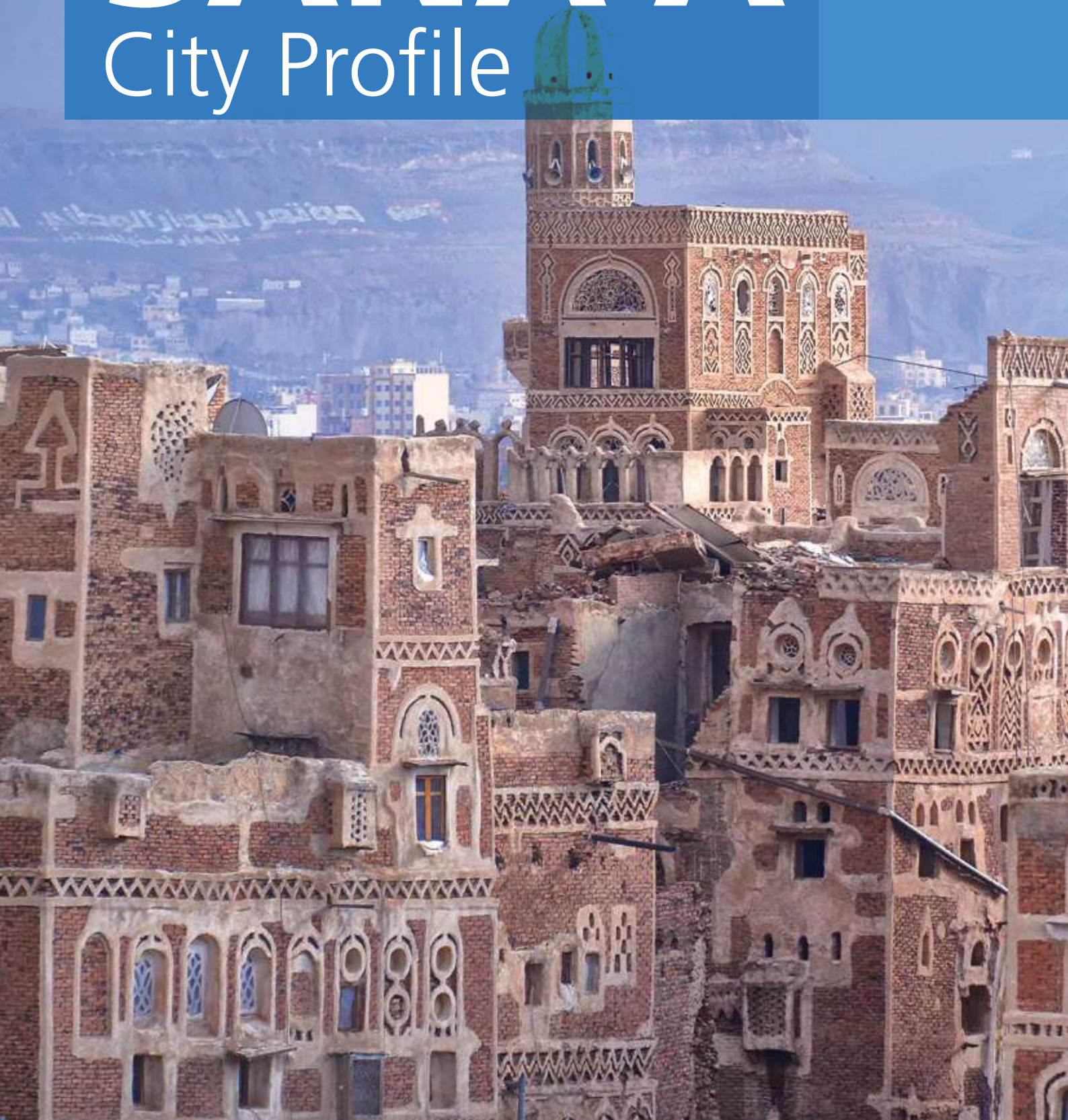


SANA'A

City Profile



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SANA'A

City Profile

Urban Profiling Yemen

This project is part of a Profiling Project that aims to develop city profiles of 7 cities in Yemen. These

cities include Aden, Sana'a, Sa'ada, Taizz, Al Hudaydah, Al Hawtah and Zinjibar. All profiles and data

developed in this profile are accessible on the Yemen Mapping and Data Portal.

<https://yemenportal.unhabitat.org/>

Sa'ada
 Sana'a
 Al Hudaydah
 Taizz
 Zinjibar
 Al Hawtah
 Aden



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Acronyms

AQAP	AL-Qaeda in Arabian Peninsula	MoHM	Ministry of Housing and Municipalities
CBY	Central Bank of Yemen	MoHUD	Ministry of Housing and Urban Development
CCIF	Cleanliness and City Improvement Fund	MoI	Ministry of Interior
CSO	Central Statistics Organization	MoLA	Ministry of Local Administration
DHUP	Department of Housing and Urban Planning	MoPHP	Ministry of Transportation
DNA	Dynamic Needs Assessment	MoT	Ministry of Transportation
DTM	Displacement Tracking Matrix	MoTEVT	Ministry of Technical Education and Vocational Training
EC	European Commission	MoWE	Ministry of Water and Environment
ERW	Explosive Remnants of War	MPWH	Ministry of Public Works and Highways
GALSUP	General Authority for Land, Survey and Urban Planning	MSWM	Municipal Solid Waste Management
GCC	Gulf Cooperation Council	NFI	Non-Food Items
GDP	Gross Domestic Products	NGO	Non-Governmental Organization
GIS	Geographic Information System	NLP	National Land Policy
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH	NNGO	National Non-Governmental Organization
GoY	Government of Yemen	NSSWM	National Strategy for Solid Waste Management
GOPHCY	General Organization for the Preservation of Historic Cities	NWRA	National Water Resources Authority
Ha	Hectares	NWSSIP	National Water Sector Strategy and Investment Program
HH	Household	PDRY	People's Democratic Republic of Yemen
HLP	Housing, Land and Property	PEC	Public Electricity Corporation
HNO	Humanitarian Needs Overview	PiN	People in Need
ICRC	International Committee of the Red Cross	SFD	Social Fund for Development
ICT	Information and Communications Technology	SWM	Solid Waste Management
IDP	Internally Displaced Persons	UAS	United Arab States
ILO	International Labor Organization	UN	United Nations
INGO	International Non-Governmental Organization	UNCTAD	United Nations Conference on Trade and Development
IRG	Internationally Recognized Government	UNDP	United Nations Development Program
JICA	Japan International Cooperation Agency	UNESCO	United Nations Educational, Scientific and Cultural Organization
JRC	Joint Research Center	UNESCWA	United Nations Economic and Social Commission for Western Asia
KI	Key Informant	UNICEF	United Nations Children's Fund
KSA	Kingdom of Saudi Arabia	UNOCHA	United Nations Organization for Coordination of Humanitarian Affairs
LAEO	Literacy and Adult Education Organization	USA	United States of America
LAL	Local Authority Law	USAID	United States Agency for International Development
LC	Local Councils	USSR	Union of Soviet Socialist Republics
MC	Mercy Corps	WASH	Water, Sanitation, and Hygiene
MCLA	Multi-Cluster Location Assessment	WHO	World Health Organization
MENA	Middle East and North Africa	WWTP	Wastewater Treatment plant
MKY	Mutawakkilite Kingdom of Yemen	YAR	Yemeni Arab Republic
MoAI	Ministry of Agriculture and Irrigation	YER	Yemeni Rial (currency)
MoC	Ministry of Communications	YSP	Yemeni Socialist Party
MoE	Ministry of Education		
MoHESR	Ministry of Higher Education and Scientific Research		

Executive Summary

One of the oldest continuously inhabited cities in the world, Sana'a is an historically important center and capital city for most early state polities in the region. It is also the administrative center of the Sana'a governorate. This city profile describes and examines living conditions and needs in the city of Sana'a across a variety of sectors. It addresses key thematic findings made prominent by the impact of the ongoing conflict, its toll on the city's population, and the ability of institutions to provide basic services. Each individual section paints a picture of the prevailing situation and the needs of the city's residents through triangulation of different data types, including secondary data analysis which draws on available publications and media reports; remote sensing, and structured interviews with community leaders and key sector experts. The aim of this profile is to provide partners with the widest possible canvas, assisting them in their operational programming and strategic policy development.

Key findings include:

- **Fighting between different factions has caused considerable damage to edifices and cultural sites.** Sana'a has been an embattled city since the escalation of the conflict in early 2015. It has witnessed three major battles, in 2011, 2014, and 2015, and has intermittently been targeted by airstrikes and other ground attacks which have resulted in momentous loss of human life and caused widescale material damages.
- **The Sana'a basin is home to approximately nine percent of the total population of Yemen.** The population in Sana'a city is very young. Almost 60 percent are under 18 years old and 12 percent of the population are aged between 15 and 24 years old.¹ Over 1.5 million children are classified as boys and girls in need.² In terms of population density, As Sabain, Ma'ain, Shu'aub and Bani Al Harith are the most populated areas in the city. Historically, Sana'a has been one of the main destinations for internally displaced people (IDP), many of whom left rural areas due to lack of jobs, and climate-related factors, including water scarcity and droughts. Almost 70 percent of the IDP population is located in Bani Al Harith, Ma'ain, and As Sabain districts.³
- **The economic infrastructure in Sana'a has deteriorated exponentially in recent years and trends are severely weakened.** Even before the political woes that followed the Yemeni Revolution of 2011, the poverty rate in Sana'a was highest amongst all other governorates. The conflict has caused widespread disruption of economic and commercial activities and has dramatically diminished employment and income opportunities in both private and public sectors.
- **The intensification of the conflict in 2015 caused significant damage to health facilities.** There is a significant lack of health amenities, in particular, hospitals. Moreover, available facilities are operating under problematic circumstances due to insufficient numbers of health workers and large numbers of population coming from neighboring governorates to receive healthcare services, leading to facilities operating at strained capacities. The closure of Sana'a airport to all commercial flights in August 2016 also prevented those in need of specialized medical care to seek assistance abroad. The high price of medicines was reported as the most serious problem faced by IDPs, returnees, and non-host community when accessing health facilities in Al Wahdah and At Tahrir districts in Amanat Al Asimah according to 2019 Multi Cluster Locations Assessment (MCLA) Assessment.
- **The main issue affecting access to housing in Sana'a specifically is not the supply, rather affordability.** More recently, rents increased 250 percent – 300 percent for well-located apartments; it is highly likely that this is driven by the significant influx of IDPs to the city, rapid urban expansion, and housing overspill beyond the administrative boundaries of the capital; in 2013, almost 37 percent of the population of Sana'a lived in 'slums';⁴ by 2019, these areas expanded even further and are currently housing a large population of IDPs displaced to the city from other governorates. Returnees are primarily based in As Sabain, Assafi'yah, Az'zal, Ath'thaorah, Shu'aub, and Bani Al Harith districts. Some 89 percent of returnees live in their original domiciles or habitual residence.
- **While most of the urban areas are connected to the electricity grid, public electricity supply almost halted in Sana'a.** During the conflict, many of the electricity sector assets sustained damage, including power plants, substations and distribution lines. Furthermore, the Public Electricity Corporation (PEC) saw a drastic reduction of funding and almost collapsed. Currently, provision of electricity through a public grid is almost non-existent, with most of the population relying on diesel generators and solar panels.

1 Ministry of Public Health and Population, Central Statistical Organization, Pan Arab Program for Family Health and ICF International, National Health and Demographic Survey 2013 (Rockville, Maryland, USA: MoPHP, CSO, PAPFAM, and ICF International, 2013), <https://dhsprogram.com/pubs/pdf/FR296/FR296.pdf> (accessed September 2019).

2 Yemen PIN Severity HNO 2019 data, available at <https://data.humdata.org/dataset/yemen-humanitarian-needs-overview>

3 United Nations Organization for Coordination of Humanitarian Affairs, Humanitarian Needs Overview: Yemen 2019 (New York, NY: 2019).

4 UN-Habitat, Country Slum Data by Shelter Deprivation (Nairobi, Kenya: 2020), https://urban-data-guo-un-habitat.hub.arcgis.com/datasets/430beee2622b45a7857ff8af7ce463eb/data?orderBy=One_Shelter_Deprivation&where=Countrypercent20percent3Dpercent20percent27yemenpercent27 (accessed May 2020).

- The water supply grid and management in Sana'a city is considered the worst across Yemen.** Water consumption decreased by half in the last year, due to restrained operational capacity of the system and production. The presence of large numbers of IDPs in Sana'a city put additional pressure on the city's stretched capacity. In the district of Hamdan, Bani Al Harith and Bani Hushaysh, farmers have reportedly drilled so many unlicensed boreholes for irrigation that water levels have declined by an estimated 6m. The high demand for qat in Sana'a alone is supplied by 4,000 such unauthorized wells.⁵
- In Sana'a city specifically, 27 percent of educational facilities sustained some form of damage,** with 25 percent of the facilities partially damaged and 2 percent completely destroyed. According to the latest 2019 Humanitarian Needs Overview, Amanat Al Asimah governorate had the highest number of affected schools. As of April 2018, almost a third (28 percent) of school age children lacked access to formal education.⁶ Many of the schools are overcrowded and there is a reported lack of teachers and teaching materials.
- Sana'a's drastic urban expansion over the last decades has led to an increased demand for transportation services.** The city's population continued to increase following the escalation of the conflict as many IDPs arrived in the city. Most of the investment within the city targeted development of the roads and intersections network, while the public transportation sector remains largely controlled by the informal sector. Several roads have been damaged during the conflict. While some have been rehabilitated, many are still in need of reconstruction

5 Frederika Whitehead, "Water Scarcity in Yemen: The Country's Forgotten Conflict," The Guardian, April 2, 2015, <https://www.theguardian.com/global-development-professionals-network/2015/apr/02/water-scarcity-yemen-conflict> (accessed September 23, 2019).

6 The World Bank Group, Yemen Dynamic Needs Assessment: Phase 3 (Washington, DC: 2018).

Context

Sana'a – Cultural Center and National Capital in a Divided Nation

Sana'a rapid urban profiling in a dynamic and chaotic period for the country

Times of armed conflict are extremely difficult for cities and their citizen. Especially, in Yemen, where the current armed conflict is in its sixth year and population figures are changing fast due to internally displaced people and migrants. Local administration, urban economy and development barely exist. After five years of conflict more than 100,000 people have died due to combat, over 230 districts are food insecure, 3,6 million people have been displaced including 375,000 in 2019 and 46 districts are at high risk of cholera. The total number of People in Need (PiN) stands at 24,3 million.⁷ Moreover, the political division in the country has dramatically reduced the function of Sana'a as a capital.

This city profile can hardly be compared with a similar profile developed in peacetime because data and information had to be compiled with limited field visits and interviews on the ground. Inaccessibility and a lack of situational information pose a significant challenge to the local government as well. Hence, the State of the Yemeni Cities Report had to be produced under very difficult circumstances, complementing the city profiles, where national experts compiled important information and together with other reports and documents this profile provides snapshots on a wide range of subjects relevant to urban planning and development.

One of the oldest continuously inhabited cities in the world

The history of the City of Sana'a is made up by a unique blend of geography, culture, urban and political developments. It is the largest city and the national capital of Yemen. Nested between the Jabal An-Nabi, Shu'ayb and Jabal Tiyal mountains of the Sarawat mountain range, correspondingly the two highest peaks in the Arabian Peninsula, Sana'a rises at an elevation of 2,300m above sea level. It is one of the highest capital cities in the world. It possesses a semi-arid climate with an average of 265 mm of rainfall per year. Average temperatures rarely exceed 30°C, but they do oscillate considerably between day and nightfall.

As one of the oldest continuously inhabited cities in the world, Sana'a is an historically important center and capital city for most early state polities in the region. The history of the city can be traced back to the Second Century AD where it was first mentioned in an inscription of the Third-Century Himyaritic King Shaar Awtar.⁸ Yemeni tribes supported the earliest campaigns of Islam, and conversion to Islam was rapid and nearly universal in the area. Later, the Umayyad and Abbasid caliphates ruled Yemen through governors whose seat was Sana'a. In the 10th century the local Zayedi dynasty was established. Sana'a came under Ottoman rule first from 1547 – 1629 and then from 1872 until the end of World War I in 1918. Thereafter, Sana'a became the capital of the Mutawakkilite Kingdom of Yemen (MKY), except for a brief period between 1948 and 1962 when Taizz replaced it.

Following the North Yemen Civil War (1962-1970), Amanat Al Asimah regained its status as the capital city of the new [North] Yemen Arab Republic and remained the political and administrative capital of the Republic of Yemen after the unification of North and South in 1990. In September 2014, Yemen's Houthis took control of the Yemeni capital Sana'a.

Figure 1: Geographic Location of Sana'a within Yemen



7 United Nations Office for the Coordination of Humanitarian Affairs, Humanitarian Update Issue 3, March 2020.

8 Tim Mackintosh-Smith, Yemen: The Unknown Arabia (New York, NY: Harry N. Abrams, 2001)

Traditionally, the primary social unit of Northern Yemen is the tribe. Grouped into confederations, which are then split into innumerable branches and sub-branches, their lineages are often traced back to the pre-Islamic era. The presence of fertile agricultural lands along the highlands allowed Yemeni tribes to settle and establish agricultural civilizations, in contrast to their nomadic counterparts in the rest of the Arabian Peninsula. Indeed, in ancient Yemen, tribes constituted the structural foundation of the early state. In the pre-Islamic period, powerful tribes were able to generate enough support, unify many such confederations and establish monarchies. Examples include the Himyar and Sabaean Kingdoms.

The power of the monarchy in Yemen, however, was not absolute and subject to checks by a council of tribal elders who wielded significant consultative powers in virtually all affairs of state and economy. Overall, tribal structures were essential to instituting a system of checks and balances, thereby ensuring the peaceful coexistence of existing forms of social organization and an equitable distribution of economic resources and activities, while, at the same time, enjoying the protection that the state afforded to its subjects.

With the decline of these early states, tribes reasserted their individual independence anew. In southern Yemen, where geography was less forbidding and social interactions more opened to the outside world, tribal structures gradually weakened in favor of farming communities and interregional trade, and thus economic relationships. In contrast, in the North, loss of protection by the state meant that tribes had to continuously compete for their economic viability as well as protection from rival neighbors. This had the reverse effect of strengthening tribal structures, independence, and an aversion to external interference.⁹

The tribes of the North conventionally rejected the concept of the sovereign state. Although secure in their Yemeni identity, the function of the sovereign state to represent a unified national identity was distrusted and actively resisted. For the tribes, the state and its institutions represented a political elite that held power over Yemen, and consequently over them, to the detriment of inherited traditional liberties and ways of life. Retaining the tribal character of Yemen pristine and resisting the state's encroachments, therefore, has been a major political objective.

After the establishment of the independent MKY (1918 – 1962), the Imamate was able to establish a theocratic state, but tribal divisions and resistance persisted. Indeed, tribal support for the Imamate was conditional upon non-state interference. The North Yemen Civil War (1962 – 1970) tested these loyalties. The previous separation between the state and tribal institutions became indistinguishable as war split loyalties not only between tribes, but also between constituent clans within tribes.¹⁰

A major outcome of the civil war was the end of the state's attempts to penetrate society and break the cohesion and resistance of tribal structures. The opposite took place. Owing to the military support they had given during the war, the republican-allied tribes and their sheikhs became important stakeholders in the postwar decision-making process. The state was able to co-opt the tribes in two important ways. First, with support from the republican regime, entirely new sheikh lineages emerged from former simple tribesmen or peasants that did not have the long pedigrees of their class. Second, many anti-republican sheikhs that lost the war were briefly marginalized. The state, however, was both unable and unwilling to permanently alienate large swathes of the population. The national reconciliation program that followed in the 1970s, rehabilitated these sheikhs who, in turn, gradually increased their prestige when they assumed important executive and legislative posts. National government infrastructure was located in Sana'a, and before the current war broke out, the public sector accounted for more than 30 percent of the non-agricultural employment in the city.¹¹ Nonetheless, the relationship between society and state remained fragile.¹²

After the Houthis, an Islamic political and armed movement that emerged from Sa'ada in northern Yemen in the 1990s, took over Sana'a in September 2014 and the Presidential Palace in January 2015, the internationally recognized Government (IRG) of Yemen led by President Adbrabbuh Mansur Hadi declared Aden as its interim capital while Sana'a remains held by the Houthis. Parallel authority has resulted in two separate branches of the Central Bank of Yemen (CBY) and has led to administrative bifurcation. In addition, the large number of international stakeholders adds increased complexity to political economy dynamics in Yemen.¹³

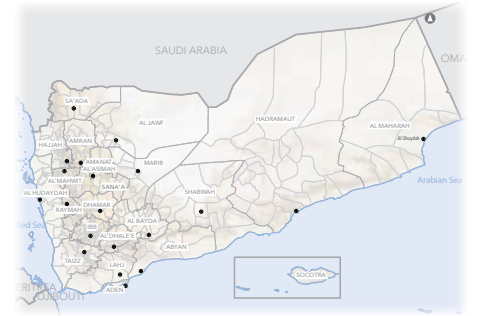
9 J.E. Peterson, "Yemen: The Tribes, the State and the Unraveling," in *Tribes and State in a Changing Middle East* ed. Uzi Rabi, (London: Hurst, 2016), 111-143.

10 Marieke Brandt, *Tribes and Politics in Yemen* (New York and London: Oxford University Press, 2017), 42-50.

11 Ahmed El Basti et al., *Sana'a: A City Development Strategy* (Washington, DC: The World Bank Group, 2009), <http://documents.worldbank.org/curated/en/639151468170064779/Sanaa-A-city-development-strategy>, (accessed October 23, 2019).

12 Ibid., 55 and in passim.

13 The World Bank Group, *Country Engagement Note for the Republic of Yemen for the Period FY20-FY21* (Washington, DC: 2016)

Figure 2: Sana'a Conflict Timeline
SANA'A
WITHIN YEMEN CONTEXTUAL
TIMELINE OF CONFLICT

30 OCTOBER 1918

The Ottoman Empire collapses and the former vilayet of Yemen becomes an independent sovereign state under Imam Yahya Muhammad Hamid ed-Din of the al-Qasimi dynasty.

1926

Imam Yahya proclaims the MKY assuming both executive and religious spiritual leadership in northern Yemen.

1932

MKY and Iraq signed a treaty that allows for training of Yemeni military officers in Iraq.

20 MAY 1934

MKY signs the Treaty of Taif with Saudi Arabia which sets the international boundary between the two kingdoms.

FEBRUARY – MARCH 1948

A coup d'état by rival Alwaziri family succeeds in assassinating Imam Yahya, but fails to overthrow the al-Qasimi dynasty. Imam Yahya is succeeded by his son, Imam Ahmad bin Yahya.

1955

Saudi–MKY relations improve and, to service their growing oil industry with foreign workers, Saudi authorities allow Yemeni nationals to enter freely without work permits.

MARCH 1955

Imam Ahmad withstood a coup by a group of pan-Arab nationalist sympathizers within the military.

APRIL 1956

MKY enters into a mutual defense treaty with Egypt, largely to offset growing domestic pan-Arab nationalist sympathies imported from Abdel Gamal Nasser's Egypt. In March 1958, MKY joins the United Arab Republic, a federation consisting of Egypt and Syria, into a confederation known as the United Arab States (UAS).

SEPTEMBER 1961

Syria withdraws from the confederation and relations between Egypt and MKY deteriorate. UAS dissolves later in December.

SEPTEMBER 1962

Imam Ahmad dies and is succeeded by his son Muhammad al-Badr. One week later, a coup d'état by military officers deposes the new Imam and declares the Yemen Arab Republic YAR. The North Yemen civil war begins.

THE NORTH YEMEN civil war was a conflict fought that lasted more than 8 years. It began with a coup d'état by Egyptian- and Iraqi- trained revolutionary military officers inspired by pan-Arab nationalist ideology imported from Gamal Nasser's Egypt. The conflict quickly spilled over and each side obtained the support of international backers. The royalist side was supported by Jordan and Saudi Arabia, with covert British financial and material aid. In contrast, the republican side obtained significant Egyptian and Soviet Union support. Egypt alone contributed 70,000 soldiers and a large number of aircrafts. In addition, the conflict tested the loyalties of the Yemeni tribes with an equal number supporting either sides. By mid 1960s, the conflict had settled into a stalemate, which was broken only after the republicans managed to lift the siege of Sana'a in February 1968. A critical victory for the republicans, it also coincided with the British earlier withdrawal from Aden and growing international recognition of the republican government. Although the royalists remained active until 1970, their inability to mount offensives, and foreign disengagements from the conflict, meant that the war was basically over.

OCTOBER 1972

Fighting erupts between northern YAR and the southern PDRY, respectively supported by Saudi Arabia and the Union of Soviet Socialist Republics (USSR).

28 OCTOBER 1972

Both Yemeni states sign the Cairo Accord, tentatively agreeing to national unification.

FEBRUARY – MARCH 1979

Fighting erupts again, allegedly over Democratic Republic of Yemen (PDRY) assistance to several opposition groups operating as the North Democratic Front.

1970S – 2010S

Spurred by remittances of Yemeni guest workers in Saudi Arabia and elsewhere in the gulf, Sana'a experiences tremendous urban and demographic growth. Furthermore, oil exploration in Ma'rib and Shabwah governorates awakened interest in both Yemeni states to jointly exploit resources and lift both countries economies.

1983

Amanat Al-Asimah, or the Capital Secretariat, governorate is created within Sana'a governorate to accommodate demographic growth and mitigate urban sprawl.

MAY 1988

YAR and PDRY agree to reduce tensions, establish joint oil exploration initiatives, allow freedom of movement based on a single national ID card and demilitarize the joint border. A constitution was drafted in November 1989.

MAY 1990

The Republic of Yemen declared with Ali Abdullah Saleh, President of the former YAR since 1978, as the President of the unified Yemen, and Ali Salim al-Baidh, former General Secretary of Yemen's Socialist Party, as Vice President.

MAY 1991

After a 30-month-long transition period the new constitution is ratified establishing the new Yemeni state as a modern state committed to political pluralism, equality under the law, right to own property and etc. In April 1993, the first pluralistic elections are held.

1990 – 1994

Tensions emerge and new government coalitions became ineffective.

JANUARY 1994

To avoid open conflict hostilities, a Document of Pledge and Accord was signed in Amman, Jordan.

MAY 1994

Former Yemeni Socialist Party (YSP) leaders withdraw support for a unitary Yemen and begin hostilities seeking the reestablishment of South Yemen as a separate state as it existed before 1990. The Democratic Republic of Yemen was declared but did not gain recognition.

JULY 1994

Northern forces enter Aden, informal capital of the South, ending resistance shortly thereafter.

OCTOBER 1994

President Saleh was reelected to a 5-year term. Southern YSP opposition crippled by President Saleh's crackdown and lost much of its former influence and support base.

JUNE - JULY 2000

New constitutional amendment extended the presidential term to office by two years. Also, parliamentary term to office is extended to 6 years. The new parliament created a 111-member council of advisors, who, appointed by presidential decree, enjoyed broad legislative prerogatives.

2000S

Zaidi tribes in Northern Yemen grow increasingly concerned over the close relationship that President Saleh nurtured with both the Kingdom of Saudi Arabia (KSA) and the United States as a reluctant partner in the global War on Terror.

SEPTEMBER 2004

Hussein Badreddin al-Houthi, a Zaidi political and religious leader and former member of parliament for the al-Haq party until 1997, was killed in a military operation that also claimed the lives of 25 of his supporters. This sparked the Houthi Movement.

THE HOUTHİ MOVEMENT began as a Zaidi revivalist movement seeking to find redress against a number of religious, social, economic, and political issues. Its political roots can be traced to the 1962 Revolution that replaced the Mutawakkilite Kingdom and nearly a millennia of Zaidi imamates with the Yemen Arab Republic. The new republican regime, however, was unable to dislodge the old political system reliant on tribal- and patron-client- loyalties. The Houthis claim that their struggle seeks to end corruption, joblessness, Western influence, and bring back government accountability, fair fuel and utility prices. In contrast, the GoY crackdown relied on the argument that the Houthis sought to restore the Zaidi Imamate.

SEPTEMBER 2008

AQAP attacks a foreign embassy, resulting in 18 dead and 16 wounded.

NOVEMBER 2009

Houthi fighters crossed over into Saudi territory and seized several border villages. This attack was the first to internationalize the Yemeni conflict and led to Saudi air strikes of Houthi strongholds within Yemen.

JANUARY 2011

Within the broader context of the Arab Spring Yemen erupted into demonstrations protesting unemployment, worsening economic conditions, corruption, and demanding President Saleh's resignation. The range of demands grew to include the uneven literacy rates and social disparities among women and men, women's health, maternal mortality, and child marriage. Under pressure, Saleh declared he would not run again for President at the end of his term in 2013.

MAY 2011

First Battle of Sana'a between the government forces loyal to President Saleh and Hashid tribal confederacy led by Sheikh Sadiq al Ahmar, a former member of parliament. Heavy street fighting, including artillery and mortar shelling, resulted in indecisive outcome.

APRIL 2011

Faced with mounting domestic pressure, Saleh stepped down under a 30-day transition plan to ensure immunity. Vice President Abdrabbuh Mansur Hadi became his interim successor.

JUNE 2011

Saleh survived an assassination attempt, which, however, killed four and injured scores more. Evacuated to Saudi Arabia and then the USA for treatment, he relinquishes executive power to Hadi who takes over as acting President.

FEBRUARY 2012

Saleh formally cedes power to Hadi but retains the allegiance of loyalists within the military and forms an alliance with the Hashid tribal federation.

MARCH 2013 - JANUARY 2014

National Dialogue Conference begins to oversee the transition of power from Saleh to Hadi. Although there is wide agreement, it fails to find implementation.

MAY 2012

A suicide bomber in the al-Sabin square during rehearsals for Unity Day celebrations, causes over 120 dead and 350 injured. AQAP claims responsibility hours after it took place.

JULY 2014

Government announces an increase on fuel prices to ease pressure on budget.

SEPTEMBER 2014

In the Second Battle of Sana'a, Houthi fighters capture the city. President Hadi transfers national institutions to Aden, which becomes in early 2015 the interim capital of Yemen IRG.

JANUARY - AUGUST 2015

Faced by an ineffectual national army, the Houthis launch their southward offensive, overtaking the Lahej, Dhale, Aden and Taiz governorates. Hadi flees to Saudi Arabia.

26 MARCH 2015

A Western-backed Saudi-led coalition of GCC countries begins airstrikes in Yemen targeting Houthi forces and strongholds. By August, Houthi forces are repelled from the South.

OCTOBER 2016

Two airstrikes hit the packed Al Kubra hall, causing 155 dead and about 525 wounded.

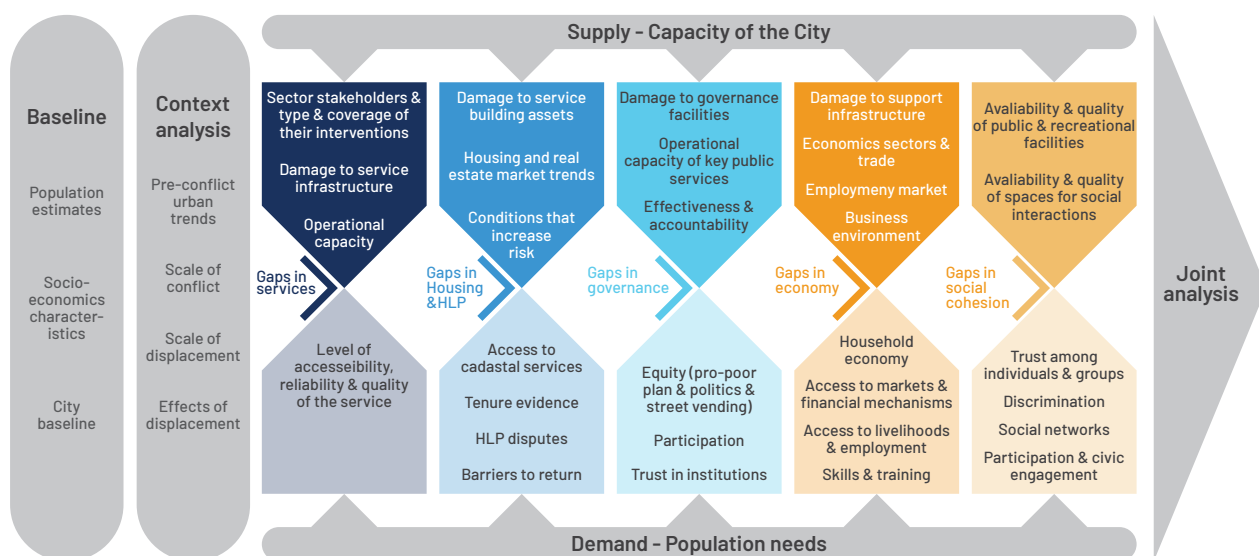
NOVEMBER - DECEMBER 2017

Third Battle of Sana'a, between Houthis and forces loyal to President Saleh erupts. Houthis takeover Sana'a and President Saleh is killed.

JANUARY 2019

Multiple airstrikes against 7 targets around Sana'a described by witnesses as the most violent in a year. However, similar events continue to occur throughout the year.

Figure 3: Analytical Framework



Data Compilation

This city profile describes and analyzes the situation in the city across a variety of sectors. Using an **area-based** approach, each individual section paints a separate picture through the latest available data. These are then synthesized to provide the most up-to-date holistic information backed by contextual information and analysis. The aim of the profile is twofold. First, it provides partners with the widest possible canvas to support future rehabilitation plans and prioritization of investments. Second, it assists them in their operational programming and strategic policy development. Urban profiling rests on different sets of elements and pillars, which jointly provide an integrated analysis that assess the city's capacities as well as its population's needs. The main elements of urban profiling – in **bold** – are discussed below.

- 1. Secondary Data Review** Secondary data draws on available publications and media to create a **context-specific** background of information on pre- and post- conflict trends and baselines, against which the full array of primary data is weighed. This provides a better understanding of focal events in the city's own history, thus allowing the triangulation of analysis with primary data results.
- 2. Remote Sensing** Satellite imagery provides accurate assessment of the degree of physical damage inflicted on infrastructure and services, comparing pre-crisis to current imagery. Definitions of damage categories are defined by the Joint Research Center (JRC). Geographic Information System (GIS) tools provided a comparative pre- and post- conflict analysis on land use classification and damage assessments per district.

- 3. Asset Verification** Observational Data was collected on a variety of municipal public assets, like facilities, roads, schools, hospitals and the like. The primary objective is to gather information and quantify the degree of damage that asset has suffered and assess its operational capacity. Sectors include governance; WASH; solid waste management, energy, health, education, communications, cultural heritage and transportation.

During this exercise, some of the damaged buildings were photographed in order to assess the damage, this included: private, public or government buildings of a services provision nature. The rapid field asset verification did not aim to assess all or most of the damaged buildings owing to the difficulty of implementing such an assessment given the fluid situation in Yemen. Therefore, random sampling of the buildings within the predetermined areas was adopted. This approach was based on the relative distribution of the number of buildings, the level of damage shown in satellite imagery, and their approachability relative to distance from battle lines. Over 150 varying buildings were included in the assessment. These structures were evaluated based on the level of damage, ownership and nature of use while excluding all security or military buildings, as well as those that serve any other specific national security purpose.

Figure 4: Primary Data Collection tools



Field images of damaged or demolished buildings were compared with satellite images by utilizing geographic coordinates taken in the field using the Global Positioning System (GPS) Explorer application installed on mobile devices. These were later office-based corrected using Google Earth. After that, buildings were assessed more accurately through field images according to below classification:

- No Visible Damage (class 1): assigned to the structures that appear to have complete structural integrity, i.e. when the walls remain standing and the roof is virtually undamaged;
- Moderate damage (class 2): visible damage level, i.e. buildings with a largely intact roof characterized by presence of partial damage (collapse of chimneys or roof tiles detach) or surrounded by large debris/rubble or sand deposit;
- Severe Damage (class 3): assigned to structures with part of the roof collapsed and serious failure of walls;
- Destroyed (class 4): assigned to structures that are total or largely collapsed (>50%). This category is also assigned when only a portion of the building has collapsed to the ground floor. In these cases, the original building structure is no longer distinguishable.

The satellite-based methodology described, has been developed based on the experience of European Commission (EC)–JRC with assessing damages in numerous crisis areas (e.g. Georgia, Gaza strip, Lebanon).

In some cases, the interpretation is straightforward, and the risk of error is low (industrial and touristic areas), there are also borderline cases in which the assessment is difficult to discern (informal settlements and congested areas). To avoid individual bias linked to the personal judgment of a single image interpreter, collaborative work is particularly encouraged while interpreting borderline cases.

However, for this methodology to be appropriate

and efficient, the quality and timing of the image acquisition are of high importance. Specifically, it should be acknowledged that the time of the year for which assessments are made is a source of important challenges with respect to monitoring damages during prolonged conflict situations – the acquisition angle and the acquisition season, both of which impede the satellite damage assessment.

The build-up pattern of Yemeni cities is also a source of important challenges. Urban density undermines the possibility of detecting damage concealing the presence of debris among other important criteria to detect affected areas.

Ground truth photographs, of the satellite images, and field visits remain very important in high density areas where satellite images have limitations. For instance, building facades affected by artillery shells may never be visible in satellite imagery.

Additionally, enumerators faced difficulties on the ground due to inaccurate positioning and GPS error margins, both of which cause navigational discrepancies.

2 Demographics

Amanat Al Asimah is the official capital and the most important cultural center in the country. Until 1962, Sana'a could be considered a medieval city stalled in time. Since 1962, the city has experienced tremendous growth and expanded its urban boundaries from its 3.7 km² medieval core to more than 40 square kilometers by the end of the 1970s and more than 1,600 km² in 2010. The fasted growth has taken place since 1980, along the north-south roads, starting from the airport in the north to Taizz in the South.

The population of Sana'a also rose steeply from an estimated 50,000-80,000 in 1962. Amid this growth, namely in 1983, another governorate, Amanat Al Asimah (the Capital's Secretariat), was created by Presidential Decree No. 13 within, and considered distinct from Sana'a governorate. It is here where the administrative institutions and functions of the capital city, Sana'a, are also located. Another presidential decree, No. 2 of 2001, was issued dividing Amanat Al Asimah into nine administrative areas or directorates (muderiat), plus Bani Hareth district to the north as the governorate 10th district. Currently the population of Sana'a and Amanat Al Asimah governorates are estimated respectively at 1.47 and 3.52 million. Jointly, they constitute the most populous areas in Yemen.¹⁴

The medieval core Old Sana'a which was declared World Heritage Site by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 1984 and it was expected that the unique urban and architectural patrimony of Sana'a would act as an important draw factor for tourism in a city which had become already the economic engine of the country. Economic development including that of the tourism sector came to a halt with the outbreak of the war. Instead, thousands of internally displaced people turned to Sana'a looking for a safe future.

Trying to accommodate new migrants from rural areas during the war, Sana'a underwent an unplanned and haphazard expansion that fragmented the urban and social fabric of the city and, in turn, fractured the inherited high levels of cultural unity and linkages to the past. Modernization and the push and pull factors of urban sprawl increased poverty incidence to an estimated 300,000 by the early 2000s, even as Sana'a became the main economic engine of Yemen.

Yemen has the highest rate of population growth in the Middle East and North Africa (MENA) region, with an annual rate of up to three percent.¹⁵ The population in Sana'a also grew rapidly, from only 162,000 people in 1977 (three percent of the country's population) to 1.7 million in 2004 (eight percent of the country's population).¹⁶ Currently, Humanitarian Needs Overview (HNO) estimates the population of Yemen to be 30.4 million and that of Sana'a and Amanat Al Asimah governorates are estimated respectively at 1.47 and 3.52 million.¹⁷ In less than three decades, Sana'a's percentage share increased by more than ten-fold and currently represents about 10 percent of the total population of Yemen. If the present growth rate continues at the same pace, the next 20 years will see a doubling of the existing population numbers.

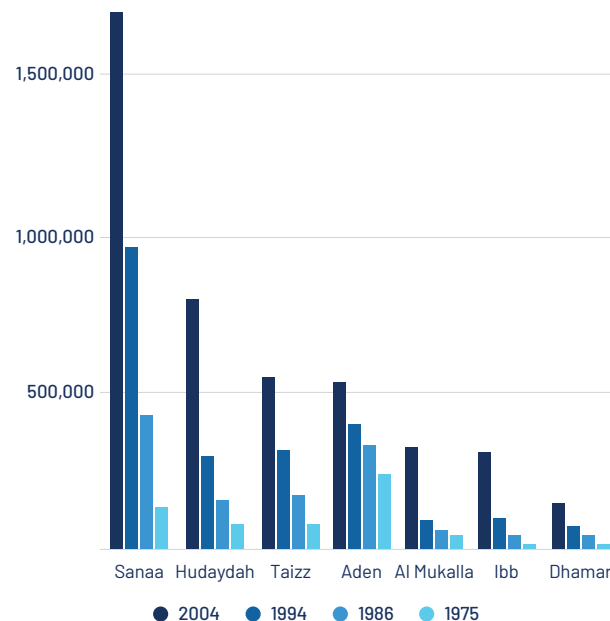
¹⁴ This profile examines the greater Sana'a urban area, which in addition to Amanat Al Asimah, also includes the districts of Bani Hushaysh, Sanhan, and Bani Matar. OCHA/Giles Clarke, "Humanitarian Needs Overview: Yemen 2019," UN Office for the Coordination of Human Affairs, 14 February 2019. Greater Sana'a city is understood here to include Amanat Al Asimah governorate and the districts of Bani Harith, Bani Hushaysh, and Sanhan.

¹⁵ United Nations Human Settlement Program and the Republic of Yemen National Report, Third United Nations Conference on Housing and Sustainable Urban Development, HABITAT III (Quito, Ecuador: 2016), http://habitat3.org/wp-content/uploads/Habitat_III_Country_Report_Austria_161011.pdf (accessed August 4, 2019).

¹⁶ Ahmed El Basti et al., Sana'a: A City Development Strategy (Washington, DC: The World Bank Group, 2009), <http://documents.worldbank.org/curated/en/639151468170064779/Sanaa-A-city-development-strategy>, (accessed October 23, 2019).

¹⁷ United Nations Office for the Coordination of Human Affairs, Humanitarian Needs Overview: Yemen 2019, (New York, NY: 2019). Greater Sana'a city is understood here to include Amanat Al Asimah governorate and the districts of Bani Harith, Bani Hushaysh, and Sanhan.

Figure 5: Sana'a growth compared to other major urban areas in Yemen.



Source: CSO, Statistical Yearbook, 2004.

The demographic explosion after 1970 and the resulting urban sprawl made administrative changes necessary. Yet, fertility rate in Yemen fell from 7.4 births per woman in 1994 to 4.4 in 2013.¹⁸ Reasons include higher levels of access to education, family planning, and higher age of marriage. As of 2013, the fertility rate in Sana'a city amounted to 3.1, which is consistent with the Yemen urban average of 3.2.¹⁹

The population in Sana'a city is very young. Almost 60 percent of its bulk in Amanat Al Asimah is below 18 years old and 12 percent of the population are aged between 15 and 24 years old²⁰ which puts additional pressure on the educational system as well as the labor market.

According to CSO, in 2010, 40.8 percent of the working age population (aged 15-64) across Yemen were participating in the labor market.²¹ For the age group 15-24 years, the participation rate was significantly lower and amounted to 30.3 percent. The following year, it was estimated that an additional 300,000 new jobs and 700,000 health and education services were required annually as a result of the population growth.²²

18 Republic of Yemen National Report, Third United Nations Conference on Housing and Sustainable Urban Development, HABITAT III (Quito, Ecuador: 2016), http://habitat3.org/wp-content/uploads/Habitat_III_Country_Report_Austria_161011.pdf (accessed August 4, 2019)

19 Ministry of Public Health and Population, Central Statistical Organization, Pan Arab Program for Family Health and ICF International, National Health and Demographic Survey 2013 (Rockville, MD: MoPHP, CSO, PAPFAM, and ICF International, 2013), <https://dhsprogram.com/pubs/pdf/FR296/FR296.pdf> (accessed September 2019).

20 Ibid.

21 Michele Bruni et al., Demographic and Labor Market Trends in Yemen, (Beirut, Lebanon: International Labor Organization, 2014) https://www.ilo.org/wcmsp5/groups/public/---arab-states/---ro-beirut/documents/publication/wcms_358144.pdf (accessed October 23, 2019).

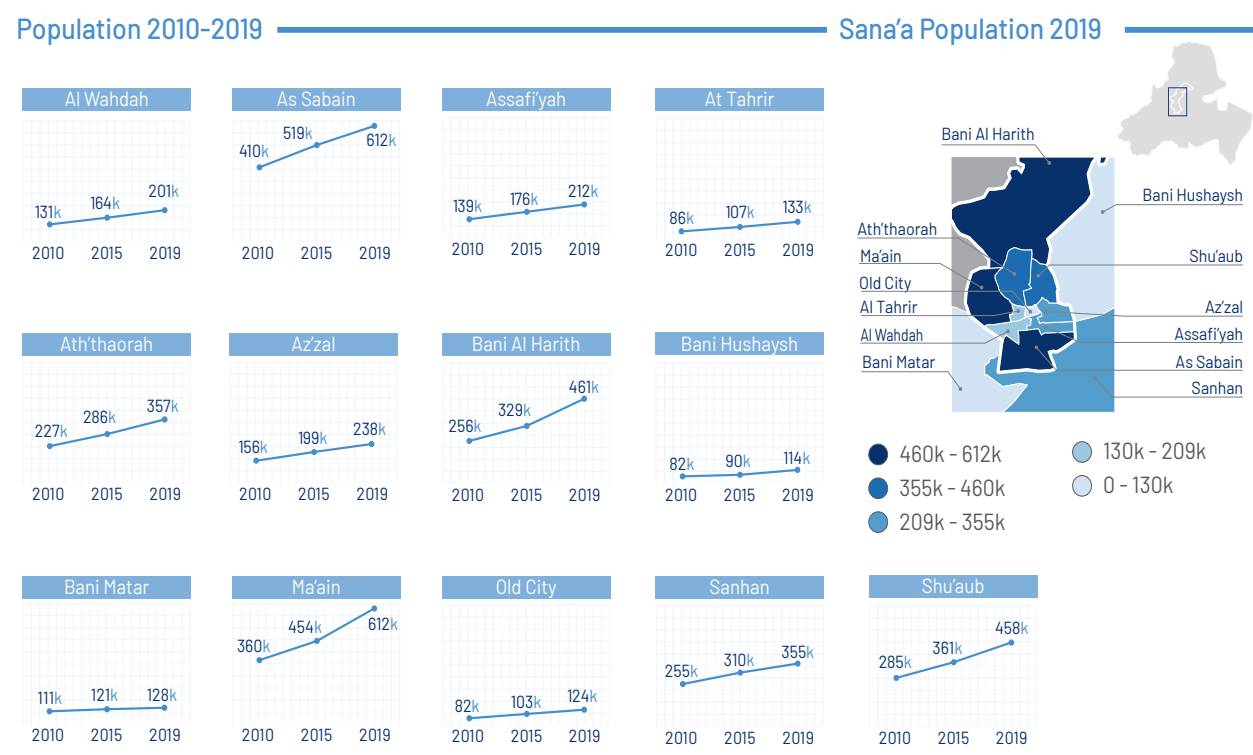
22 Government of Yemen and United Nations, Development Assistance Framework, (Sana'a, Yemen: 2011) https://www.unfpa.org/sites/default/files/portal-document/Yemen_UN-DAFpercent202012-2015.pdf (accessed September 16, 2019).

Displacement

Sana'a city has historically been one of the main destinations for IDPs, many of whom left rural areas due to lack of jobs, and climate-related factors, including water scarcity and droughts.²³ While in 1995 their percentage of urban agglomeration stood at 29.9 percent, by 2015 it reached 33.5 percent.²⁴ Such rapid increase in the population put additional pressure on infrastructure and natural resources, affecting in particular water resources and availability.

Since the escalation of the conflict in 2015, Sana'a city hosted thousands of displaced families. According to HNO data (2019), the population of Amanat Al Asimah was estimated to be 3.52 million, of which 430,000 are IDPs, 190,000 returnees, 112,000 refugees and migrants and 2.79 million are non-displaced.²⁵

Figure 6: Sana'a Population 2010–2019



Source: CSO Population Projections and HNO 2019 Population Data. As of 2019, Amanat Al Asimah governorate hosts the highest number of IDPs in Yemen.²⁶ Almost 70 percent of its IDP population is in Bani Al Harith, Ma'ain, and As Sabain districts. Approximately 24,000 IDPs can be found in Bani Al Hushaysh district in Sana'a governorate and 3,000 and 5,000 in Bani Matar and Sanhan

districts respectively.²⁷

Approximately 89 percent of IDPs in Amanat Al Asimah governorate live in rented accommodation.²⁸ Another 11 percent live with host families who are relatives. Sana'a city is the primary destination for IDPs in the country.

During the escalation of hostilities in Al Hudaydah in autumn 2018, many IDPs fled to Sana'a city. As of October 2018, 26,257 displaced families from Al Hudaydah were living in Sana'a city.²⁹ During the same period, United Nations Organization for Coordination of Humanitarian Affairs (UNOCHA) reported that nine schools in Sana'a city were hosting IDPs.³⁰ According to the Displacement Tracking Matrix (DTM) Yemen Area Assessment (March 2019), financial services are the primary need for IDP households in Amanat Al Asimah.³¹

27 Ibid.

28 International Organization for Migration, UN High Commissioner for Refugees, Protection Cluster, Task Force on Population Movement, Yemen, 16th Report, (2017), https://reliefweb.int/sites/reliefweb.int/files/resources/tfpm_16th_report_oct2017.pdf (accessed September 16, 2019).

29 United Nations Office for the Coordination of Humanitarian Affairs, Yemen: Humanitarian Update: 7 – 21 October 2018, https://reliefweb.int/sites/reliefweb.int/files/resources/ls-suepercent2030FINAL_original.pdf (accessed September 19, 2019).

30 United Nations Office for the Coordination of Humanitarian Affairs, Yemen: Humanitarian Update: 30 July – 9 August 2018, https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/20180806_humanitarian_update_final.pdf (accessed September 20, 2019).

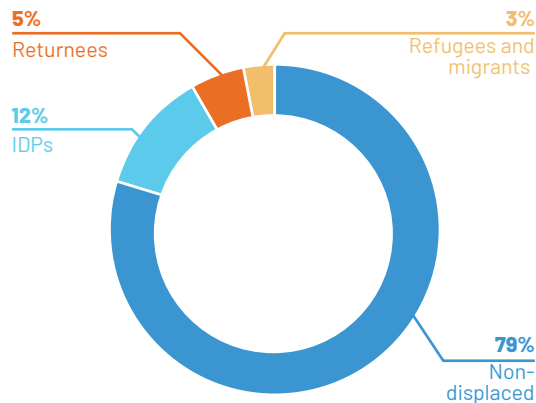
31 International Organization for Migration, Displacement Tracking Matrix, Yemen Area Assessment, Round 37, (March, 2019), <https://displacement.iom.int/system/tdf/reports/Yemenpercent20Areapercent20Assessmentpercent20Round-percent2037.pdf?file=1&type=node&id=5295> (accessed September 20, 2019).

23 Ahmed El Basti et al., Sana'a: A City Development Strategy (Washington, DC: The World Bank Group, 2009), <http://documents.worldbank.org/curated/en/639151468170064779/Sanaa-A-city-development-strategy>, (accessed October 23, 2019).

24 The World Bank Group, Urban Transport in Sana'a, 10; Al Abed, Sana'a Urban Transformation, 903; Roman Stadnicki, The Challenges of Urban Transition in Yemen: Sana'a and Other Major Cities, *Journal of Arabian Studies*, 4, 1(2014), 118.

25 United Nations Office for the Coordination of Human Affairs, Humanitarian Needs Overview: Yemen 2019 (New York, NY: 2019).

26 Ibid.

Figure 7: Sana'a City Population Groups

Source: UNOCHA, HNO Population Data, 2019. According to the HNO 2019 report, Amanat Al Asimah governorate has one of the highest numbers of returnees in Yemen, alongside with Aden and Taizz,³² representing 19 percent of all returnees in Yemen (over 30,000 HHs).³³ They are primarily located in the As Sabain, Assafi'yah, Az'zal, Ath'thaorah, Shu'ub, and Bani Al Harith districts. Some 89 percent of returnees live in their original domiciles or habitual residence.

Recent assessments suggest that 356 migrants are in Amanat Al Asimah governorate, representing a share of two percent from the total number of migrants in Yemen.³⁴ Most refugees and migrants in Yemen, including Sana'a, come from the Horn of Africa countries, including Ethiopia and Somalia.

According to the MCLA Assessment 2019, the most reported priority needs for IDPs in Yemen are food (86 percent of the districts), followed by drinking water and healthcare and Non-Food Items (NFI).³⁵ For Returnees, the top three priority needs were reported as following: food, livelihoods, and healthcare. The same assessment highlighted that the high price of medicines was reported as the most serious problem faced by IDPs, returnees, and non-host community when accessing health facilities in Al Wahdah and At Tahrir districts in Amanat Al Asimah according to Key Informants (KIs).³⁶ Also, 77 percent of IDPs are in need of rental subsidies in Amanat Al Asimah.³⁷

Refugees and Migrants

During 2019, record number of migrant arrivals were recorded in April (18,320 people) and May (18,904), with a total of 84,347 East African arrivals during the first half of 2019.³⁸ Most of the migrant arrivals in Yemen are predominantly men and come from Ethiopia, followed by Somalia and Nigeria and Mali.³⁹ Many of the migrants intend to cross Yemen en route to Saudi Arabia or other Gulf countries, however, following unsuccessful attempts many remain in Yemen.⁴⁰

According to MCLA, there are 356 migrants in Amanat Al Asimah governorate, representing a two percent share of the total number of migrants in Yemen. According to the same source, 81 percent of refugees and migrants are in need of rental subsidies in Amanat Al Asimah.⁴¹ Also, KIs estimated that 23 percent of the refugee population in Amanat Al Asimah faced restricted access to health facilities, legal status being one of the top three obstacles while in the Assafi'yah district and this was true for the entire refugee population.⁴²

32 United Nations Office for the Coordination of Human Affairs, Humanitarian Needs Overview: Yemen 2019 (New York, NY: 2019)

33 TFPM, Yemen, 2017.

34 Ibid.

35 MCLA Technical Working Group, 2018 Yemen Multi-Cluster Location Assessment (Yemen: 2018), https://reliefweb.int/sites/reliefweb.int/files/resources/01percent20MCLA_V7.pdf (accessed November 20, 2019).

36 Ibid.

37 Ibid.

38 Danielle Botti and Melissa Phillips, Record numbers of refugees and migrants arrive in Yemen amidst intensifying and complicated war (Geneva, Switzerland: Mixed Migration Center, 2019), <https://reliefweb.int/report/yemen/record-numbers-refugees-and-migrants-arrive-yemen-amidst-intensifying-and-complicated> (accessed November 20, 2019).

39 International Organization for migration, Flow Monitoring Points - Migrant Arrivals and Yemeni Returns from Saudi Arabia in November 2019 (Geneva, Switzerland : 2019), <https://reliefweb.int/report/yemen/flow-monitoring-points-migrant-arrivals-and-yemeni-returns-saudi-arabia-november-2019> (accessed December 5, 2019).

40 Danielle Botti and Melissa Phillips, Record numbers of refugees and migrants arrive in Yemen amidst intensifying and complicated war (Geneva, Switzerland: Mixed Migration Center, 2019), <https://reliefweb.int/report/yemen/record-numbers-refugees-and-migrants-arrive-yemen-amidst-intensifying-and-complicated> (accessed November 20, 2019).

41 MCLA Technical Working Group, 2018 Yemen Multi-Cluster Location Assessment (Yemen: 2018), https://reliefweb.int/sites/reliefweb.int/files/resources/01percent20MCLA_V7.pdf (accessed November 20, 2019).

42 Ibid.

Children

Across Yemen, one child dies every ten minutes because of preventable causes, such as diarrhea, malnutrition, and respiratory tract infections.⁴³ Children are increasingly affected by infectious diseases, such as cholera, measles and dengue fever. Children from displaced or refugee populations are particularly vulnerable to infectious diseases, because of poor housing, water, and sanitation conditions, as well as lack of access to health services.

From April 1, 2013 to December 31, 2018, the UN verified 11,779 grave violations against children in Yemen, with 47 percent of all incidents being killing and maiming (mostly as a result of air strikes), followed by ground fighting (40 percent).⁴⁴ The report also highlighted the instances of child recruitment and indiscriminate attacks on schools and hospitals. In 2015, the Amanat Al Asimah counted for the highest number of recruitment of children as soldiers (435), followed by Taizz (238) and Amran (226).⁴⁵ During the same period, UN verified 244 attacks on schools, most of which occurred in Sa'ada governorate (60), followed by Amanat Al Asimah (31) and Taizz (24).

According to HNO data, the UN classified in the Amanat Al Asimah governorate over 1.5 million children are classified as boys and girls in need.⁴⁶ Most of these children are in need of protection assistance (92 percent), followed by food security (79 percent), health (69 percent), water and sanitation (67 percent).⁴⁷

Women

According to the Global Gender Gap Report 2018, Yemen was ranked as the worst performing country in terms of gender-gap.⁴⁸ While gender discrimination affects both men and women, women are more affected in terms of their rights, access to services and Gender-Based-Violence (GBV). In Yemen, women do not have equal rights in inheritance, divorce and child custody in Yemen.⁴⁹

Since the start of conflict, the situation of women and girls in Yemen deteriorated. This includes higher prevalence of GBV, forced marriage and child marriage.⁵⁰ In 2018, the United Nations (UN) estimated that three million women in Yemen are at risk of violence. According to Amnesty International, Sana'a governorate is amongst the worst affected ones, alongside Taizz, Hajjah, Ibb and Al Hudaydah.⁵¹

A study conducted between 2016 and 2018, recorded 1447 reports of incidents related to the discrimination based on gender in Yemen.⁵² In Amanat Al Asimah and Sana'a governorates 41 incidents of GBV were recorded, along with 41 incidents related to property and access and justice, 76 reports concerning discrimination in education, and 5 reports related to employment.⁵³

Between January and September 2019, there were 21 partners supporting Women Protection activities in Amanat Al Asimah Governorate, including four International Non-Governmental Organizations (INGOs) and 17 National Non-Governmental Organization (NNGOs).⁵⁴

43 United Nations Office for the Coordination of Human Affairs, Humanitarian Needs Overview: Yemen 2019 (New York, NY: 2019).

44 Report to the UN Security Council, Children and Armed Conflicts in Yemen (New York, NY: 2019), <https://undocs.org/en/S/2019/453> (accessed November 12, 2019).

45 Ibid.

46 Yemen PiN Severity HNO 2019 data, available at <https://data.humdata.org/dataset/yemen-humanitarian-needs-overview>

47 Protection Cluster 4Ws Dashboard, available at <https://www.humanitarianresponse.info/en/operations/yemen/protection>

48 World Economic Forum, The Global Gender Gap Report 2018 (Cologne, Switzerland: 2018), http://www3.weforum.org/docs/WEF_GGGR_2018.pdf, (accessed December 7, 2019).

49 Human Rights Watch, Yemen, Events of 2018 (New York, NY: 2018), <https://www.hrw.org/world-report/2019/country-chapters/yemen#49dda6> (accessed December 7, 2019).

50 Ibid.

51 Amnesty International, Amnesty International Report 2017/18 – Yemen (London, United Kingdom : 2018) <https://www.refworld.org/publisher/AMNESTY,,YEM,5a99382fa,0.html> (accessed November 2019).

52 Ghamdan Abdullah Mohammed et al, Sifting the Grain, 6,000 Testimonies of Discrimination and Inequality From Yemen (London, United Kingdom : Equal Rights Trust, 2018), <https://www.equalrightstrust.org/ertdocumentbank/Siftingpercent-20thepercent20Grainpercent20reportpercent20Eng.pdf> (accessed November 2019).

53 Ibid.

54 Protection Cluster 4Ws Dashboard, available at <https://www.humanitarianresponse.info/en/operations/yemen/protection>

Legal Framework

The Sana'a basin is home to approximately nine percent of the total population of Yemen. The demographic upsurge and the urban sprawl since the 1970s, has resulted in a complicated and unique governance structure for the region which, however, is based on legal norms shared by all Yemeni cities. To mitigate the result of this population explosion, the Governorate of Amanat Al-Asimah was created within the Governorate of Sana'a in 1983. Presidential decree No. 2 of 2001 divided Amanat Al-Asimah into nine districts, to which a tenth, Bani Harith, was added the same year.

Yet, even before the intensification of the current conflict, the legal status of Amanat Al-Asimah - acting simultaneously as an independent governorate, the national capital, and a separate governorate - was unclear. After 2002, when the Local Authority Law (LAL) established the Local Councils (LCs), the latter were intended to simplify this structure. In theory, they represented a mechanism of stability which, on the one hand would allow for a reduction in the authority of the national government by transferring some administrative and financial functions over to local administrations (i.e. LCs) and, on the other, it would enable the local population to elect their own representatives. However, decentralization was reliant upon the degree of political will. There has been considerable confusion as to whether "decentralization" referred to the transfer of authority from central to local governing bodies, or simply the delegation of responsibilities and tasks downwards while retaining final authority in the hands of central national bodies. Consequently, there was no clear definition of hierarchical administrative powers and prerogatives.⁵⁵

Government Structure

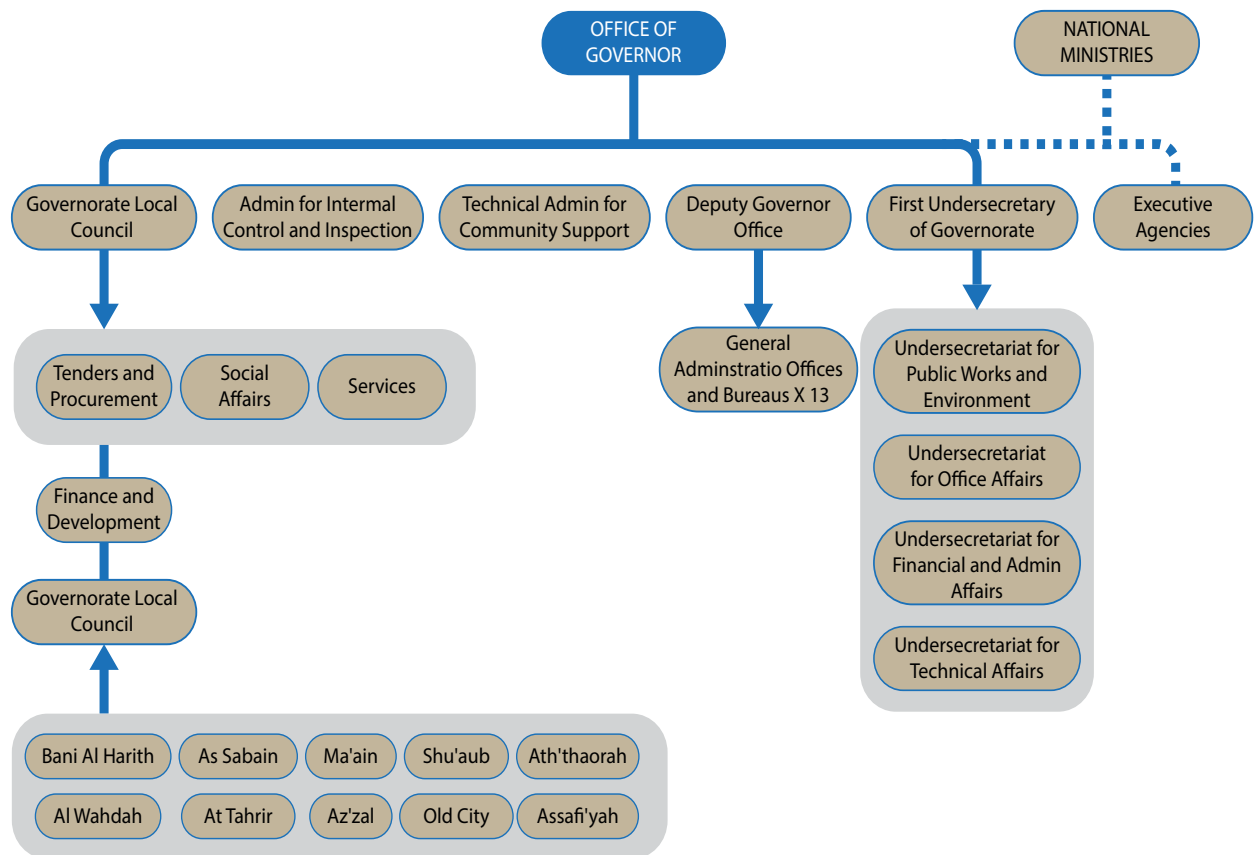
Although the local government structure of Amanat Al-Asimah is based on the general organizational structure of governorates, it also departs from it in several significant ways. Broadly, organizational units (offices and bureaus) are either tied directly to the Office of the Governor or managed by the Office of the Deputy Governor. The Office of the Governor, which ranks as a government minister, exercises executive control over the governorate, either directly or through his deputies. The Office of the Deputy Governor, for instance, presides over 13 different general administration offices, whereas the First Undersecretary of the Governorate supervises the functions of, and reports on, several administrative issues dealing with public works and the environment, financial and technical affairs, and the like. In addition, there are also several specific oversight committees composed of elected members of the Governorate Local Council, which prior to the intensification of the conflict dealt with finance and development, social affairs, services, and tenders and procurement.

While this structure appears to preserve the relative powers of local government, thus confirming a positive political decentralization, central control over local decision-making remains strong. Attached to the Office of the Governor there are an unspecified number of executive, sector-oriented service delivery, agencies. Although legally branches of the governorate - from which they also receive their funding and reporting directly to the Governor - technically these remain tied to the central ministries. To complicate matters, although LAL confers considerable legal autonomy to local and governorate bodies, these remain subordinate to tight administrative control by the ministries.⁵⁶ Administrative functions may be represented as shown in Figure 8.

⁵⁵ Ahmed El Basti et al., *Sana'a: A City Development Strategy* (Washington, DC: The World Bank Group, 2009), <http://documents.worldbank.org/curated/en/639151468170064779/Sanaa-A-city-development-strategy>, (accessed October 23, 2019).

⁵⁶ Ibid.

Figure 8: Structure of the Current Local Governance in Sana'a City



Below the governorate, there are the LCs. Local Authority Law confers to the LCs the same weight as to the governorate governing bodies. The district's administration is headed by an appointed general director who reports to the district's LC. The number of councilors within an LC ranges between 18 and 30 members depending on the district's population density. Thus, a district with less than 35,000 people has 18 councilors whereas those with 150,000 or higher about 30 councilors. In order to ensure equal representation for all constituent districts, at no time should the number of councilors fall below 15.⁵⁷

The election process divides the districts' population into sub-districts depending on each one's density. Residents cast ballots for their representative at the LC as well as the president of the LC who, in turn, represents them at the governorate council. To serve as councilor, the elected councilor must be a natural-born Yemeni citizen, a Muslim, at least 25-years-old, and be a resident of the district which they seek to represent. Upon election, their mandate is limited to four years in office, though they may run for reelection at the end of that term. Until 2008, governors were appointed by presidential decree. Following significant political pressure, an amendment was added that year which granted LCs, at both the governorate- and district- level, the right to elect governors. According to Article 38, after the electoral college elects the governor, the announced winner is confirmed to the post by a presidential decree. Yet, because governors rank as cabinet ministers, in practice, few have ever been elected in this manner. Initially, former president Ali Abdullah Saleh reluctantly upheld the letter of the law for most of Yemen's governorates, except for Al Dhale'e and Sa'ada, where he appointed his loyalists. The contradictions stem from the inherent ambiguities within LAL itself. For instance, Article 105 specifies that if the Ministry of Local Administration (MoLA) fails to elect a governor, the President may appoint a person of his choice among the members of the governorate's local council. The same law upholds the right of the president to appoint officials at lower district posts as well.

57 Wadhah al-Awlaqi and Maged al-Madhaji, *Beyond the Business as Usual Approach: Local Governance Amid Conflict and Instability*, Rethinking Yemen's Economy Series (Sana'a, Yemen: Sana'a Center for Strategic Studies, 2018), 25–41, https://carpo-bonn.org/wp-content/uploads/2018/09/Rethinking_Yemens_Economy_white_paper_2.pdf (accessed September 18, 2019).

Budget and Financing

In theory, LAL empowers governorate - and district - councils to generate their own revenues through a series of tariffs and taxes. It specifies four main sources of revenues for the councils; first, district's local revenues; second, joint revenues gathered by the district and the governorate; third, joint public resources; and fourth, financial support by the central government. The budget of local councils, however, is neither distinct nor separate from the national state budget. They are, in fact, a subset of the latter which vertically integrates and consolidates taxation and finance from district to governorate to the national budget. This setup considerably limits the authority of the municipalities to amend budgets or reallocate resources to address crises as they arise. In addition, the LCs have no discretion to set the amount of taxation and must share whatever is collected with the governorate authorities, which, in turn, must share it with the central government. Revenues from the last two sources are, in theory, redistributable downwards to the local councils based on a set of criteria ranging from priority of need, population density, poverty levels, availability of resources, etc. In practice, the degree to which these funds are sufficient to address and alleviate local issues is uncertain.⁵⁸

Although the LCs are in theory entitled to financial support from the central government for capital investments and recurring operating expenses, in practice, the conflict has considerably reduced that aid. LC income is ordinarily generated from commercial taxes: fees on sports' events, tourism, building permits, registrations; state-operated utilities, such as water and electricity bills, property transfers, car registrations, entertainment venues, and the like. Yet, income from these resources is meager. The LCs have not enjoyed the authority to set a budget that would cover operations and adapt to deal with challenges as needed. They have been reliant on central government funding to cover operations and projects' costs, wages, infrastructure maintenance, investments, development programs, and capital transfers.⁵⁹

Prior to the Yemeni Revolution in 2011, the financial system for Amanat Al Asimah followed a pattern similar to that of all other urban areas in Yemen. There are, however, key alterations. Because of its unique status as an exclusively urban governorate without attached rural areas, there are three separate sources of budgetary allocations. First, the budget for the ten (10) districts, which is the largest in both expenditures and revenues, represents over 50 percent of the total. Second, Amanat Al Asimah's Central Budget, accounts for another 30+ percent, and the Cleanliness and City Improvement Fund (CCIF) at no more than 16 percent. Amanat Al Asimah, therefore, is heavily dependent upon central government subsidies, which, for instance, in FY 2006-2007 accounted for over 74 percent of the total revenues. There is, however, little reliable data available to weave together the complex threads of the entire financial mechanisms of local administrations. The most important financial tool that local governments possess is the CCIF whose operations are governed by Law 20 and a Prime Ministerial decree, both of 1999. The CCIF is the only financial mechanism that allows the LCs in Amanat Al Asimah to deliver services to its citizens.⁶⁰

58 Republic of Yemen, National Information Center Data, 2014, <https://www.yemen-nic.info/gover/aden/politlocal/> (accessed September 18, 2019).

59 El Basti, A City Development Strategy, 24 – 30; al-Awlaqi and Maged al-Madhaji, Local Governance, 35 – 41.

60 Ahmed El Basti et al., Sana'a: A City Development Strategy (Washington, DC: The World Bank Group, 2009), <http://documents.worldbank.org/curated/en/639151468170064779/Sanaa-A-city-development-strategy>, (accessed October 23, 2019).

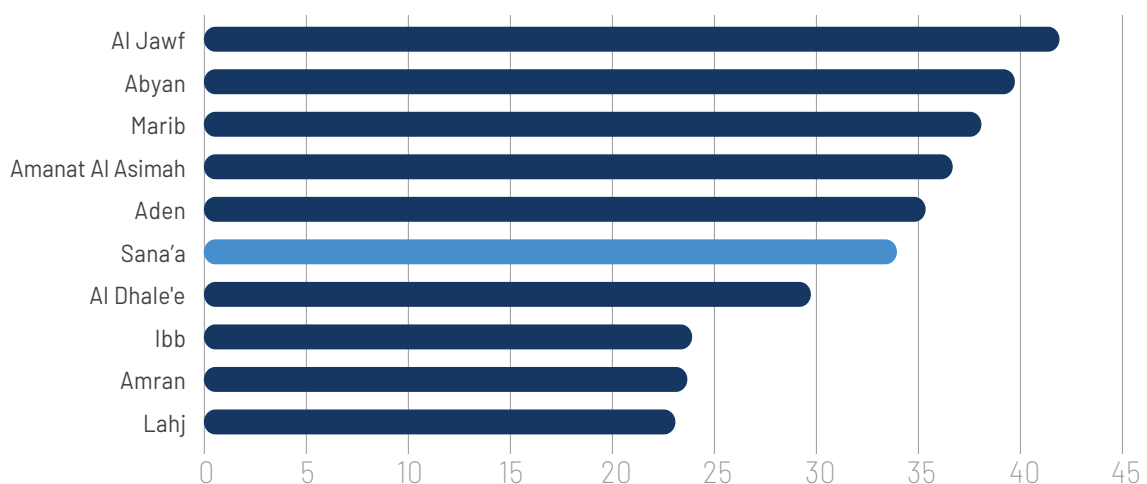
Current Operations

The regime change after September 2014 did not alter the basic legal structure of governance. The administrative apparatus, such as it existed before September, offered the advantage of established institutions already in place that allowed the new regime to penetrate the fabric of society. The conflict, however, has deleteriously impacted the LC's ability to provide essential services to their communities, thus undermining the trust of Yemeni citizens in state institutions. Anecdotal evidence suggests that the new regime has used the LCs to redirect resources and aid to serve its needs and interests. In Amanat Al Asimah, governorate income and support provided in the past by the central government, came to a near halt after 2015. Nonetheless, there are reports that across Yemen, including Amanat Al Asimah, LCs continue low level operations and provide city residents with aid and essential services, help to monitor developments at the local level, and act as a crucial link between INGOs and central governing authorities.⁶¹

Figure 9 shows the presence of a large civil service apparatus in operation. Yet, the strength of such ties is open to dispute. So are the authorities' motivations. The German Berghof Foundation, for example, found that LCs in Sana'a have been allowed to function in order to generate grassroots support.⁶²

Recently, in October 2019, authorities in Sana'a approved an income tax to levy all local and international organizations working in Yemen on up to 20 percent of all salaries and wages of their staff. In late September 2019, the same authorities suspended business licenses of domestic remittance organizations and forbade them to process the circulation of money.⁶³

Figure 9: Percentage of the Population that Relies on Government Salaries as a Main Source of Income



Source: WFP, Emergency Food Security and Nutrition Assessment (EFSNA), June 2017

61 Wadhah al-Awlaqi and Maged al-Madhaji, Beyond the Business as Usual Approach: Local Governance Amid Conflict and Instability, Rethinking Yemen's Economy Series, ed. Anthony Biswell (Sana'a, Yemen: Sana'a Center for Strategic Studies, 2018), 25–41, https://carpo-bonn.org/wp-content/uploads/2018/09/Rethinking_Yemens_Economy_white_paper_2.pdf (accessed September 18, 2019).

62 Badr Basalmah, Local Governance in Yemen: Challenges and Opportunities, Local Governance: Engine for Stability in Yemen (Berlin, Germany: Berghof Foundation Operations GmbH, 2018) https://www.berghof-foundation.org/fileadmin/redaktion/Publications/Other_Resources/Berghof_Foundation_Yemen_locgov_Paper02LocalGovernance_WEB.pdf (accessed October 1, 2019).

63 News Yemen, "ما وراء إغلاق الحوثيين لشبكات التحويلات المالية"، September 22, 2019, <https://www.newsyemen.net/news45981.html> (accessed October 20, 2019).

5 Culture and Heritage

Figure 10: Old City of Sana'a



Source: UNESCO, and Cultural Organization, Old City of Sana'a. Available at <http://whc.unesco.org/en/list/385>

Sana'a is the largest and most populous city in Yemen as well as the country's administrative and most important cultural center. Old Sana'a, or Madinat Sana'a Al-Qadimah, within Amanat Al Asimah, was declared a UNESCO World Heritage Site in 1984.⁶⁴ This part of the city – which remained unchanged for centuries – has a unique urban and architectural patrimony that preserves intact the traditional coherence and historical uniqueness of Sana'a.

Nonetheless, the modernization drive after 1970 and the push and pull factors of urban and demographic sprawl, saw expansion of Sana'a beyond the old core which, in turn, led to a competition for resources between the city and new urban areas. Sana'a's unique heritage is an important factor to build upon and drew significant levels of tourism, thereby significantly contributing to growth and local economic development.

⁶⁴ United Nations Educational, Scientific, and Cultural Organization, Old City of Sana'a, <http://whc.unesco.org/en/list/385> (accessed October 3, 2019).

Figure 11: Old Sana'a City Drawn by Niebuhr in 1763

Source: Hossein Soltanzadeh and Mohammadreza Sadeghi Moghaddam, *Sana'a, Structure, Historical Form, Architecture and Culture*, *Civil Engineering and Architecture* 3(3): 56-67, 2015

Madinat Sana'a Al-Qadimah

Madinat Sana'a Al-Qadimah is a fortified, walled, city that has been inhabited for more than two millennia.⁶⁵ The different architectural styles used in Madinat Sana'a Al-Qadimah reflect, for the most part, the cultural composition of its historical inhabitants: Yemeni, Ottoman, and Jewish. Both public and private edifices are universally constructed of either baked and rammed mud bricks or stone. The latter material is ubiquitous in Yemen and is characterized by resistance to moisture and climate change as well as an ability to expand or contract during construction. Waterproofing with lime plaster gives these structures considerable longevity and permanence.

In 2004, Sana'a was named the Arab World's City of Culture.⁶⁶ Yemeni houses are built vertically as towers and typically occupied by a single family. Their height changes depending on ownership. Former Jewish houses for instance are no taller than three-stories high; followed by four-stories Ottoman houses, and, lastly, six-stories Yemeni houses. Some of these houses stand on naturally occurring outcrops at such a height that they give the impression of medieval skyscrapers. Beautifully decorated in symmetrical geometric patterns, stained-glass windows, and elaborate friezes, the architectural harmony and the preservation of medieval fabric and small square represents a long and profound urban heritage. Since the selection into the World Heritage Fund in 1986, the GoY installed water and sewage networks, paved lanes and public spaces, and erected sidewalks. Between 2001-2004, a Yemeni – Dutch project produced a preservation strategy, which, in addition to expanding Old Sana'a to include some historic neighborhoods lying beyond the walls, also developed proper conservation guidelines.⁶⁷

⁶⁵ Hossein Soltanzadeh and Mohammadreza Sadeghi Moghaddam, *Sana'a, Structure, Historical Form, Architecture and Culture*, *Civil Engineering and Architecture* 3(3): 56-67, 2015

⁶⁶ Ibid.

⁶⁷ Michelle Lamprakos, *Rethinking Cultural Heritage: Lessons Learned from Sana'a, Yemen*, *Traditional Dwelling and Settlements Review* 16, 2 (2005), 17 – 37.

Best Known Sites

The city is surrounded by medieval clay walls about 9-14 meters tall. It contains more than 100 mosques, 14 baths (hammams), and over 6,000 houses, all built before the 11th century. In addition to the overall architectural style, selected sites of interest include the Bab Al-Yaman, or Gate of Yemen, the main gate in Sana'a's fortified walls. One of the two extant city gates (the other being the northern Bab al-Shaub), the present structure, facing south, dates to the first Ottoman occupation and is the most ornately decorated of the city's walls. A short distance from the Bab Al Yaman is the Great Mosque of Sana'a (Al-Jami al-Kabir bi Sana'a), which local lore traces back to the early Islamic period during the life of the prophet Muhammad. Confirmed by archeological findings and surviving scriptures, it has gone through several renovations, blending Christian Byzantine and Ethiopian Axumite features over time. It remained the largest in the city until the construction of the Al Saleh Mosque, which can accommodate up to 44,000 worshippers. Ghamdan Palace is another ancient palace and fortress in Sana'a, reputed to be the oldest castle in the world. According to the Guinness Book of Records, it dates to 200 AD.⁶⁸ Although much of the original structure is now in ruins, it was originally built on top of a hill and was seven stories high. Some accounts, now held to be apocryphal, speak of 20 stories. This structure served as a prototype for most other edifices of Sana'a.

⁶⁸ Guinness World Records Data, available at: <https://www.guinnessworldrecords.com/world-records/first-castle>

Figure 12: Gate of the Yemen – Old City of Sana'a

Source: Hossein Soltanzadeh, Mohammadreza Sadeghi Moghaddam, *Sana'a, Structure, Historical Form, Architecture and Culture*, *Civil Engineering and Architecture* 3(3): 56-67, 2015

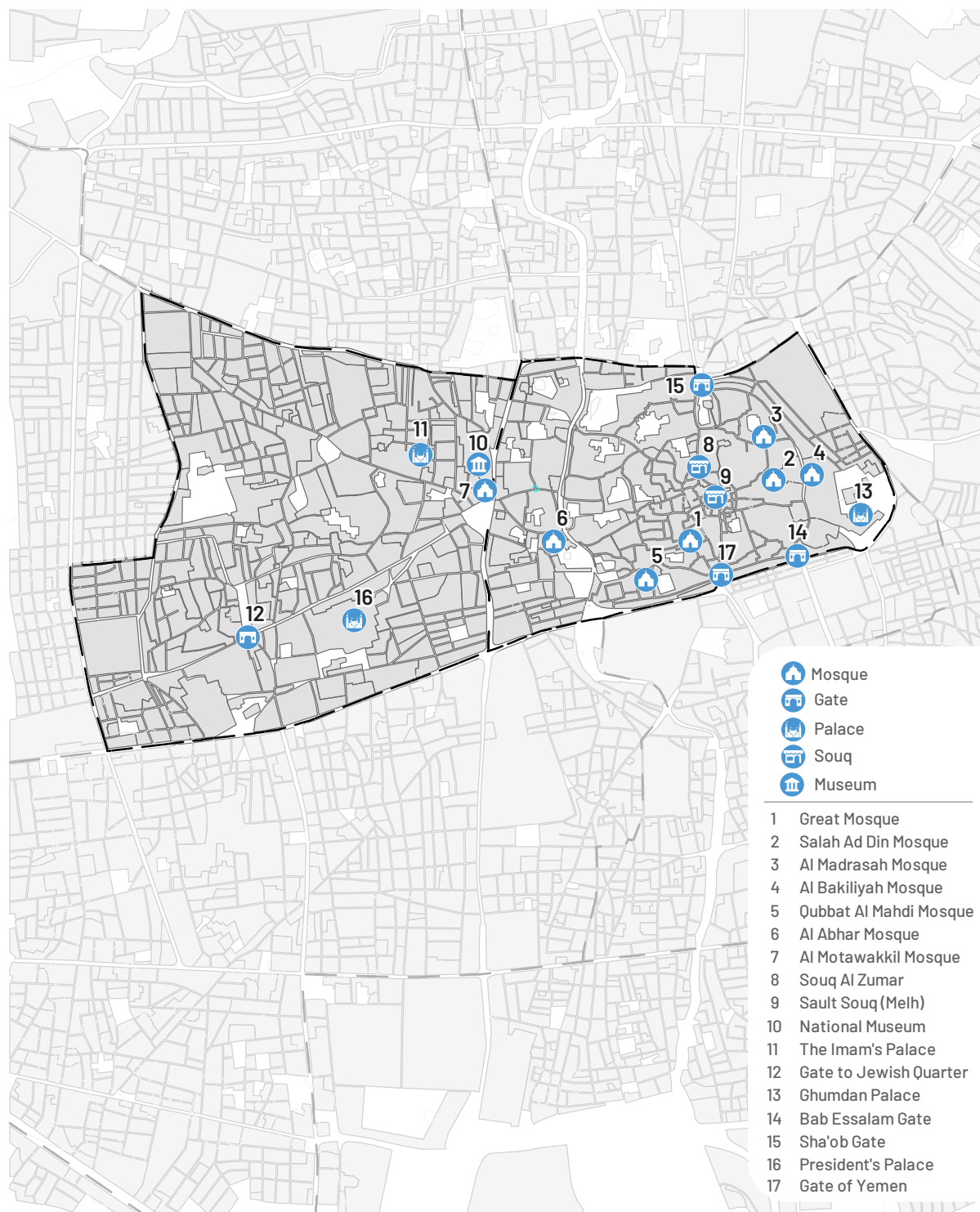
Conflict Damages

Sana'a has been an embattled city since the escalation of the conflict in early 2015. It has witnessed three major battles, in 2011, 2014, and 2015, and has also intermittently been hit by airstrikes and other ground attacks which have resulted in significant loss of human life and caused material damages. Fighting between different factions has caused considerable damage to edifices and cultural sites. An airstrike conducted in June 2015 resulted in the destruction of many houses and historic buildings in the center of Old Sana'a.⁶⁹ Another June 2015 airstrike destroyed an additional number of such buildings just outside the city walls including the Ottoman era Al-Owrdhi historical compound.⁷⁰

⁶⁹ Amnesty International, "Yemen: Airstrike and Weapon Analysis Show that Saudi Arabia-led Forces Killed Scores of Civilians," July 2, 2015, <https://www.amnesty.org/en/latest/news/2015/07/yemen-airstrike-analysis-shows-saudi-arabia-killed-scores-of-civilians/> (accessed October 13, 2015).

⁷⁰ UN News Service, "Yemen: UNESCO Deplores Destruction of Sana'a Heritage Site Bearing 'Soul of Yemeni People'", June 12, 2015, <https://www.refworld.org/docid/5580150f408.html> (accessed September 23, 2019).

Figure 13: Some Key Heritage Sites in Sana'a City.



Source: A Historical Atlas of Yemen by Amy Romano, 2004.

6 Housing, Land and Property (HLP)

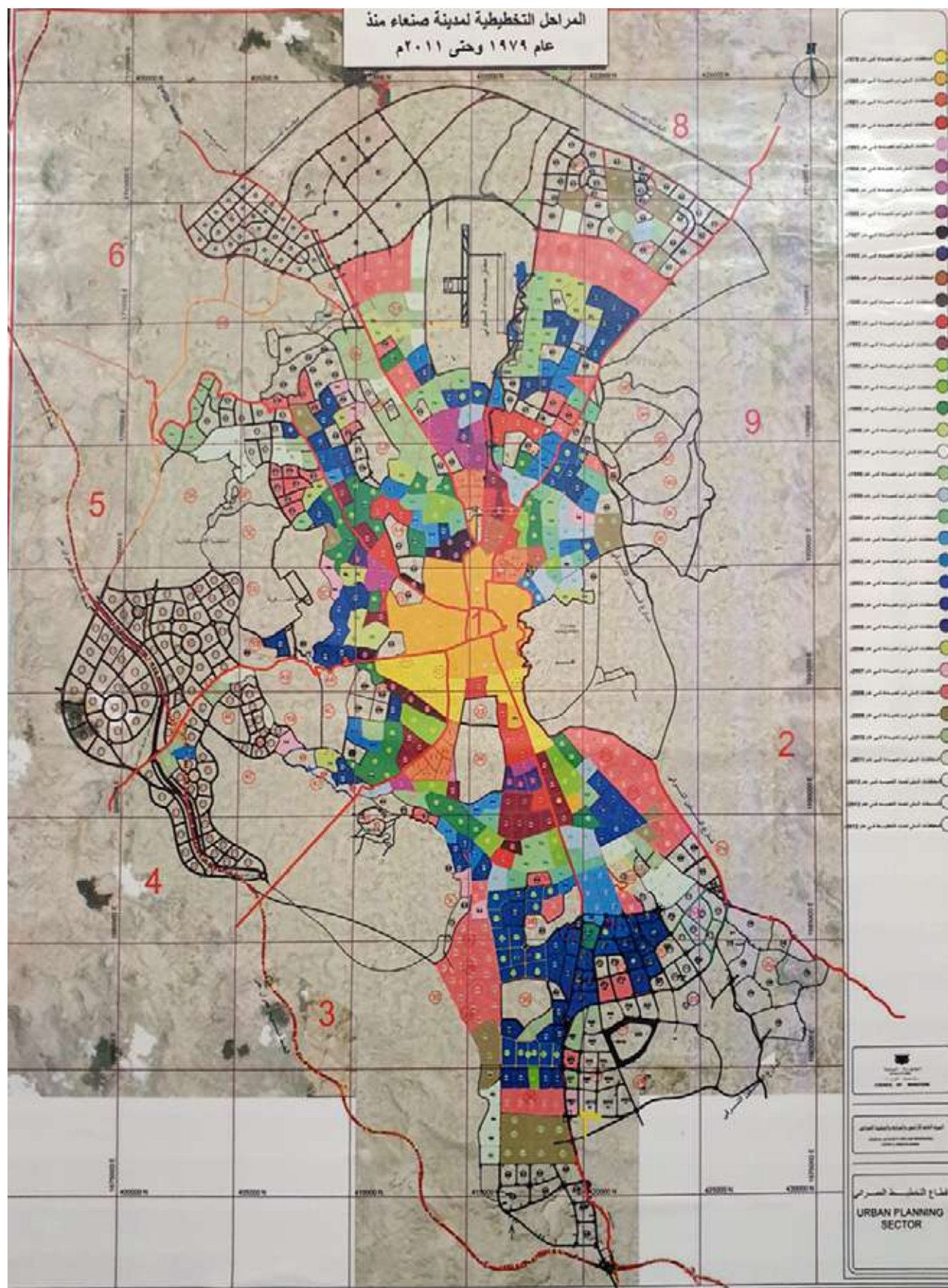
Overview

Since 1962, Sana'a city has experienced tremendous growth and expanded its urban boundaries from its 3.7 km² medieval core to covering more than 1,600 km² in 2010. This growth can be differentiated in three phases (figure 14 shows the phases per year):

1. The walled Old City of the 1960s, housing many historic buildings.
2. The rapid growth of the 1970s and 1980s expanding the urban fabric beyond the walls of the Old City. Initially, the Old City and the new areas directly adjacent to the Old City competed for resources, but due to the advantages of the availability of land at lower costs, the latter won in importance.
3. The influx of IDPs after the gulf war in 1990–1995 leading to an initial proliferation of informal settlements.
4. General uncontrolled urban expansion on hill sides, hazardous areas by migrants and IDPs until 2020.

In the last two phases, this growth has put an immense stress on urban services and infrastructure. Combined with an absence of effective urban planning processes and urban development controls to channel the growth, this growth has led to the proliferation of informal constructions.

Figure 14: Planning Stages in Sana'a City (1979-2011)



Note: Planning stages of Sana'a city from 1979 to 2012. Even though this plan covers many extension areas, most of the roads planned were not implemented. Image received in 2019 from GALSUP by UN-Habitat.

In the midst of the rapid urban expansions of 1970-1980, efforts were made in 1978 to develop a master plan to guide future growth. However, the uncontrolled sprawl that followed the years after the formulation of the plan soon rendered the plan superfluous, and the main roads foreseen in the plan were squatted upon, making implementation nearly impossible. Image 14 shows the planned roads foreseen in the master plan, which suggests that a phased implementation was realized. In reality, constructions have appeared mostly haphazardly, not respecting the road reserves and neat neighborhood divisions suggested in the plan.

Another attempt in 1998 to develop a plan sought to redress the spatial imbalance that developed in the intervening years, but the plan was not approved. By 2019, urban built-up growth had reached the administrative boundaries of the capital, requiring serious coordination between administrative institutions in order to manage growth at the borders. However, various institutional stakeholders - the national state, the governorates of Amanat Al Asimah and Sana'a, and the General Organization for the Preservation of Historic Cities (GOPHC) – has up until now not articulated a vision for the future of the city at the level of greater Sana'a.⁷¹

Most of the land in and around Sana'a falls under two categories: private- or state- owned. Private land is mostly agricultural land while state owned includes public land that the state deems necessary for building public facilities, including parks, hospitals, and schools. Mountain slopes, including those at a steep 20 percent gradient, are similarly categorized as public. Yet, there is little effort to catalogue and protect state holdings. This opens state-owned land to a series of encroachment from the public that comes in the form of illegal squatters' settlements, speculators claiming state lands as extensions to their own parcels, or those who claim historic rights-to-water for their thirsty crops. Given the proliferation in the cultivation of qat (see Economy) in the highlands around Sana'a, predominantly in the Bani Hushaysh, Hamdan, and Bani Al Harith districts, claimants often appropriate the land.

Until 2006, urban planning fell under the authority of the Ministry of Public Works and Roads (MoPWR), which exercised its mandate either through the Department of Housing and Urban Planning (DHUP), or through its own branches in each governorate. After 2006, the General Authority for Land, Survey and Urban Planning (GALSUP) was established (replacing the State Land and Real Estate Authority) to take over some of these responsibilities: however, this establishment has not resulted in an appreciable expansion of institutional prerogatives or stricter enforcement of development controls. In fact, GALSUP's mandate remains limited, primarily focused on overseeing the design of detailed neighborhood plans (which often remain unimplemented) and post-facto amendments to plans to reflect the situation on the ground.⁷² In other words, there never was a strict monitoring system or mechanisms to ensure either the implementation of detailed urban plans or stop development in prohibited areas, including those allocated for public services. This challenge is widely known, and importance of developing an up-to-date system for land registration was highlighted in multiple housing symposia and housing policy dialogues (see box), however little progress has been made so far in increasing land registration numbers.

71 Roman Stadnicki, The Challenges of Urban Transition in Yemen: Sana'a and Other Major Cities, *Journal of Arabian Studies*, 4, 1 (2014), 118.

72 El Basti, A City Development Strategy: For disaster area dangers see, Global Facility for Disaster Reduction and Recovery and The World Bank Group, Probabilistic Risk Assessment Studies in Yemen (Washington, DC: 2009), https://www.gfdrr.org/sites/default/files/publication/GFDRR_Probabilistic_Risk_Studies_Yemen.pdf (accessed August 23, 2019).

Milestones for Planning and Housing Development in Sana'a.

- The 1981 First Urban Development Project (Sawad Sawan Project in Sana'a)
- 1987-1988-1989-1995 the preparation of 'Urban Planning Guidelines for Yemen' by the Ministry of Construction, Housing and Urban Planning in collaboration with GTZ
- The 1992 International Symposium on Low-Cost Housing in the Arab Region
- The 1992 Draft National Housing Policy
- In the early 2000s, the Urban Development Project III in Taiz and a similar one in Sawad Sawan in Sana'a city (3 phases) for upgrading and re-settlement of slums and squatters
- The 2006 establishment of President Al Saleh low-cost housing project.
- Draft National Land Policy (NLP) submitted in 2012 for government revision.

In an attempt to improve these numbers, the registration of land titles with the Land Registration Department in the GALSUP has been made an obligatory step in the process to obtain a building permit. However, in practice registration rarely happens: according to some estimations 81.5 percent of constructions in Sana'a happens without permits.⁷³ One reason is that property transactions for both land and real estate are taxed with three percent of the sales value, due when the new owner registers the property on their name, which poses an obstacle in particular to low-income families. As a result of the widespread lack of official registration, disputes over land are widespread. Indeed, land disputes are estimated to constitute 30-50 percent of all cases that appear before primary courts.⁷⁴

Housing affordability

According to some research, the main issue affecting access to houses in Yemen and Sana'a specifically is not the supply, but affordability of houses.⁷⁵ Starting in Sana'a in the 1980's, currently a significant chunk (20 percent in Yemen) of housing production is performed as by private developers, typically as apartment buildings with commercial ground floors. These types of buildings are seen as good investments, in the face of volatility of the Yemeni Rial (YER). Even though these developers sometimes facilitate access to housing finance, the for Yemeni poor stringent loan conditions mean that in practice few can qualify, and often end up as empty units. Nevertheless, locally interviewed informants suggest that rents recently increased 250 percent – 300 percent for well-located apartments; it is highly likely that this is driven by the significant influx of IDPs to the city.

Conversely 60 percent of the total housing production is driven by owner-builders, which makes up the vast majority (90 percent Yemen-wide) of the 'usable housing stock'.⁷⁶ However, most of these constructions occurs in largely unplanned urban fringe areas, on disputed lands or land without known ownership as informal (unplanned) developments.

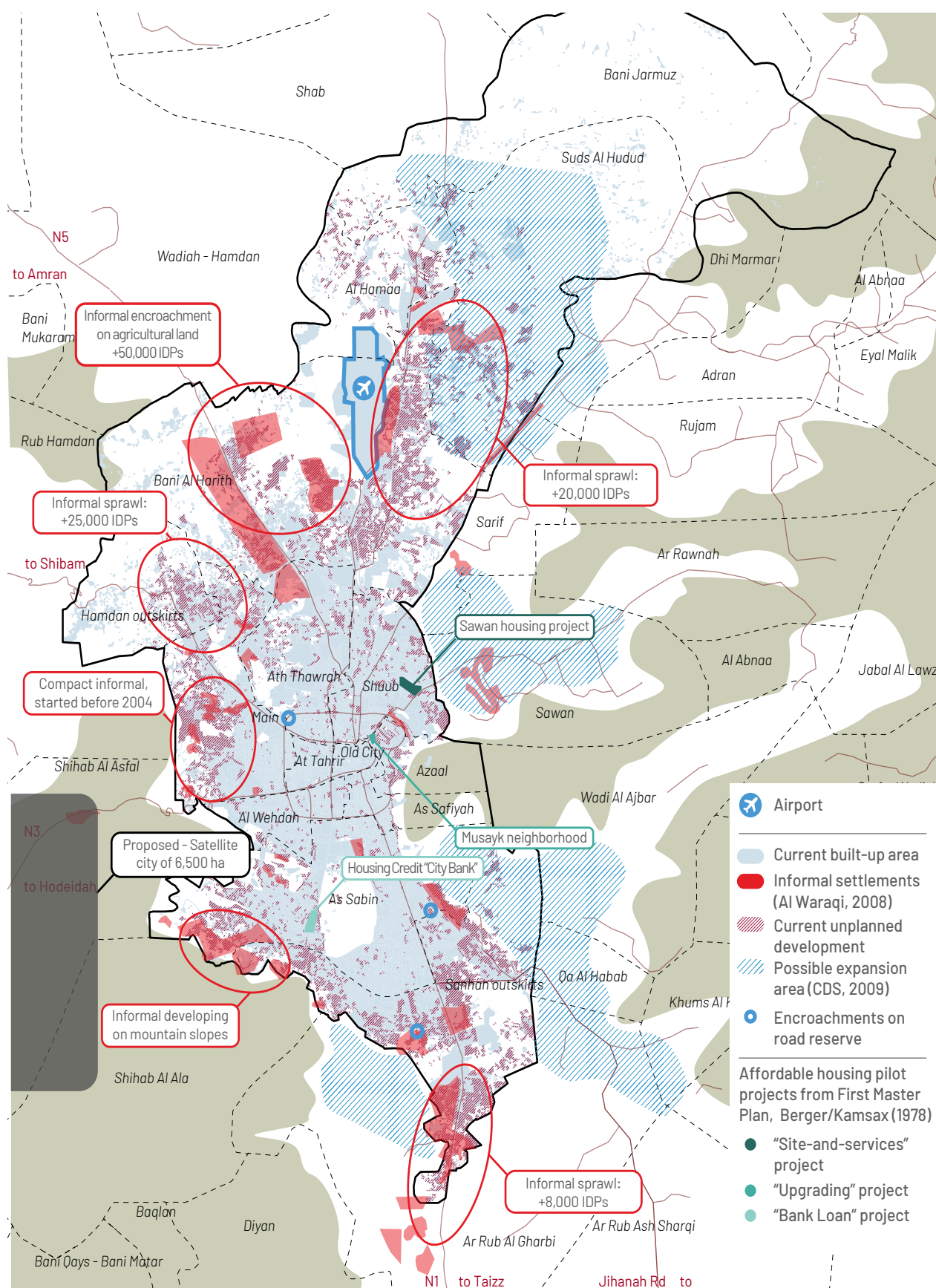
73 Sana'a Urban Upgrading Study, Informal Residential Development and Informal Areas in Sana'a, Inventory, Typology, Dynamics, Strategy and Action Plan, Draft Final Report, Sana'a City Development Strategy (CDS), March 2008

74 The World Bank Group, CDS, 18-21

75 Abdullah Al-Abed, Urban Housing Supply and Affordability in Yemen, *Journal of Architecture and Planning*, Vol. 27 (2015), 17-28. https://cap.ksu.edu.sa/sites/cap.ksu.edu.sa/files/imce_images/jap_ksu_jan2015_e2.pdf (accessed August 23, 2019).

76 Ibid.

Figure 15: Growth of Sana'a City 1962–2019 and Unplanned Settlements, UN-Habitat (2019).



Source: JRC, Google Earth, Sana'a CDS (World Bank), Ramdane Djebarni and Abdullah Al-Abed "Satisfaction level with neighborhoods in low-income public housing in Yemen" (Vol. 18 No. 4, 2000, pp. 230-242. MCB University Press) and Al-Waraq "Urban Planning Strategy of Sana'a City Based on Present and Future Requirements", 2009

Unplanned Developments

Ministry of Public Works and Highways (MPWH), in cooperation with Amanat Al Asimah and with support of Cities Alliance, conducted an assessment of informal settlements in the city in 2007-2008. The study was able to identify a total of 35 informal settlements located throughout the city as well as on the urban fringe, most of which were established in 1990-1995 (23 areas) on state land by returnees after the 1991 Gulf war and/or by poor rural migrants, low paid security personnel, low rank government employees, and other lower income segments of society. Most of these areas, are located on private agricultural lands and adjacent mountains; four are established next to sailas (dry riverbeds), which are prone to occasional flash floods and thus classified as potential disaster areas.

Figure 16: *Jabel Attan Informal Area, Sana'a*



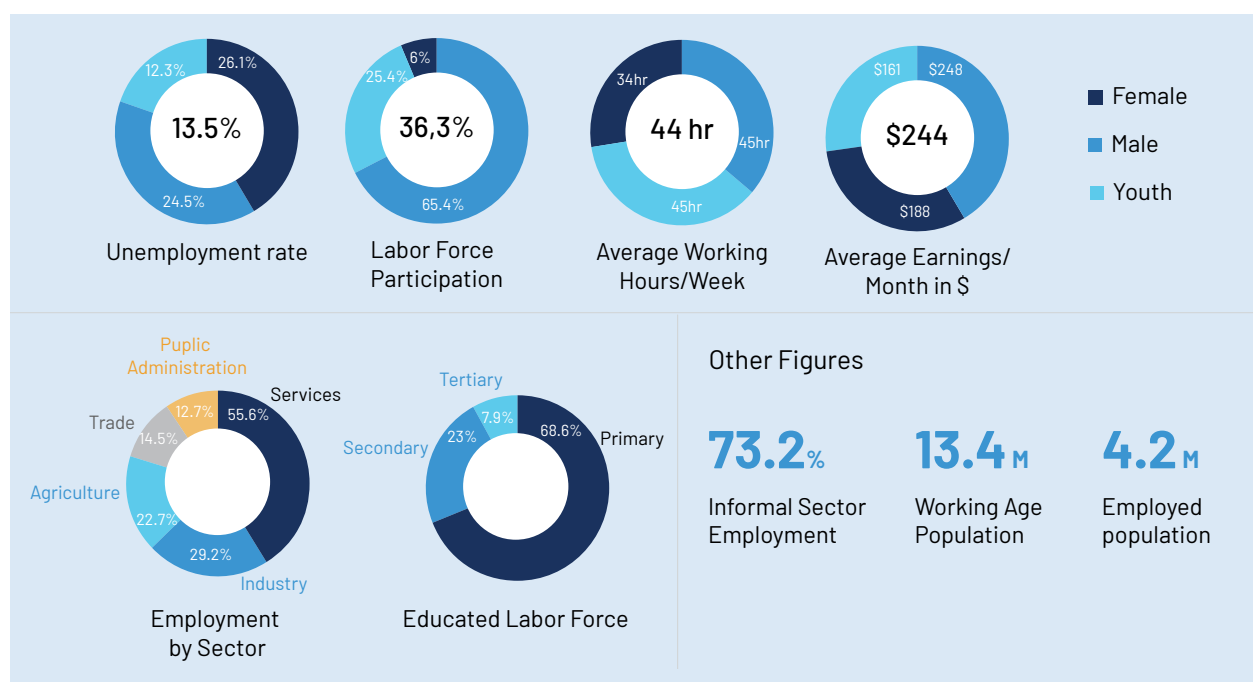
UN-Habitat, Wael Al Aghbari, 2020.

By 2013, almost 37 percent of the population of Sana'a lived in slums.⁷⁷ By 2019, these areas had again expanded and are currently housing a large number of IDPs displaced to the city from other governorates.

These settlements are not included in any formal plan, they suffer from a lack of infrastructure and basic services, no paved roads, water supply, schools and health facilities and public transportation. Electricity is wired illegally in each habitation. In stark contrast, certain hilly areas such as the mountains in Faj Attan outside the city limits are covered with huge villas for affluent tribesmen and the elite.

⁷⁷ United Nations Human Settlement Program, Country Slum Data by Shelter Deprivation (Nairobi, Kenya: 2020), https://urban-data-guo-un-habitat.hub.arcgis.com/data-sets/430beee2622b45a7857ff8af7ce463eb/data?order=By=One_Shelter_Deprivation&where=Countrypercent20percent3Dpercent20percent27yemenpercent27 (accessed May 2020).

Figure 17: Eve of Conflict Key National Figures.



Source: ILO, 2013-2014.

5. Pre-Conflict Overview

Historically, much of Sana'a's economy was dependent upon mining of silicates and semi-precious gems, metalworking, and fruticulture. As the national capital of Yemen, Sana'a enjoys a unique economic position. Amanat al-Asimah possesses the largest number of commercial establishments and labor force in the country.

The City Development Strategy of the World Bank and Cities Alliance summarized the economy of Sana'a in 2009 as "a capital city economy," in terms of concentrations of national economic activities and employment and public sector administration. The economy was described as large compared to its population. Amanat Al Asimah contained almost 16 per cent of the nation's establishments and 22 percent of the nation's employment in establishments, whereas it had only about 9 per cent of Yemen's total population in 2004.

The average size of establishments in Sana'a was small at 3.88 employees per establishment, but this was higher than the Yemeni average (2.87 employees per establishment). Of all the main cities, only Aden, at 6.44 employees per establishment, has a larger establishment size than Sana'a. The public sector accounted for 30 percent of a large share of the non-agricultural employment in Sana'a. In terms of establishments and employment, commerce and small services were by far the largest sectors in Sana'a. This is similar in other cities of Yemen, but the degree of concentration in commerce and small services is even higher. Also, there is a relative higher concentration of general administration, hotel and restaurant, and transportation employment in Sana'a compared to the Yemeni averages.

The government is the largest employer in Yemen. In Sana'a, government employees constituted 40 percent of the available 295,000 jobs in the city in 2002.⁷⁸

78 The World Bank Group and the Capital Secretariat of Sana'a, Sana'a: A City Development Strategy (Sana'a, Yemen : World Bank Group, City Alliance, 2009) <http://documents.worldbank.org/curated/en/639151468170064779/pdf/839120WP0Box-380e0Sana0a0pub01005009.pdf> (accessed October 23, 2019).

SANA'A RAPID CITY PROFILE

Table 1: Establishments and Employment in the Main Yemeni Cities (2004)

Governorates	Establishments		Workers	
	Number	Percentage	Number	Percentage
Sana'a	84,922	15.9%	252,257	21.6%
Taizz	45,391	11.1%	136,328	11.8%
Ibb	39,195	9.6%	80,903	6.9%
Al Hudaydah	36,909	9.1%	110,794	9.5%
Aden	16,547	4.1%	106,686	9.1%
Total Yemen	407,477	100%	1,170,031	100%

Source: CSO, Census of Establishments, 2004.

Table 2: Percentage of Economic Establishments and Available Labor Force in Main Yemeni Urban Areas

Type of Establishments	Amanat Al Asimah	
Private, locally owned	95%	64%
State-owned	2%	33%
Waqf	2%	1%
Private, foreign-owned	1%	1%
Private, Joint Venture	0%	1%
Total	%100	%100

Source: CSO, Census of Establishments, 2004.

Commerce and small services are the largest performing economic sectors in Sana'a both in terms of establishments and in terms of labor force employed in them. As the national capital, Sana'a traditionally lead the way in the concentration of a large civil service, hospitality, and transportation. It also led the national average in terms of formal job sectors and new economic projects.

Table 3: Percentage Distribution of Establishments and Employment by Economic Activity (2004)

Economic Activity	Establishments		Employment	
	Sana'a	Urban Yemen	Sana'a	Urban Yemen
Commerce and Small Services	58.9%	50.6%	31.3%	28.4%
Manufacturing	12.1%	10.2%	12.5%	11.4%
Other Activities	11.2%	22.9%	10.8%	12.5%
Hotels and Restaurants	7.1%	4.7%	7.4%	5.5%
Transportation	4.8%	2.3%	4.0%	2.7%
Health and Social Work	2.7%	2.2%	5.3%	4.8%
Education	1.5%	4.1%	9.0%	18.6%
General Administration	0.8%	1.1%	18.0%	13.4%
Electricity, Gas, and Water	0.5%	1.7%	1.1%	1.2%
Agriculture	0.2%	0.7%	0.3%	0.8%
Mining and Quarrying	0.1%	0.1%	0.3%	0.7%
Fishing	0%	0%	0%	0%
Total	%100	%100	%100	%100

Source: CSO, Census of Establishments, 2004.

Amanat Al Asimah was the leading governorate in Yemen in terms of formal sector job creation and new economic projects. Thirty-nine percent of new formal jobs and 33 percent of new formal establishments were created in Sana'a. This is supported by the fact that Sana'a's population is relatively better educated than the population of other Yemeni cities and much better educated than the national population.

Table 4: New Projects and Formal Sector Jobs Created 1992-2006

Governorates	Number of Projects	Number of Employees
Amanat Al Asimah	1,125	29,298
Aden	584	5,430
Taizz	566	11,587
Hadramout	404	10,114
Al Hudaydah	366	7,474
Other Governorates	310	10,330
Total	3,355	74,233

Source: General Investment Authority, 2007.

Table 5: Distribution of Population by Level of Education

Level	Amanat Al Asimah	Urban Yemen	All Yemen
Illiterate	32%	34.4%	31.5%
Read and Write	21.9%	25.7%	45.3%
Primary	15.8%	13.8%	7.2%
Vocational - Basic	14.2%	12.9%	8.5%
Diploma before Secondary	7.4%	5.3%	2.3%
Secondary and Equivalent	6%	4.9%	3.1%
Diploma after Secondary	1.5%	1.7%	1%
Higher Education	0.9%	0.6%	0.7%
Nondeclared	0.3%	0.7%	0.4%
Total	%100	%100	%100

Source: General Investment Authority, 2007.

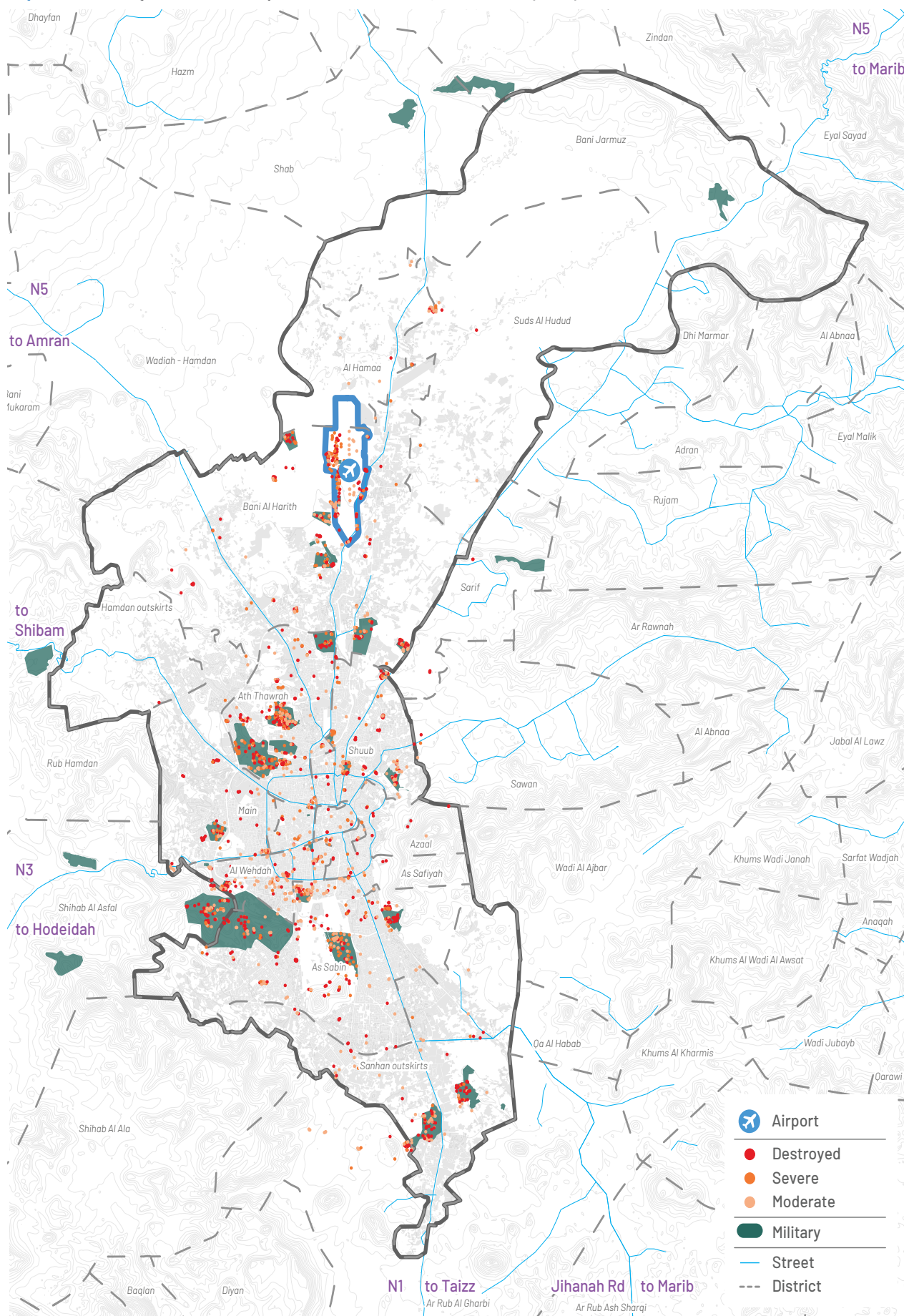
Impacts of the Conflict on the Economy

Sana'a's economic trends during the conflict mirror those of the country as a whole. Even before the political woes that followed the Yemeni Revolution of 2011, Sana'a poverty rate was highest amongst all other governorates. The conflict has caused widespread disruption of economic activities and has dramatically diminished employment and income opportunities in both private and public sectors. More than 600,000 jobs have been lost.

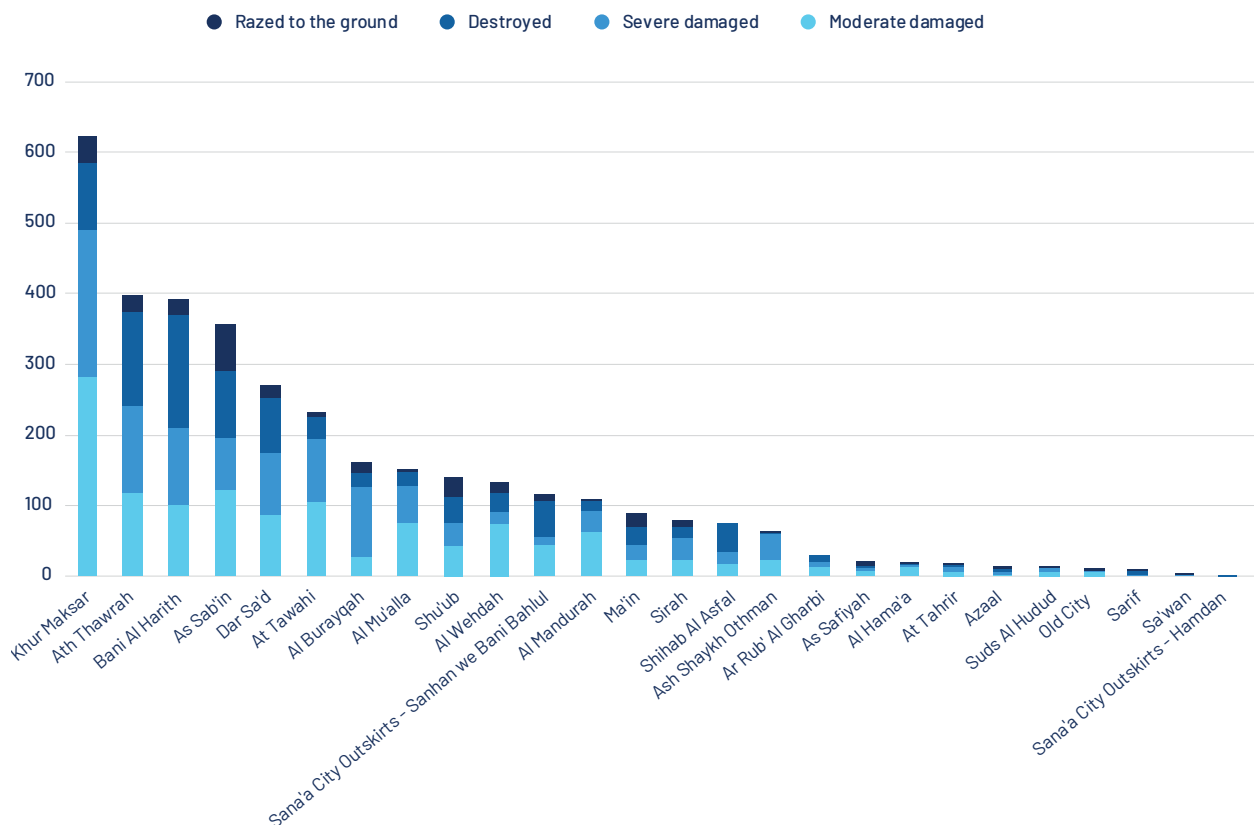
National economy has contracted by nearly 50 percent since 2016 and cumulative losses in real Gross Domestic Product (GDP) are estimated at 49.9 billion. Domestic and external debt grew respectively to 49.4 percent and 25.1 percent of the GDP, while inflation has accelerated to over 40 percent. Poverty rates are rampant with an estimated 81 percent of the population below the poverty line.⁷⁹

79 United Nations Office for the Coordination of Human Affairs, Humanitarian Needs Overview: Yemen 2019, (New York, NY: 2019).

Figure 18: Damages in Sana'a City due to the Conflict ,UN-Habitat (2019)



Source: Damage assessment conducted with remote sensing by JRC in 2019.

Figure 19: Damage Assessment in Sana'a City


Source: JRC, 2019.

Tourism

Sana'a enjoys a great but currently untapped potential for tourism. It possesses a year-long mild and temperate climate in stark contrast to the sweltering heat in the rest of the Arabian Peninsula. Its medieval Old City, included in UNESCO's World Heritage Sites in 1983, is arguably Yemen's most important tourist attraction.

The Old City is distinguished with an interlocking consistency of buildings, streets and other features. The design of the residential buildings, which exceed 6000 houses, relied on a closed plan system and the area built vertically with most of its functional areas mimicking an architectural tower system. One of its most important characteristics is the integration of environmental solutions into its design, where its narrow passages and other spatial features appear to keep in line with the movement of the sun, permitting ample sunlight while accommodating a steady airstream to obtain natural lighting and ventilation. Gardens and orchards can also be seen lining the roads and alleys.

The walls of the upper floors of the buildings were built with burnt terracotta (Yajur), which was contrasted with windows of various shapes, shades and functions. These walls were decorated with white stucco belts and plaster formations.

While cataloguing the mosques of Sana'a, historians list 106 structures. This large number came as a result of confining the mosques inside the city's walls or placing them in close proximity to the outer wall. The city also has 10 traditional public steam baths.⁸⁰

The Old City is famous for its unique design and engineering feats that have made it one of the most illustrious urban design cities in the region (see the chapter on Culture and Heritage).

⁸⁰ Organization of Islamic Capitals, Sana'a - the foundations of architectural design and urban planning in different Islamic eras (Mecca, Saudi Arabia: 2005).

Handicrafts

Closely linked to tourism, Yemen has a long history in artisanal manufacturing and Sana'a is considered a center for handicraft production, especially in metalworking, leather, woodcarving, gold and silver filigree, and embroidery. Although industrialization led to the extinction of some forms of artisanal work, others, like metal working, persevered. The current conflict, however, has led to a considerable decline in production of certain traditional manufacturing due to higher production costs and decreasing demand. Furthermore, quick cash schemes and concerns with safety have led many traders to switch to selling weapons and ammunition for hefty prices.⁸¹

Agriculture

Agriculture is the mainstay of Yemen's economy.⁸² About 75 percent of agricultural production comes from the highlands of north Yemen, where 60 percent of the total population lives. However, soil erosion, increased salinity, desertification, rapidly dwindling water resources, inadequate legislation, outdated farming techniques, and a growing focus on cash crops of no nutritional value, have greatly contributed to the inability of the country to feed itself. Use of agricultural lands is primarily confined to terraced mountain slopes in the northern parts of the country. These lands support the cultivation of coffee, fruits, grains, and qat.

Agriculture accounts for more than 93 percent of the available water use and, with scarce rainfall, is reliant on underground aquifers to irrigate crops. Sana'a, for instance, draws 80 percent of its water supplies from the Sana'a geological basin, an area 70x40 km northwest of the city,⁸³ and may well have exhausted its water reserves already, according to the World Bank.

Although its mountains receive far more appreciable levels of rainfall than elsewhere in the Gulf, Yemen has conventionally ranked unfavorably even among other MENA countries where fresh water scarcity is equally endemic.⁸⁴ With the decline of rainfall-fed crops and the steep rise in irrigation, cash crops in Yemen have become a valuable commodity and the country has achieved self-sufficiency in qat, cereals, and fodder. These represent 80 percent of the total arable land. Of these, qat is the most valued cash crop. A mildly narcotic plant that produces natural stimulant effects, similar to concentrated coffee, when its leaves and stems are chewed, qat is heavily cultivated in Yemen's highlands. In some highland districts, over 90 percent of farmers grow qat. In the mountains around Sana'a, for instance, in the Bani Al Harith, Bani Hushaysh, and Hamdan districts, farmers have reportedly drilled so many unlicensed boreholes for irrigation – often at 1,500m in depth – that water levels have declined by an estimated 6m. The high demand for qat in Sana'a alone is supplied by 4,000 such unauthorized wells.⁸⁵

81 Vladi Vovchuk, "Yemenis are Selling Their Guns on Facebook to Feed their Families," Business Insider, April 1, 2015, <https://www.businessinsider.com/yemenis-are-selling-their-guns-on-facebook-to-feed-their-families-2015-4> (accessed September 22, 2019).

82 Food and Agriculture Organization of the United Nations, Smallholder Agricultural Production Restoration and Enhancement Project: Environmental and Social Management Network (Sana'a, Yemen: 2017), <http://www.fao.org/3/a-bt085e.pdf> (accessed September 14, 2019).

83 Yahya Alwathaf, Hydrodynamic Modeling for Groundwater Assessment in Sana'a Basin, Yemen, *Hydrogeology Journal*, 20, 7 (2012), 1375-1392; See also El Basti, et al. Sana'a: A City Development Strategy, 17-18.

84 The World Bank Group, The Republic of Yemen: Unlocking the Potential for Economic Growth; A Country Economic Memorandum (Washington, DC: 2015), <http://documents.worldbank.org/curated/en/673781467997642839/pdf/102151-RE-VIDED-box394829B-PUBLIC-Yemen-CEM-edited.pdf#page84> (accessed September 15, 2019).

85 Frederika Whitehead, "Water Scarcity in Yemen: The Country's Forgotten Conflict," *The Guardian*, April 2, 2015, <https://www.theguardian.com/global-development-professionals-network/2015/apr/02/water-scarcity-yemen-conflict> (accessed September 23, 2019).

1. Overview

The intensification of the conflict in 2015 caused significant damage to health facilities. There is a significant lack of health facilities, in particular, hospitals. Additionally, available facilities are operating under difficult circumstances due to insufficient numbers of health workers and large numbers of population coming from neighboring governorates to receive healthcare services, leading to facilities operating at stretched capacities.

Amanat Al Asimah has one of the highest numbers of cholera cases in Yemen with 87,234 suspected cases reported during 2019, followed by Al Hudaydah (86 046) and Sana'a (76 884).⁸⁶ This can be attributed to poor WASH conditions in IDP settlement and informal areas in the city. Sana'a city also faces serious access challenges to drinking water.

2. Institutional and legal framework

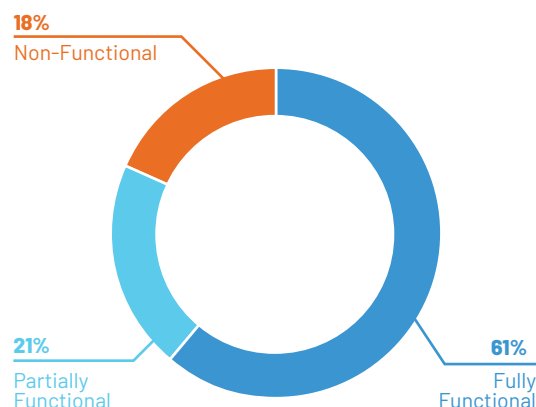
Article (55) of the Constitution of the Republic of Yemen guarantees the right to healthcare for all Yemeni citizens. At the national level, the main body responsible for managing the health sector in Yemen is the MoPHP. Following the decentralization law passed in 2000, the governorate health offices became responsible for providing healthcare at the governorate level, while the district health offices manage the local level.⁸⁷

Prior to the conflict the health sector heavily relied on private financing, with 76.42 percent of the health expenditure coming from out-of-pocket sources.⁸⁸

3. Infrastructure

As of October 2016, there are 88 health facilities in Amanat Al Asimah, of which 54 are fully functional, 18 are partially functional, and 16 are non-functional due to damage, lack of staff, funds, or inaccessibility.⁸⁹ In addition, almost a third of the facilities have sustained some degree of damage, with 24 facilities partially damaged and one facility completely destroyed. This represents the second highest share of damaged health facilities across Yemen, second only to Sa'ada, where 37 percent of facilities are damaged.

Figure 20: Functionality of Health Facilities in Amanat Al Asimah



Source: MoPHP, Service Availability and Health Facilities Functionality in 16 Governorates, October 2016.

There were only five health units in the city. Health units serve as primary facilities and should cover 1,000 - 5,000 people according to national standards. There are also 56 health centers, each covering over 50,000 people. These numbers are much higher than the national average of 36,340 people per health center and the legal standard of 5,000 - 20,000 people per health center.⁹⁰ Similarly, there are 19 hospital facilities in the governorate covering almost 390,000 people per hospital. These numbers, too, are more than double of the recommended threshold of 150,000 people per hospital.⁹¹

In 2016, Sana'a's hospitals had only 6.9 beds available for 10,000 people. This ratio is slightly above the national average of 6.2 beds but much lower than the recommended minimum of 10 beds.⁹² Additionally, 25 ambulances were available.

As of 2017, Health Cluster partners were supporting 68 facilities in Amanat Al Asimah, as outlined in the figure below.

⁸⁶ World Health Organization Regional Office for the Eastern Mediterranean, "Cholera in Yemen", Outbreak Update, September 1, 2019, <http://www.emro.who.int/pandemic-epidemic-diseases/cholera/outbreak-update-cholera-in-yemen-1-september-2019.html> (accessed November 14, 2019).

⁸⁷ N. Qirbi and S.A. Ismail, Health system functionality in a low-income country in the midst of conflict: the case of Yemen, *Health Policy and Planning* 32, 6 (2017), 911-922.

⁸⁸ Ibid.

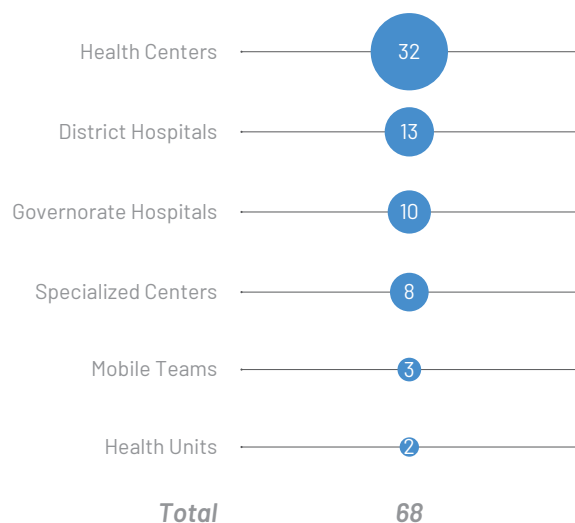
⁸⁹ Government of Yemen, Ministry of Public Health & Population, Service Availability and Health Facilities Functionality in 16 Governorates, October 2016.

⁹⁰ Ibid.

⁹¹ Ibid.

⁹² Ibid.

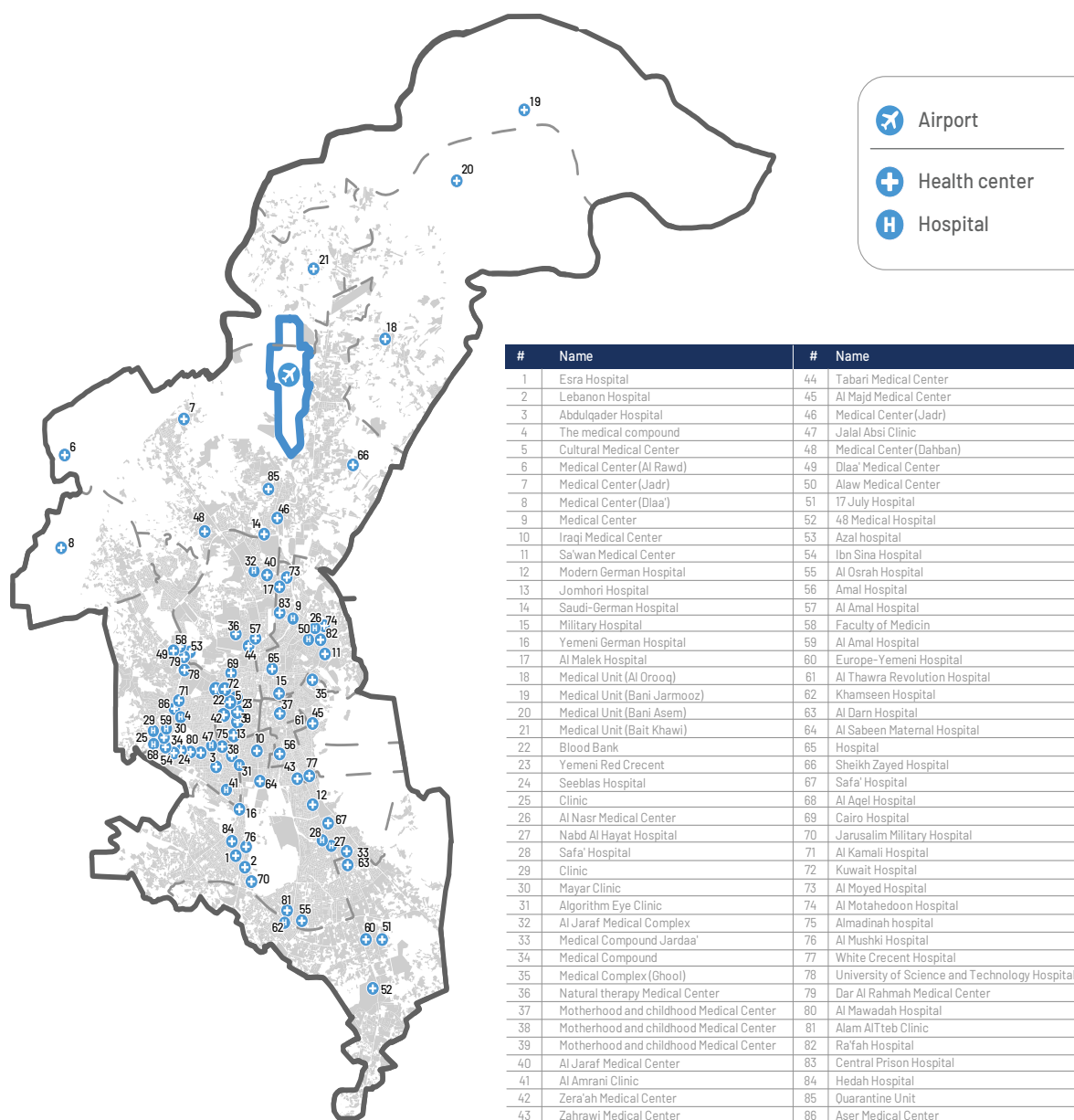
Figure 21: Health Facilities Supported by Health Cluster Partners in Amanat Al Asimah



Source: Health Cluster Yemen, Annual Report, 2017.

The number increased in 2019, with 77 health facilities supported by partners. This number includes 6 district and general hospitals, 1 governorate hospital, 5 specialist hospitals, 62 health centers, and 3 health units.⁹³ The support includes provision of outpatient consultations, medical interventions, fuel and water support, and training. Since the start of the year, partners have provided over 1 million outpatient consultations.

⁹³ Health Cluster Dashboard, available at <https://www.humanitarianresponse.info/es/operations/yemen/health-cluster-dashboard-2019> (accessed August 23, 2019).

Figure 22: Health Facilities in Sana'a City


Source: OpenStreetMap and Wikimapia, 2020.

Operational Capacity

As of October 2015, 13 health facilities in Amanat Al Asimah have sustained partial damage, eight of which were hospitals.⁹⁴ More recent data indicates that 29 percent of 240 surveyed health facilities in Sana'a city sustained some form of damage. In terms of functionality, 44 percent of the health facilities are functioning, while 3 percent of the facilities are not. The remaining 53 percent of the facilities could not be assessed.⁹⁵ Overall, the damage cost to the health sector on Sana'a city is estimated between 191 and 233 million USD, representing a third (35 percent) of the total damage cost to the health sector across 16 assessed cities.⁹⁶

Blood transfusion centers suffer from deteriorated conditions like the rest of health facilities in the country. Yemen has six blood transfusion centers in Aden, Taiz, Al Hudaydah, Hadramout, Abyan and the capital, Sana'a. The biggest of them all is located in Sana'a at As-Sabeen Maternal hospital and on 27 April 2018, it was hit by an airstrike and put out of order.⁹⁷ No information is available about the current status of the facility.

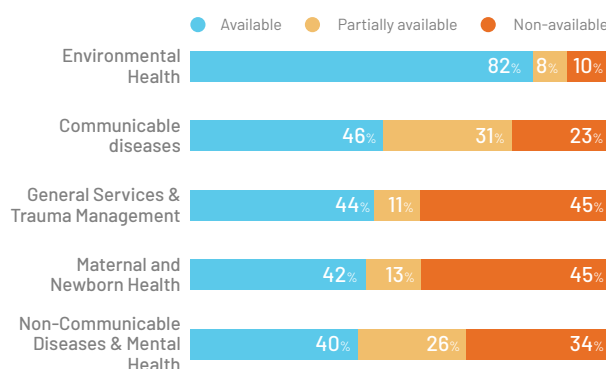
Additionally, there is a lack of health personnel in the city. As of 2016, there were 6,231 available health staff in all categories, including specialists, general practitioners, assistant doctors, certified nurses, midwives, and others, representing a ratio of 20 health workers for every 10,000 people.^{98, 99} Over 30 percent of all staff were certified nurses. The total number of staff included 798 specialists, 430 general practitioners, 161 assistant doctors, 174 midwives and 1,876 nurses.¹⁰⁰ Two years later, by 2018, this ratio decreased to 14 health workers per 10,000 people, significantly lower than the World Health Organization (WHO) recommended ratio of at least 22 health staff in the context of humanitarian crisis. It is important to note that the city also serves people from nearby governorates, as it is one of the two Yemeni cities offering tertiary healthcare services.

Severe shortage of medicines and high prices were also reported in Sana'a, with 57 types of cancer medicines and 8 kidney dialysis medicines commercially unavailable.¹⁰¹

Demand

The least available healthcare services are general services and trauma management and reproductive healthcare, followed by non-communicable diseases and mental health. In 2016, WHO reported that there are approximately 40 specialists in psychiatric care, with most of them located in Sana'a city.¹⁰²

Figure 23: Availability of Services in Health Facilities in Amanat Al Asimah



Source: MoPHP, Service Availability and Health Facilities Functionality in 16 Governorates, October 2016.

94 World Health Organization, Yemen crisis: Reported violation against health sector due to conflict, (Yemen: 2015) <https://reliefweb.int/report/yemen/yemen-crisis-reported-violation-against-health-sector-due-conflict-october-2015> (accessed August 23, 2019).

95 The World Bank Group, Yemen Dynamic Needs Assessment: Phase 3 (Washington, DC: 2018).

96 Ibid.

97 Physicians for Human Rights, Yemen: Attacks on Health May 2018 Newsletter (Yemen: 2018), <https://reliefweb.int/report/yemen/yemen-attacks-health-may-2018-newsletter> (accessed August 23, 2019).

98 Government of Yemen, Ministry of Public Health & Population, Service Availability and Health Facilities Functionality in 16 Governorates, October 2016.

99 World Health Organization, Yemen: Health Resources and Services Availability Mapping System 2018 (HeRAMS).

100 Ibid.

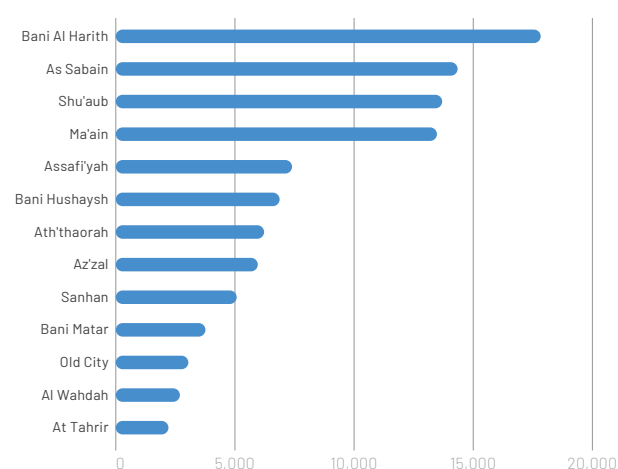
101 The World Bank Group, Yemen Dynamic Needs Assessment: Phase 3 (Washington, DC: 2018).

102 World Health Organization, Insecurity drives health workers out of Yemen, (Yemen: 2016), <https://www.who.int/en/news-room/feature-stories/detail/insecurity-drives-health-workers-out-of-yemen> (accessed August 6, 2019).

SANA'A RAPID CITY PROFILE

The cholera outbreak in Yemen began in 2016 and is still ongoing. The visual below presents data on the number of suspected cholera cases in all districts of Amanat Al Asimah governorate and three districts of the adjacent Sana'a governorate from January 1, 2019 to December 31, 2019. Prevalence of cholera cases has high correlation with the number of IDPs. The four districts with the highest numbers of suspected cholera cases are also the four districts with the highest IDPs numbers. Lack of access to clean water and sanitation facilities, which are often observed in IDPs camps, are among the risk factors for outbreak and transmission.¹⁰³ While children and young adults are more vulnerable to contracting cholera, around half of the deaths occur among elderly people, aged 60 and over.

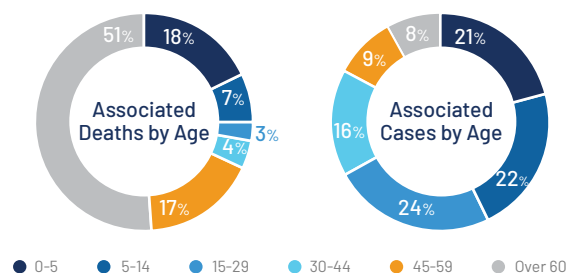
Figure 24: Number of Suspected Cholera Cases in Sana'a (January-August 2019)



Source: Health Cluster Yemen, 2020.

In addition, Amanat Al Asimah governorate had the second highest number of measles cases in Yemen, following Sa'ada, for the epidemiological weeks 1-12 in 2019.¹⁰⁴

Figure 25: Cholera Associated Cases and Deaths by Age in Sana'a city, (January - December 2019).



Source: Health Cluster Yemen, 2019. Available at <http://www.yemeneoc.org/bi/>

The closure of Sana'a airport to all commercial flights in August 2016 prevented those in need of specialized medical care to seek assistance abroad. According to the Ministry of Health, an estimated 7,000 Yemenis used to travel abroad through Sana'a International Airport to receive types of medical treatment unavailable in Yemen.¹⁰⁵ This includes heart, kidney and liver diseases, blood conditions, and cancer.

Residents of informal settlements in Sana'a are particularly vulnerable to health hazards due to a lack of basic infrastructure and the fact that most construction is conducted without permits and consequently falls short of health and environmental standards.¹⁰⁶ In some areas, the government has refused to develop basic infrastructure to encourage resettlement elsewhere.

¹⁰³ World Health Organization, "Cholera Key Facts", News Room, January 17, 2019, <https://www.who.int/news-room/fact-sheets/detail/cholera> (accessed August 6, 2019).

¹⁰⁴ World Health Organization, EDEWS Bulletin Volume 07, Issue 12, Epi Week 12 (2019), http://yemenhc.org/wp-includes/uploads/W12_19_EDEWS_Bulletin_EN.pdf (accessed August 2019).

¹⁰⁵ Norwegian Refugee Council, Airport closure amounts to death sentence for thousands of sick Yemenis, (2019), <https://www.nrc.no/news/2019/august2/airport-closure-amounts-to-death-sentence-for-thousands-of-sick-yemenis/> (accessed August 2019).

¹⁰⁶ United Nations Economic and Social Commission for Western Asia, Overcoming Population Vulnerability to Water Scarcity in the Arab Region: Population and Development Report Issue No. 7 (Beirut: 2015).

Overview and Organizational Structure

From the 1980s onward, both Northern and Southern Yemen made the development and expansion of their respective education systems a top priority. The share of the budget dedicated to education remained equally high following the unification of the two previously independent countries in 1990. Between 1977 and 2000, illiteracy rates declined from 90 percent to 45 percent and enrollment rates climbed steadily from 0.5 million to 3 million students. This represents an increase from seven percent to 17 percent of the share of population enrolled in higher education. Higher education witnessed similar growth, from 5,000 to 175,000 students for the same period.¹⁰⁷

The sector is managed by three separate ministries, namely the Ministry of Education (MoE), Ministry of Technical Education and Vocational Training (MoTEVT), and Ministry of Higher Education and Scientific research (MoHESR), each overseeing a specific part of the field of education. Admission and progression rules are complex and their rigidity results in high drop-out rates.

The formal education system in Yemen was established prior to the 1990 unification. The MoE was established in 1963, by a Decree No. 16. Consequent legislation includes the Education Act (1964), which establishes different levels of education, and the Education Act (1965), which sets up scholarships and fellowships.¹⁰⁸

Following the 1990 unification of Yemen the basic nine-year education program was established country-wide, which is followed by three years of secondary education. Prior to this, a 6+3+3 system was used in the North Yemen, with six years of primary school, three years of preparatory and another three years of secondary education.¹⁰⁹

The interim curriculum was adopted in 1990 combining elements of Northern and Southern systems. It was then revised for all grades between 2000 and 2003.¹¹⁰

Currently, there are several ministries that manage the education system at different levels. General education falls under the purview of the MoE. Vocational schools and community colleges are managed by the MoTEVT, first introduced in the 1970s under the MoE, but then established as a separate system in 2001. Finally, the tertiary level is managed by the MoHESR, first established in 1990 and, after a brief hiatus, reestablished in 2001.¹¹¹ The Government of Yemen subsidizes public education at all levels.¹¹² The Literacy and Adult Education Organization (LAEO), is an autonomous technical agency within the MoE that measures and reports on national literacy rates.

The education cycle in Yemen begins at early childhood, or pre-school, which, however, is non-obligatory. Next, basic education is compulsory for all children, generally starting at the age of six or seven. Following nine years of basic education, students proceed either through a general secondary path or a vocational path (which consists of either vocational secondary or vocational training education).¹¹³

Secondary school lasts three years. The first year is general education and consists of literary and scientific subjects.¹¹⁴ During the second year, students may choose to pursue either humanities or exact sciences. After the general secondary education, students may choose to pursue higher education at a university, a teachers' institute, a community college, or receive a technical education.¹¹⁵ To be admitted to postgraduate studies, one must complete a bachelor's degree amongst other prerequisites. Exiting the scholar system and entering into the labor market is possible following any level after the completion of basic education. Following vocational secondary education, the student may opt for a technical education.

107 The World Bank Group and the Republic of Yemen, International Bank of Reconstruction and Development, Education Status Report, Challenges and Opportunities (Washington DC: 2010), <http://documents.worldbank.org/curated/en/182051468154759836/Yemen-Education-status-report-challenges-and-opportunities> (accessed April 15, 2019).

108 Ibid.

109 United Nations Educational, Scientific and Cultural Organization, World Data on Education VII Ed. 2010/2011, http://www.ibe.unesco.org/fileadmin/user_upload/Publications/WDE/2010/pdf-versions/Yemen.pdf (accessed September 17, 2019).

110 Ibid.

111 The World Bank Group and the Republic of Yemen, International Bank of Reconstruction and Development, Education Status Report, Challenges and Opportunities (Washington DC: 2010), <http://documents.worldbank.org/curated/en/182051468154759836/Yemen-Education-status-report-challenges-and-opportunities> (accessed April 15, 2019).

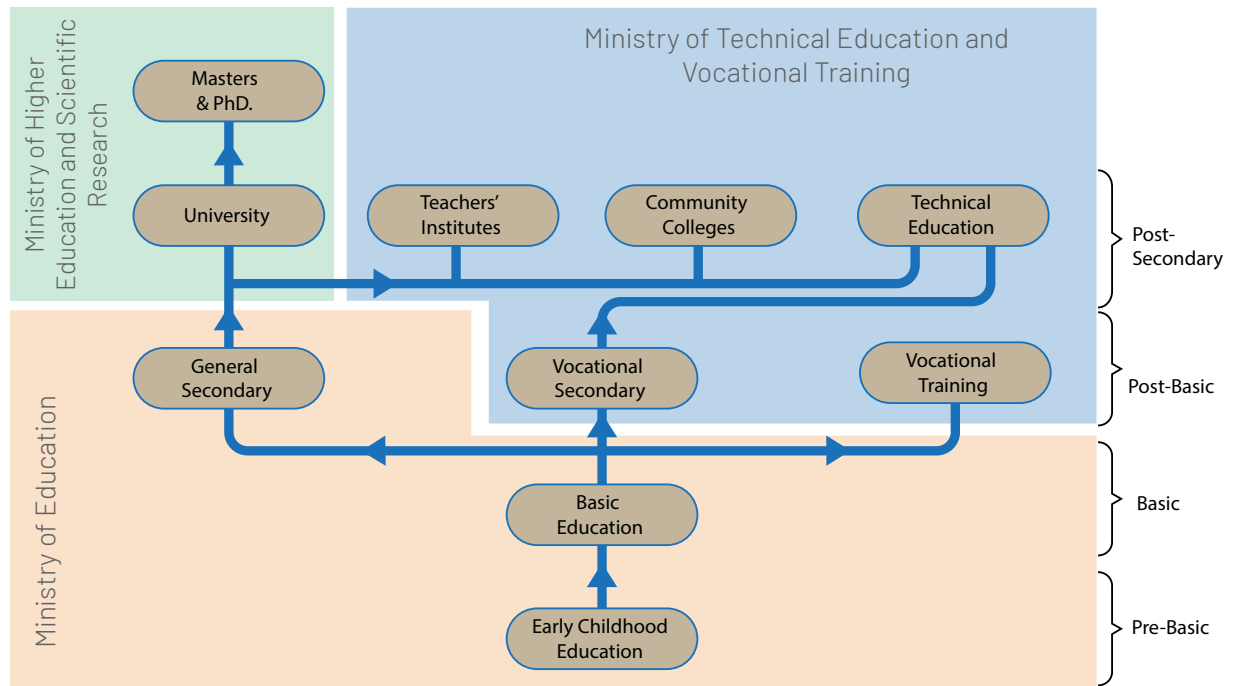
112 Ibid.

113 Michele Bruni et al., Demographic and Labor Market Trends in Yemen (Beirut: ILO, 2014), https://www.ilo.org/wcmsp5/groups/public/-arabstates/-ro-beirut/documents/publication/wcms_358144.pdf (accessed April 15, 2019).

114 Ibid.

115 Ibid.

Figure 26: Gate of the Yemen - Old City of Sana'a



Source: UNESCO, *World Data on Education VII Ed., 2010/2011* and *The World Bank, Yemen - Education status report : challenges and opportunities (English), 2010*.

Admissions and Progression

The regulations governing admissions and progression are complex and can prevent students from pursuing further education. Already prior to the conflict, the number of students repeating a school year in Yemen was high. According to the World Bank report, on average it took 15.9 years to complete the compulsory nine years of education.¹¹⁶

Students who choose to proceed to vocational education upon the completion of basic education, legally lose the opportunity to attend university in the future.¹¹⁷ Both the TEVT post-basic and TEVT post-secondary institutions set an age limit for admission purposes. Since most students require longer time to progress out of basic education, some might not even qualify for a TEVT path solely due to age restrictions. Furthermore, there are no provisions allowing reentry into the basic education system following a dropout.¹¹⁸ In such instances, the only possible path is Alphabetical Programs, whose mandate is limited to only to teach reading and writing.

To be admitted to a public university, a secondary education diploma is required. However, upon finishing, these graduates cannot directly apply or enroll for a tertiary education. A one-year-long hiatus is legally mandated. Although unclear, the reason is generally attributed to the obligatory performance of the national military service upon reaching the age of maturity. After this year has elapsed, secondary education graduates have only up to three years to apply for admittance to the university. If unable, they lose the privilege to attend higher education for life.¹¹⁹ The complexity of the system thus prevents not only further education but also the attainment of qualifications necessary to transition into the labor market.

¹¹⁶ The World Bank Group and the Republic of Yemen, International Bank of Reconstruction and Development, *Education Status Report, Challenges and Opportunities* (Washington, DC: 2010), <http://documents.worldbank.org/curated/en/182051468154759836/Yemen-Education-status-report-challenges-and-opportunities> (accessed April 15, 2019).

¹¹⁷ Ibid.

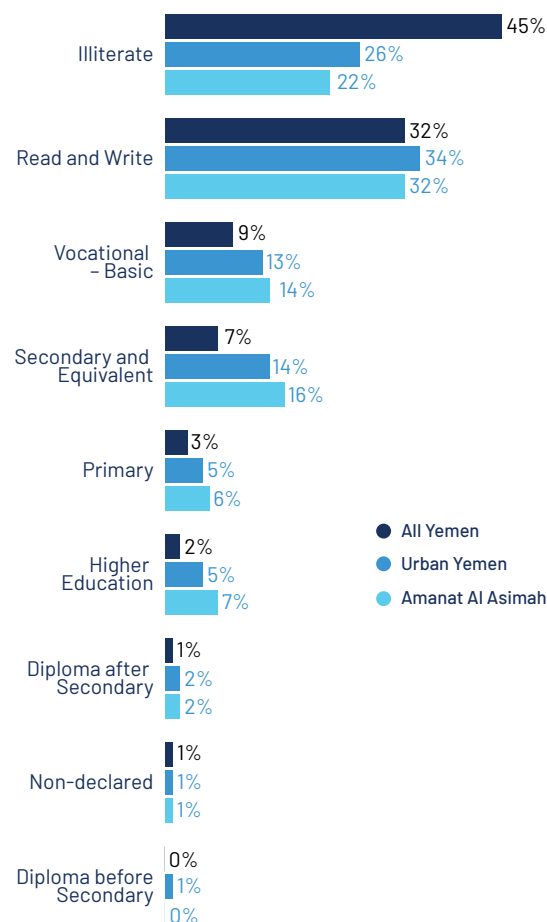
¹¹⁸ Ibid.

¹¹⁹ Ibid.

Infrastructure and Operational Capacity in Sana'a

During the academic year 2016-2017, there were 465 basic schools in Sana'a city (204 public and 261 private), six secondary schools (five public and one private), and 298 basic/secondary schools (325 public and 182 private). During the same academic year, there were 599,194 students enrolled in basic and secondary education (public and private), with 21,686 teachers available in Sana'a city, representing a ratio of one teacher per 28 students, same as the national average.¹²⁰ However, the ratio is much higher in public schools, with one teacher per 37 students, as compared to private schools, where the ratio drops to one teacher per 15 students. In fact, the student to teacher ratio in public schools in Sana'a city is amongst the highest within Yemen, with the same ratio in Ibb governorate and one teacher per 41 students in Socotra. When the conflict erupted, the education sector was significantly affected. The World Bank's Damage Needs Assessment conducted in 2018, concluded that 28 percent of education facilities across the surveyed cities sustained total or partial damage and 15 percent are not functioning¹²¹. In Sana'a city specifically, 27 percent of educational facilities sustained some form of damage, with 25 percent of the facilities partially damaged and 2 percent completely destroyed.¹²² The MoE set up an emergency task force to assess damage and needs and to provide support to affected schools.¹²³ Overall, the total cost of damage to the education sector in Sana'a city is estimated to be between 60.5 and 74 million USD, representing a 41 percent of the total cost of damage in 16 assessed governorates.¹²⁴

Figure 27: Distribution of Population in Yemen by Level of Education in 2009



Source: Ahmed El Basti et al., *Sana'a: A City Development Strategy* (Washington DC: The World Bank Group, 2009)

According to the latest HNO 2019, Amanat Al Asimah governorate had the highest number of affected schools, totaling 227, followed by Dhamar with 192 affected schools and Hajjah with 161 affected schools. This number includes those partially or totally damaged, occupied by armed groups or IDPs, and those located near the frontline.¹²⁵

Conflict dynamics, including the economic crisis, have also negatively affected numbers of enrollment. According to a UNDP assessment in 2016, child recruitment into militias has become one of the few available ways to secure steady income in Sana'a, which has led many parents to pull children out of school and allow recruitment into militias as a means to provide financial support to the family.¹²⁶ In addition, to make up for the reduced revenue, some schools have resorted to charging fees to their students to cover teachers' salaries. School attendance is also affected due to the prevalence of diseases, such as cholera and diphtheria.

120 Central Statistical Organization, Statistical Yearbook 2017, available at <http://www.cso-yemen.com/content.php?lng=english&id=690> (accessed April 15, 2019).

121 The World Bank Group, Yemen Dynamic Needs Assessment: Phase 3 (Washington, DC: 2018).

122 Ibid.

123 The World Bank Group, Input to the Yemen Policy Note no. 4 on Inclusive Services Delivery Yemen: Immediate Priorities for Post-Conflict Recovery of the Education Sector (Washington, DC: 2017), 4, <http://documents.albankaldawli.org/curated/ar/355221508405689150/pdf/120528-WP-P159636-PUBLIC-Yemen-Education-Policy-04-12-2017.pdf> (accessed September 2019).

124 The World Bank Group, Yemen Dynamic Needs Assessment: Phase 3 (Washington, DC: 2018).

125 United Nations Office for the Coordination of Human Affairs, Humanitarian Needs Overview: Yemen 2019, (New York, NY: 2019).

126 United Nations Development Programme, Yemen Rapid Assessment Report for December 2016, Measuring the Impact of the Public Sector Wage Suspension on Basic Service Delivery in the Healthcare and Education Sectors, February 2016, <https://reliefweb.int/report/yemen/yemen-rapid-assessment-report-december-2016-measuring-impact-public-sector-wage> (accessed April 15, 2019).

Prior to the conflict, higher education in Sana'a attracted students from all over Yemen. According to local sources, this was mainly linked to the high number of private universities, good variety of specializations and high academic reputation of certain schools, such as the International Lebanese University and the University of Science and Technology. Also, Sana'a university is the biggest public university in Yemen, with 74,031 students enrolled in university studies in 2013-2014, almost double compared to Aden University with 39,491 students.¹²⁷ Sana'a University has been created in 1970, along with Aden university, and comprises of 18 faculties.¹²⁸

Many students are denied access to a university education due to lack of financial resources. Al Fanar Media has reported that, according to a dean of a languages faculty in a private university in Sana'a, more than half the students were unable to continue their education in 2017, despite the university's actions to reduce burdensome fees and allowing four installments instead of two.¹²⁹ According to the same article, while public universities are cheaper, students still struggle to afford education due to increased transportation fees.

Gender

In the 2007-2008 academic year, there were 200,357 male and 183,518 female students in Sana'a city for grades 1-9. For the ages 6-14, male and female students accounted respectively for 87 percent and 84 percent of the total enrolled.¹³⁰ The percentage of girls' enrollment was the highest nationally, far higher than the national average of 56 percent. Furthermore, there were 339 schools including 48 private ones, and almost half (49 percent) were operating double shifts.¹³¹

At Sana'a University, 33 percent (37 percent of male students and 19 percent of female students) were repeaters in humanities and 22 percent (26 percent of male students and 14 percent of female students) in Applied sciences.¹³² There were 1,913 teaching staff in the universities in Sana'a, with 68 percent holding Ph.D. qualification, 10 percent masters and 22 percent bachelor's.¹³³

As of April 2018, almost a third (28 percent) of school age children lacked access to formal education. Many of the schools are overcrowded and there is a reported lack of teachers and teaching materials.¹³⁴

Teachers' salaries

Following the deteriorating economic situation and the concomitant liquidity crisis in 2016, the CBY stopped paying public sector wages, including those in the education sector.¹³⁵

The deteriorating security situation, budgetary cuts, cessation of wages, conflict among faculty peers, and low motivation have led to a higher incidence of teacher absenteeism. The same factors have led to a marked deterioration in the quality of work even among those teachers who continue to hold class.¹³⁶

As a direct corollary, an estimated 350,000 children were unable to continue their studies during the year 2015-2016. That year the total number of out-of-school children amounted to over 2 million.¹³⁷ According to media reports, in 2017, failure to pay teachers' salaries caused the school year to start with a two weeks delay.¹³⁸ In March 2019, UNICEF launched a project to pay incentives to teachers. Over 136,000 teachers and other school-staff nationally became recipients of such aid. The initial payment alone, covered some 97,000 staff.¹³⁹ In October 2019, UNICEF held a ceremony in Sana'a as part of events marking the anniversary of the Convention on the Rights of the Child, calling for the immediate end of the conflict so Yemeni children can enjoy their rights, including the right to education.¹⁴⁰

127 Central Statistical Organization, Statistical Yearbook 2017, available at <http://www.cso-yemen.com/content.php?lng=english&id=690> (accessed April 15, 2019).

128 Ministry of Higher Education and Scientific Research, National Strategy for the Development of Higher Education in Yemen (Yemen: 2005), https://planipolis.iiep.unesco.org/sites/default/files/ressources/yemen_higher_education_strategy.pdf (accessed January 8, 2020).

129 Faisal Darem, "Yemen: Chaos, War and Higher Education," Al-Fanar Media, April 11, 2017, <https://www.al-fanarmedia.org/2017/04/yemen-chaos-war-higher-education/> (accessed May 6, 2019).

130 The World Bank, Education Status Report, 35.

131 Ibid.

132 Ibid.

133 Ibid.

134 The World Bank Group, Yemen Dynamic Needs Assessment: Phase 3 (Washington, DC: 2018).

135 United Nations Development Programme, Yemen Rapid Assessment Report for December 2016, Measuring the Impact of the Public Sector Wage Suspension on Basic Service Delivery in the Healthcare and Education Sectors (New York, NY: 2016) <https://reliefweb.int/report/yemen/yemen-rapid-assessment-report-december-2016-measuring-impact-public-sector-wage> (accessed April 15, 2019).

136 Ibid.

137 Ibid.

138 Gulf News, "Yemen teachers strike over unpaid salaries blamed on Al Houthis," Gulf News World, October 16, 2017, <https://gulfnews.com/world/gulf/yemen/yemen-teachers-strike-over-unpaid-salaries-blamed-on-al-houthis-1.2106589> (accessed May 6, 2019).

139 United Nations Children's Fund, to keep children in education, UNICEF starts incentives for school-based staff in Yemen, (New York, NY: 2019), <https://reliefweb.int/report/yemen/keep-children-education-unicef-starts-incentives-school-based-staff-yemen> (accessed April 15, 2019).

140 Al Jazeera, "UN sounds alarm over children's plight in war-torn Yemen", October 23, 2019, <https://www.aljazeera.com/news/2019/10/sounds-alarm-children-plight-war-torn-yemen-191023081944720.html> (accessed November 6, 2019).

10 Water, Sanitation and Hygiene (WASH)

1. Overview

The water supply grid and management in Sana'a city is considered the worst across Yemen. Water consumption decreased by half last year due to the restrained operational capacity of the system. The presence of large numbers of IDPs in Sana'a city placed additional pressure on the city's stretched capacity. Prior to the escalation of the conflict, over 790,000 people had no access to improved water sources.¹⁴¹ The total amount of water produced decreased sharply from 16.5 million m³ in 2014 to 6.5 million m³ in 2015. Damage to water and sanitation infrastructure, lack of stable electricity supply and decreased revenues have exacerbated the problem. Fuel shortages have also negatively impacted on the public water network and commercial water trucking distribution

Water Management in Yemen

Management of water resources and uses falls under the oversight of several government entities.

The National Water Resources Authority (NWRA, established in 1995) is a decentralized government agency with wide ranging legal powers to implement water laws and regulations, allocate water rights, approve permits for drilling wells, and undertake various other water resource management functions.

The Ministry of Water and Environment (MoWE, established in 2003) is the cabinet-level supervisory body that brings the water sector as a whole, and water management in particular, under the purview of the central government, thus facilitating the allocation of necessary funds.

Yet, the responsibility of water uses for irrigation purposes falls under, the third, the Ministry of Agriculture and Irrigation (MoAI), which shares jurisdiction over surface water infrastructure with the MoWE.¹⁴²

The Water Law, ratified in 2002, is one of the two main regulations that deal with the exploitation and protection of water resources and its distribution among the population.¹⁴³ The second relevant regulation, the National Water Sector Strategy and Investment Program (NWSSIP), was the outcome of a multi-stakeholder initiative led by the MoWE to prepare a consolidated strategy, an action plan, and an investment program for the sector as a whole. NWSSIP's mandate aimed to ensure coordination among the stakeholders, unify policies regarding water supply in both urban and rural areas, ensure equitable allocation of funds, integrate sustainable policies and poverty reduction, monitor the performance of water supply utilities, and ensure effective financing.¹⁴⁴

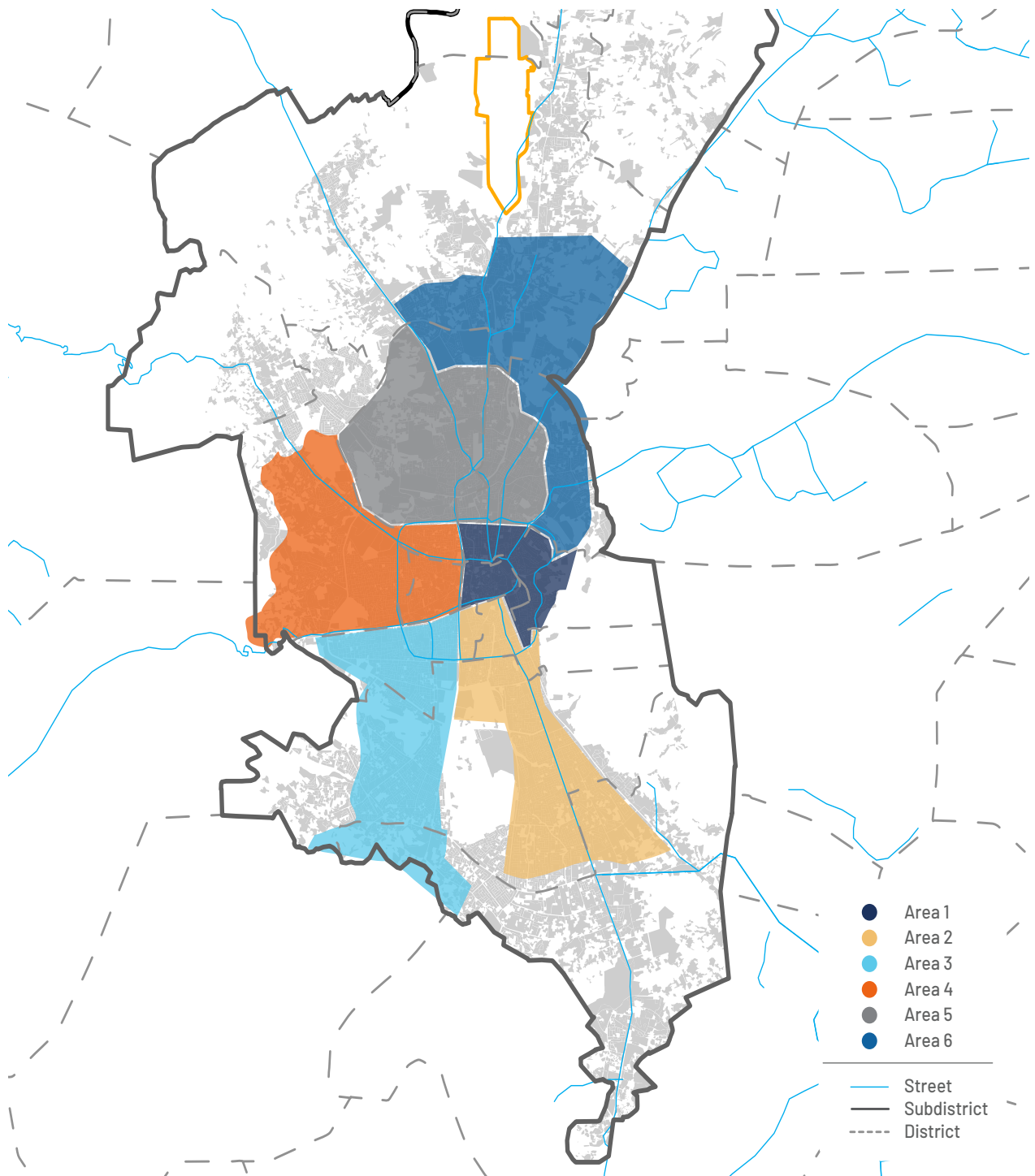
¹⁴¹ United Nations Office for Project Services, Yemen Integrated Urban Emergency Services Project (YIUSEP), Environmental and Social Management Framework (ESMF), (Copenhagen, Denmark: 2018), <http://documents.worldbank.org/curated/en/494961526464057594/pdf/P164190-ESMF-Final.pdf> (accessed September 17, 2019).

¹⁴² Republic of Yemen, Ministry of Water and Environment, National Water Sector Strategy and Investment Program, (Yemen: 2004), <http://extwprlegs1.fao.org/docs/pdf/yem147103.pdf> (accessed September 2019).

¹⁴³ Naif Mohammad et al., Water Supply in a War Zone, A Preliminary Analysis of Two Urban Water Tanker Supply Systems in the Republic of Yemen (Washington, DC: The World Bank Group, 2018). <http://documents.worldbank.org/curated/en/434091532620702995/pdf/128907-WP-P165727-Water-Supply-in-a-War-Zone-PUBLIC.pdf> (accessed May 26, 2019).

¹⁴⁴ Ibid.

Figure 28: The Six Water and Sanitation Operational Areas in Sana'a City.



GIZ, Technical Assessment Report for Local Corporation Sana'a, 2018.

There are Six Water and Sanitation Operational Areas in Sana'a City. The Water and Sanitation Local Corporation is the main body responsible for the provision of water and sanitation services in Sana'a city. It was established by the Republican Decree No. (21) in 2001 and it is the second largest in the country.¹⁴⁵

The Division comprises headquarters and two sub-structures: the water sub-structure, responsible for water distribution and the Wastewater Treatment Plant (WWTP) substructure. The Local Corporation divided the city into six areas and has a local office in each of them. The main building of the local corporation sustained extensive damage.¹⁴⁶

¹⁴⁵ Dorsch Gruppe, Yemen Water Sector: Damage Assessment Report of Twelve Water Supply and Sanitation Local Corporations (LCs) and their Affiliated Branch Offices and Utilities; Part 2: Situation Assessment Report, Annex 17 – Technical Assessment Report for LC Sana'a (Bon and Eschborn: GIZ, 2018).

¹⁴⁶ Ibid.

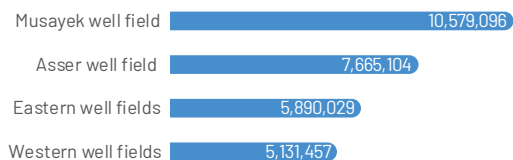
Infrastructure

Sana'a city has faced water scarcity issues for years. The city primarily relies on groundwater aquifers, 80 percent of which comes from the Sana'a basin, as mentioned in the Economy section.¹⁴⁷ Due to rapid expansion of Sana'a city, high population growth and ad-hoc usage of water for agriculture or domestic purposes, it was estimated in 2009 that the basin will be depleted within the next 10-15 years. The water levels of the basin are estimated to drop by six to eight meters yearly. More recent estimates suggest that the level of water abstraction could be four to five times higher than levels of water replenishment.¹⁴⁸ The absence of surface water further increased the reliance on the Sana'a basin.¹⁴⁹

There are 120 water wells located in four well fields: western well fields, eastern well fields, Musayek well field and Asser well field.¹⁵⁰ Visual 22 below represents the share of nominal water production amongst the well fields.

Out of 120 boreholes, 83 were operational in 2014, operating 14-16 hours per day and able to produce 46,051 m³ per day.¹⁵¹ In the first quarter of 2017 this number further decreased to 10,689 m³ per day, mainly because of lack of fuel. The rapidly dwindling underground reserves and the insufficient replenishment rates have caused many to drill deeper into the ground. Indeed, some wells reach well into 100m in depth.

Figure 29: Nominal Water Production



Source: GLZ, *Technical Assessment Report for Local Corporatuion Sana'a*, 2018.

¹⁴⁷ Ahmed El Basti et al., *Sana'a: A City Development Strategy* (Washington, DC: The World Bank Group, 2009), <http://documents.worldbank.org/curated/en/639151468170064779/Sanaa-A-city-development-strategy>, (accessed October 23, 2019).

¹⁴⁸ Dorsch Gruppe, *Yemen Water Sector: Damage Assessment Report of Twelve Water Supply and Sanitation Local Corporations (LCs) and their Affiliated Branch Offices and Utilities; Part 2: Situation Assessment Report, Annex 17 – Technical Assessment Report for LC Sana'a* (Bon and Eschborn: GLZ, 2018).

¹⁴⁹ Aliza Herzberg, *Urban Water Scarcity in Sana'a, Yemen* (San Luis Obispo, CA: California Polytechnic State University, 2018), <https://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1425&context=focus> (accessed July 21, 2019).

¹⁵⁰ Dorsch Gruppe, *Yemen Water Sector: Damage Assessment Report of Twelve Water Supply and Sanitation Local Corporations (LCs) and their Affiliated Branch Offices and Utilities; Part 2: Situation Assessment Report, Annex 17 – Technical Assessment Report for LC Sana'a* (Bon and Eschborn: GLZ, 2018).

¹⁵¹ Ibid.

Table 6: Overview of Available Water Infrastructure

Description/Facility	Unit	2014	1st Quarter 2017
Public Water Distribution points	Number	12	0
Main Source of Water Supply (SW or GW)		GW	GW
Number of Distinct Supply Zones	Number	6	6
Total Number of Boreholes	Number	120	120
Boreholes in Operation (=borehole pump no)	Number	83	44
Reservoirs	No/m ³	10/40,400	9/34,600
Elevated Tanks	No/m ³	20/2,260	20/2,261
Nominal Water Production Capacity	Well/m ³ /d	81,799	81,799
Water Supply Booster & Pumpin Stations	Number	6	5
Water Sterilization Facilities	Number	6	5
Current Water Production Capacity	m ³ /d	46,051	10,689
Total Number of Water Meters Installed	Number	94,120	88,497
Total Number of Functioning Water Meters	Meters	68,217	64,119
Number of Zero Reading Water Meters	Number	26,345	58,485
Number of New/Functional Water Meters in Stock	Number	N/A	N/A
Length of Water Supply Network	km	1,035	1,035
Total Number of Bulk Water Meter	Number	106	106
Water Laboratory	Number	1	1

Source: GIZ Yemen Water Sector Annex 17 – Technical Assessment Report for LC Sana'a, 2018

The water distribution network has a total length of 1,035 km, while the piping sanitation system does not exceed 504 km. As of 2015, there were 94,563 water connections and 85,758 sanitation connections in Sana'a city.¹⁵² The number of connections increased to 94,935 for water connections and to 88,497 for wastewater connections in 2017.¹⁵³

The Sana'a Local Corporation laboratory routinely conducts water quality checks, though its work is debilitated by a lack of equipment and chemicals needed to conduct the tests.¹⁵⁴ Laboratory results for 2016 suggest that some of the wells have high concentration of iron, exceeding recommended standards. While the Sana'a Local Corporation has six iron removal units, ten more units are sorely needed.

The sewer network is over 500 km long. There are two Activated Sludge WWTP in Sana'a city. The main WWTP which treats water from the sewer system is located in Bani Al Harith district and reportedly did not sustain damage.¹⁵⁵ The plant was commissioned in 2000 and has a daily capacity of 50,500 m³.¹⁵⁶

However, the WWTP is reportedly overloaded, and some of the equipment is either damaged or in a poor condition. United Nations Children's Fund (UNICEF) delivers fuel which supports ongoing plant operations.¹⁵⁷

The second WWTP is located in Al Hashisheah and has a nominal capacity of 500 m³ per day. This plant treats wastewater collected by tankers. However, Al Hashisheah WWTP has been out of operation since the start of the conflict.

Over half of the population relies on private cesspits for wastewater discharge.¹⁵⁸ The wastewater then is either absorbed into the ground or pumped out by either the Local Corporation or through the use of private sector services.

Currently, one of the main challenges affecting WASH sector functionality in Sana'a is lack of diesel to operate generators.¹⁵⁹ Other reported issues include unregulated wells, lack of finances, and damage.

152 United Nations Office for Project Services, Yemen Integrated Urban Emergency Services Project (YIUSEP), Environmental and Social Management Framework (ESMF), (Copenhagen, Denmark: 2018), <http://documents.worldbank.org/curated/en/494961526464057594/pdf/P164190-ESMF-Final.pdf> (accessed September 17, 2019).

153 Dorsch Gruppe, Yemen Water Sector: Damage Assessment Report of Twelve Water Supply and Sanitation Local Corporations (LCs) and their Affiliated Branch Offices and Utilities; Part 2: Situation Assessment Report, Annex 17 – Technical Assessment Report for LC Sana'a (Bon and Eschborn: GIZ, 2018).

154 Ibid.

155 Ibid.

156 Raied Ebaid and Jeremy Hall, Effluent and Sludge Management in Yemen (Sana'a, Yemen: MWH Arabtech Jardaneh, 2004), http://ftp2.ciwm.org/2004/2004-09/Raied_Hall.pdf (accessed July 21, 2019).

157 United Nations Children's Fund, Yemen Situation Report: 23 September – 1 October 2015, (New York, NY : 2015), https://www.unicef.org/appeals/files/UNICEF_Yemen_Crisis_Humanitarian_SitRep_23Sep_to_10Oct_2015.pdf (accessed July 24, 2019).

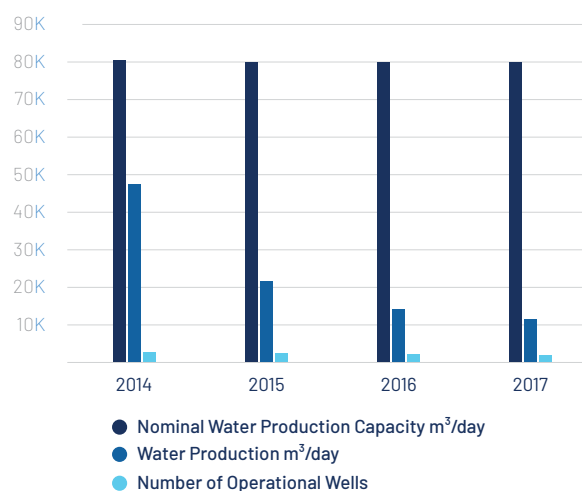
158 Dorsch Gruppe, Yemen Water Sector: Damage Assessment Report of Twelve Water Supply and Sanitation Local Corporations (LCs) and their Affiliated Branch Offices and Utilities; Part 2: Situation Assessment Report, Annex 17 – Technical Assessment Report for LC Sana'a (Bon and Eschborn: GIZ, 2018).

159 The World Bank Group, Yemen Dynamic Needs Assessment: Phase 3 (Washington, DC: 2018).

Water demand

Operation capacity of the water and sanitation infrastructure in Sana'a city has been affected by damage, intermittent electricity supply, and lack of finances. The average consumption of water in Sana'a city is 20 liters per person per day and 15 liters per person per day for IDPs.¹⁶⁰ These levels fall significantly below the national average and stand at almost less than half the levels of 2015. Water supply through the public network is available less than once a week.¹⁶¹ Furthermore, less than half of Sana'a's population (43 percent) are connected to the public water grid.¹⁶² This shows a deteriorating trend, as compared to 2009 when the public water network was estimated to cover 55 percent of the HHs.¹⁶³ Prior to the conflict, the network was already in poor physical condition, with an estimated leakage of 40 percent.¹⁶⁴ Another report suggests that water losses through the pipe network may account up to 60 percent.¹⁶⁵

Figure 30: Average Water production per Year



Source: GIZ, Technical Assessment Report for Local Corporation Sana'a, 2018.

As of 2018, residents reportedly had access to public water 1-3 hours a day.¹⁶⁶ Consequently, residents rely on private water trucking (subject to affordability), public water distributed using trucks by Sana'a LWSC in local parks, or from philanthropists-sponsored water deliveries (Sabeel).¹⁶⁷ Reportedly, two-thirds (60-70 percent) of the population relied on private water infrastructure in 2018.

Rationing of the water supply was practiced across the city, with some areas receiving water once every two weeks. Currently, commercial water trucking is the main source for HHs to fill gaps of water supply.¹⁶⁸ According to the World Bank report, private well operators sell water to water truck drivers for YER 113–500/m³ (US\$ 0.45–2.00), who in turn sell it to HHs for YER 226–1,000/m³ (US\$ 0.9–3.99).¹⁶⁹ The same report indicates that the water quality is below standards and exceeds the limits of dissolved solids and coliform bacteria, including *E. coli*. The water depletion in Sana'a also drives the increase in prices, with a 10-50 percent rise being observed between 2017 and 2018.

160 Dorsch Gruppe, Yemen Water Sector: Damage Assessment Report of Twelve Water Supply and Sanitation Local Corporations (LCs) and their Affiliated Branch Offices and Utilities; Part 2: Situation Assessment Report, Annex 17 – Technical Assessment Report for LC Sana'a (Bon and Eschborn: GIZ, 2018).

161 United Nations Office for Project Services, Yemen Integrated Urban Emergency Services Project (YIUSEP), Environmental and Social Management Framework (ESMF), (Copenhagen, Denmark: 2018), <http://documents.worldbank.org/curated/en/494961526464057594/pdf/P164190-ESMF-Final.pdf> (accessed September 17, 2019).

162 Dorsch Gruppe, Yemen Water Sector: Damage Assessment Report of Twelve Water Supply and Sanitation Local Corporations (LCs) and their Affiliated Branch Offices and Utilities; Part 2: Situation Assessment Report, Annex 17 – Technical Assessment Report for LC Sana'a (Bon and Eschborn: GIZ, 2018).

163 Ahmed El Basti et al., Sana'a: A City Development Strategy (Washington, DC: The World Bank Group, 2009), <http://documents.worldbank.org/curated/en/639151468170064779/Sanaa-A-city-development-strategy>, (accessed October 23, 2019).

164 Ibid.

165 Aliza Herzberg, Urban Water Scarcity in Sana'a, Yemen (San Luis Obispo, CA: California Polytechnic State University, 2018), <https://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1425&context=focus> (accessed July 21, 2019).

166 The World Bank Group, Yemen Dynamic Needs Assessment: Phase 3 (Washington, DC: 2018).

167 Ibid.

168 Ahmed El Basti et al., Sana'a: A City Development Strategy (Washington, DC: The World Bank Group, 2009), <http://documents.worldbank.org/curated/en/639151468170064779/Sanaa-A-city-development-strategy>, (accessed October 23, 2019).

169 Naif Mohammad et al., Water Supply in a War Zone, A Preliminary Analysis of Two Urban Water Tanker Supply Systems in the Republic of Yemen (Washington, DC: The World Bank Group, 2018), <http://documents.worldbank.org/curated/en/434091532620702995/pdf/128907-WP-P165727-Water-Supply-in-a-War-Zone-PUBLIC.pdf> (accessed May 26, 2019).

Furthermore, the population increasingly relies on water distribution points located throughout the city. While these distribution points are present in poor neighborhoods and old Sana'a city, their number is not enough to meet the population needs.¹⁷⁰

Wastewater service has deteriorated only slightly, going from 45 percent of the population in 2014 to 40 percent in 2018. The other half of the population relies on private cesspits.¹⁷¹

Several infrastructure facilities have sustained damage. At a national level, WASH sector is the second most affected in terms of functionality, with 33 percent of the facilities not functioning and 24 percent partially functioning. It is also one of the most damaged sectors, with a third of all facilities either fully or partially damaged.¹⁷² In Sana'a city specifically, 14 percent of WASH facilities sustained some form of damage, while 21 percent was destroyed.¹⁷³ The cost of damage to Water and Sanitation sector in Sana'a city is estimated to be between 46.1 and 56.4 million USD, the highest share amongst the assessed cities, representing a fifth of the total cost of damage to WASH sector.¹⁷⁴ Another report indicates that the headquarters office of Sana'a Local Corporation and pumping station buildings sustained extensive damage, however the building remains standing and intact.¹⁷⁵ In contrast, the Al Nahdin water reservoir has been completely destroyed.

There are 35 informal settlements in Sana'a city, representing an estimated 20.5 percent of Sana'a's population.¹⁷⁶ None of these areas are connected to the public water grid. Consequently, for their water supply, residents rely almost exclusively on water tanks replenished in a variety of different ways including water trucking, and private wells. Two areas, Beit Maiyad and Medinet Al Leil, are connected to the sewage network, while other areas rely on cesspits. In one area, Souq Shamlan, an open hole is used. Drinking water is supplied by private vendors, putting further pressure on poor residents of the informal settlements.

170 Dorsch Gruppe, Yemen Water Sector: Damage Assessment Report of Twelve Water Supply and Sanitation Local Corporations (LCs) and their Affiliated Branch Offices and Utilities; Part 2: Situation Assessment Report, Annex 17 – Technical Assessment Report for LC Sana'a (Bon and Eschborn: GIZ, 2018)

171 Ibid.

172 The World Bank Group, Yemen Dynamic Needs Assessment: Phase 3 (Washington, DC: 2018).

173 Ibid.

174 Ibid.

175 United Nations Office for Project Services, Yemen Integrated Urban Emergency Services Project (YIUSEP), Environmental and Social Management Framework (ESMF), (Copenhagen, Denmark: 2018), <http://documents.worldbank.org/curated/en/494961526464057594/pdf/P164190-ESMF-Final.pdf> (accessed September 17, 2019).

176 United Nations Economic and Social Commission for Western Asian Population and Development Report Issue No. 7 Overcoming Population Vulnerability to Water Scarcity in the Arab Region (Beirut, Lebanon: 2015) <https://www.unescwa.org/sites/www.unescwa.org/files/publications/files/arab-population-vulnerability-water-scarcity-2015-english.pdf> (accessed September 25, 2019).

Overview

According to pre-conflict data, Yemen is the least connected country in the region in terms of electricity, with only 55 percent access rate from all sources.¹⁷⁷

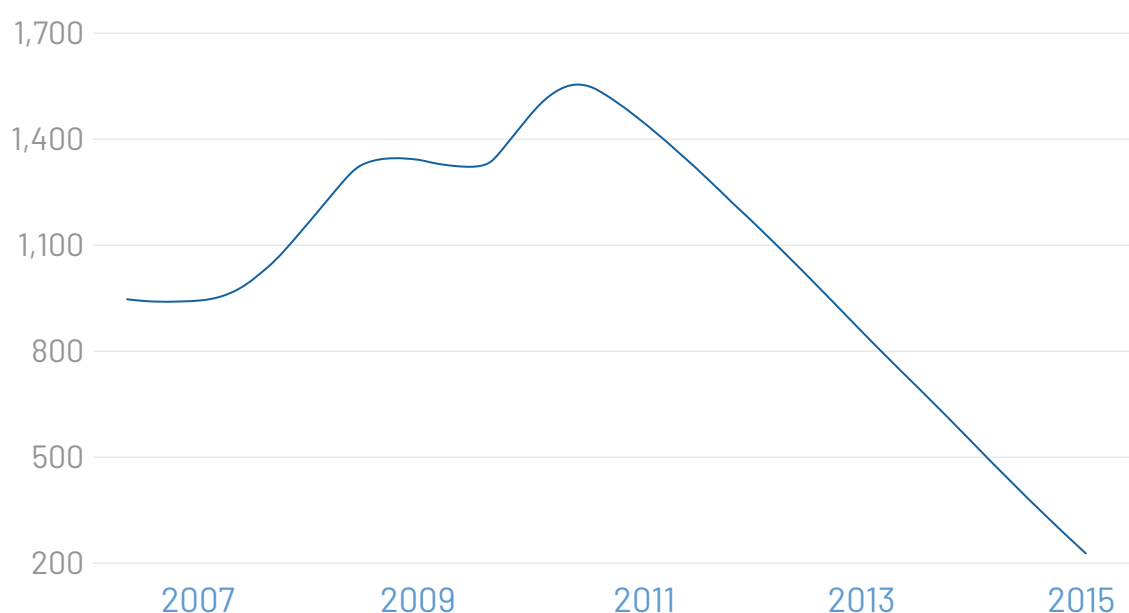
While most of the urban areas are connected to the electricity grid, power outages were common. During the conflict, many of the electricity sector assets sustained damage, including power plants, sub-stations and distribution lines.

Furthermore, the PEC saw a drastic reduction of funding and almost collapsed. Currently, the provision of electricity through a public grid is almost non-existent, with most of the population relying on diesel generators and solar panels. Diesel prices have been increasing since the start of the conflict, with the current price representing a 150% increase as compared to 2017 average.

Lack of electricity has a drastic effect on hospitals and schools, as well as Water and Sanitation sector. Several NGOs and UN Agencies provide fuel and support installation of solar panels in response to the electricity crisis.

In pre-war Yemen, power generation capacities accumulated to far less than 2 GW of total capacity. In the aftermath of overthrowing of the government in 2011, Yemen finally started to stumble. An increased number of attacks on infrastructure were taking their toll on electricity supply, especially in the two subsequent years. The transmission line between the Yemeni capital Sana'a and centrally located Marib became a prominent target. Marib hosts the nationwide-largest power plant, which accounted for roughly one-third of public generation capacities at that time. The power line became the target of 54 attacks by various tribes and movements between 2010 and 2013. Therefore, and as turmoil and missing hydrocarbon exports in that period had made the public budget even tighter, quick fixes largely replaced routine maintenance on the agenda. This decision, however, led to an ever-stronger deterioration of the public grid.¹⁷⁸

Figure 31: Operable Electricity Generation Capabilities of the Public Grid in Yemen

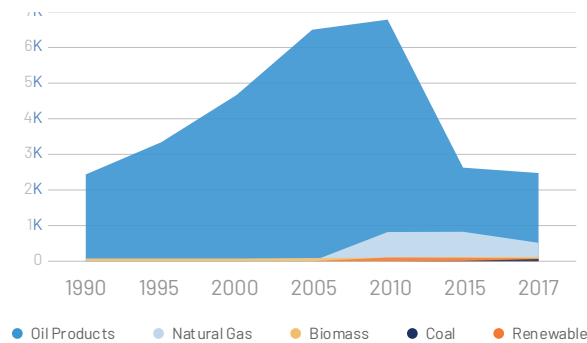


Source: International Energy Agency, 2019.

¹⁷⁷ The World Bank Group, Republic of Yemen Restoring and Expanding Energy Access: Power Sector Reengagement Note, (Washington, DC: 2017), <http://documents.worldbank.org/curated/en/655811496412539032/Republic-of-Yemen-Restoring-and-expanding-energy-access-power-sector-reengagement-note> (accessed September 25, 2019).

¹⁷⁸ DIW Berlin, Yemen's Solar Revolution: Developments, Challenges, Opportunities; Report with Policy Recommendations Based on Results from Research Projects Financed by the Federal Ministry of Education and Research and the Energy Access and Development Program (Berlin, Germany: 2019), https://www.diw.de/documents/publikationen/73/diw_01.c.683070.de/diwkompakt_2019-142.pdf (accessed September 25, 2019).

Figure 32: Primary Energy mix Yemen in ktoe



Source: International Energy Agency, 2019.

While most of the urban areas are connected to the electricity grid, public electricity supply almost halted in Sana'a. During the conflict, many of the electricity sector assets sustained damage, including power plants, substations and distribution lines.

Furthermore, the Public Electricity Corporation (PEC) saw a drastic reduction of funding and almost collapsed. Currently, provision of electricity through a public grid is almost non-existent, with most of the population relying on diesel generators and solar panels. Diesel prices have been increasing since the start of the conflict, with the current price representing a 150 percent increase as compared to the 2017 average.¹⁷⁹

Lack of electricity has a drastic effect on hospitals and schools, as well as the Water and Sanitation sector. Several international and national NGOs and UN Agencies provide fuel and support installation of solar panels in response to the electricity crisis.

Institutional and Legal Framework

The cabinet-level agency responsible for administering Yemen's electric power and policy is the Ministry of Electricity and Energy. The PEC is a public enterprise responsible for energy generation, distribution, and transmission.¹⁸⁰ The central piece of national legislation for electricity sector is the 2009 Electricity Law, which was introduced to improve power sector management, including facilitation of private sector environment.¹⁸¹ The legislation also established the Rural Electrification Authority and the Electricity Sector Regulatory Board, with the latter responsible for setting business tariffs, monitoring compliance, and encouraging the use of renewable energy. As of 2016, the board has yet to convene.

In 2002, the Government of Yemen (GoY) established a dedicated department within the Ministry of Electricity and Energy and reorganized it to also address renewable wind and solar energy sectors in 2009.¹⁸² The government plans to increase the use of renewable energy to 15-20 percent by 2025.

¹⁷⁹ Famine Early Warning System Network, Yemen Key Message Update, May 2019 (2019), <https://reliefweb.int/report/yemen/yemen-key-message-update-may-2019> (accessed July, 2019).

¹⁸⁰ International Energy Charter, Energy Investment and Business Climate Report for Observer Countries (Brussels: Energy Charter Secretariat, 2017), https://energycharter.org/fileadmin/DocumentsMedia/Occasional/Yemen_Investment_Report.pdf (June 24, 2019).

¹⁸¹ Ibid.

¹⁸² Ibid.

Infrastructure

Pre-conflict, Sana'a city primarily relied on Marib gas-fired power plant, which was contracted in 2005 and began operations in 2009.¹⁸³ However, the plant has been non-operational since 2015. Before the plant came into operation, Sana'a city was supplied by six diesel power plants inside the city.¹⁸⁴ In addition, some parts of the city were supplied with electricity from two plants in Al Hudaydah and Taizz.

Marib power plant is the main power plant in Yemen, which used to supply between 27 percent and 40 percent of the country's electricity according to different sources.¹⁸⁵ It is located 60km from Marib town and around 200 km from Sana'a and has a capacity of 340 MW.¹⁸⁶ The construction of Marib 2 was planned during the second stage of development to add additional capacity of 400 MW and Marib 3 to add another 300 MW.¹⁸⁷ Marib Power plant is connected to the Bani Hushaysh substation by a 400-kV line. From there, two 132 kV lines go to Dhahban and Hizyaz substations, which also have a generation capacity.¹⁸⁸

The Dhahban Power Station, the main station in Sana'a, is supplied through the lines from the Marib Plant.¹⁸⁹ It is located around 10km north-west from Sana'a city, in Sana'a Basin. It had an original capacity of 20 MW, with an additional generating capacity of 30 MW installed by 2000s.¹⁹⁰

The Hizeaz power station consists of three plants. One plant, with a capacity of 30 MW was completed in 2002.¹⁹¹ Two years later, the plant with a capacity of 60 MW was constructed.¹⁹² In 2007 an extension 30 MW Power was completed.

Out of 35 informal settlements in the city, most were at least partially covered by the public electricity grid. Other households typically extended the connection by using electricity cables.¹⁹³

183 Huenteler, Joern Torsten, et al., Republic of Yemen - Restoring and expanding energy access: power sector reengagement note (Washington, DC: the World Bank Group: 2017), <http://documents.worldbank.org/curated/en/655811496412539032/Republic-of-Yemen-Restoring-and-expanding-energy-access-power-sector-reengagement-note> (accessed July 20, 2019).

184 Yemen Times, "Analysis: Why Yemen remains in the dark", August 28, 2011, <https://reliefweb.int/report/yemen/analysis-why-yemen-remains-dark> (accessed November 22, 2019).

185 Erica Gaston and Nadwa al-Dawsari, Waiting for Change, The Impact of Transition on Local Justice and Security in Yemen (Washington, DC: The United States Institute of Peace, 2013), <https://issat.dcaf.ch/download/49626/788822/PW85-Waiting-for-Change.pdf>; see also Yemen Times, Analysis: Why Yemen remains in the dark, ReliefWeb, August 2019, <https://reliefweb.int/report/yemen/analysis-why-yemen-remains-dark> (accessed November 22, 2019).

186 Regional Center for Renewable Energy and Energy Efficiency, Assessment of the Status of Solar PV in Yemen (Cairo, Egypt: 2017), <http://www.rcreee.org/content/assessment-status-solar-pv-yemen> (accessed November 22, 2019).

187 MEED, "Yemen Delays Bidding for Marib 2 Power Plant", July 14, 2019, <https://www.meed.com/yemen-delays-bidding-for-marib-2-power-plant/> (accessed November 22, 2019).

188 Website of the Ministry of Energy and Electricity, available at <http://www.pec.com.ye/>

189 Erica Gaston and Nadwa al-Dawsari, Waiting for Change: The Impact of Transition on Local Justice and Security in Yemen, United States Institute of Peace: 2013

190 Regional Surveys of the World, The Middle East and North Africa, 2004

191 Website of Al Ahram Taqa FZCO, available at: <http://www.alahramtaqa.com/project.html>.

192 Ministry of Electricity, Public Electricity Corporation, Consulting Engineering Services (India) Pvt. Ltd., Environmental Impact Assessment (EIA) Of the Yemen Power Sector Project, 2005 (Yemen: 2005), <http://documents.worldbank.org/curated/en/594591468168254149/pdf/E23400v10P11061r0Sector0Project0EIA.pdf> (accessed November 22, 2019).

193 United Nations Economic and Social Commission for Western Asia, Population and Development Report Issue No. 7 Overcoming Population Vulnerability to Water Scarcity in the Arab Region, 2015.

Operational Capacity

Damage to power sector in Yemen has been relatively low, with only 13 percent of facilities either fully or partially damaged, it has been affected the most in terms of functionality, with 86 percent of the facilities either not functioning at all or partially functioning.¹⁹⁴ In Sana'a city specifically, 38 percent of the energy sector assets sustained partial damage, while 43 percent were completely destroyed. Data for the remaining 19 percent is unavailable. In terms of functionality, 14 percent of the facilities are functioning, while 5 percent are partially functioning and 81 percent is not functioning.¹⁹⁵ Critical damage includes high-voltage power lines, which connect the city to the Marib power plant and distributed generation facility used for operating WASH infrastructure. Diesel shortages further exacerbate the situation.¹⁹⁶ Electricity and Energy infrastructure in Sana'a also reportedly suffered due to poor maintenance, caused by insufficient investment and lack of qualified personnel.¹⁹⁷ The cost of damage to the energy sector in Sana'a city is estimated to be between 134.4 and 164.3 million USD, representing a share of 26 percent from all damage cost in the assessed cities.¹⁹⁸

Marib power plant sustained several attacks since 2011-2013 by a variety of actors.¹⁹⁹ The plant was also attacked in 2014, however, there is no data on damage,²⁰⁰ and as of March 2015, the plant was in need of urgent repairs.²⁰¹ Currently, the plant is non-operational. The power lines connecting Marib Station and Sana'a have also been reportedly attacked.²⁰² Furthermore, 37 percent of the distribution substations in Sana'a were either partially or completely damaged as of October 2015.

Already prior to the conflict, daily electricity outages in the city were common and could last up to 4 hours at a time.²⁰³ Recent data suggests that Sana'a city is supplied with 40 MW daily, while the demand is estimated to be 500 MW.²⁰⁴

Currently, the public grid coverage is around two percent, supplied through Hizeaz station, which has a capacity of 7 MW. Various private service suppliers' coverage is estimated to 2.8 percent, while another 30 percent of the population are supplied by solar systems and privately-owned generators.²⁰⁵

Figure 33: Yemen Oil Products Distribution Company's Sales of Fuel Products to Power Plants (2014 and 2015)



Source: MOPIC, Yemen Socio-Economic Update Issue 14, May 2016: Oil Sector Recovery in Yemen Urgently Needed, 2016.

194 The World Bank Group, Yemen Dynamic Needs Assessment: Phase 3 (Washington, DC: 2018).

195 Ibid.

196 Ibid.

197 Ibid.

198 Ibid.

199 Erica Gaston and Nadwa al-Dawsari, Waiting for Change: The Impact of Transition on Local Justice and Security in Yemen, United States Institute of Peace: 2013

200 Yemen News Agency (Saba), "SSC: Houthis attack checkpoint, killing one person", 10 September 2014, <https://sabanews.net/en/news367648.htm> (accessed November 22, 2019)

201 Gas to Power Journal, "Yemen's largest power plant at risk, needs repair", March 19, 2015, <https://gastopowerjournal.com/item/4740-yemens-largest-plant-at-risk-needs-repair> (accessed November 22, 2019).

202 Yemen Times, "Analysis: Why Yemen remains in the dark", August 28, 2011, <https://reliefweb.int/report/yemen/analysis-why-yemen-remains-dark> (accessed November 22, 2019).

203 The World Bank Group, Republic of Yemen Restoring and Expanding Energy Access Power Sector Reengagement Note, June 2017.

204 Ibid.

205 United Nations Office for Project Services, Yemen Integrated Urban Emergency Services Project (YIUSEP), Environmental and Social Management Framework (ESMF), (Copenhagen, Denmark: 2018), <http://documents.worldbank.org/curated/en/494961526464057594/pdf/P164190-ESMF-Final.pdf> (accessed September 17, 2019).

Public grid electricity supply is almost non-existent in Sana'a,²⁰⁶ with some sources suggesting that electricity is only available for one hour a day.²⁰⁷ Another report suggests that public electricity supply in the city ranges between zero and 11-17 hours in some neighborhoods.²⁰⁸ According to the assessment conducted in 2018, the rehabilitation of electricity supply is one of the top three priorities in Sana'a Hub.²⁰⁹ However, over 70 percent of the respondents stated that electricity services are very capable of meeting needs.

Currently, the population in Sana'a relies on solar panels and private generators to meet the electricity demand. The electricity provided by the power plants only covers a few nearby neighborhoods and is expensive. In some neighborhoods, the electricity from the private generators is sold to the population. In this case, HHs connect to the private generator established within the neighborhood in exchange for a fee. The prices of private providers are similar to the public ones.

The most recent fuel and diesel crisis hit Sana'a in September 2019, forcing drivers to queue for days at the petrol stations.²¹⁰ At the black market, the price can be three times higher with many unable to afford petrol. While the price on the official market is around 375 YER/liter, the price on the black market can reach 1,000 YER/liter.²¹¹

206 Ghassan Khaled Ismail Al-Akwaa, "Measuring electricity access amidst active conflict: Lessons from Yemen", World Bank Blogs, May 7, 2019, <https://blogs.worldbank.org/energy/measuring-electricity-access-amidst-active-conflict-lessons-yemen> (accessed November 14, 2019).

207 Hakim Almasmari, "Three-mile-long queues at petrol stations as Yemen's fuel crisis starves economy", The National, July 4, 2011, <https://www.thenational.ae/world/mena/three-mile-long-queues-at-petrol-stations-as-yemen-s-fuel-crisis-starves-economy-1.415779> (accessed November 14, 2019).

208 The World Bank Group, Yemen Dynamic Needs Assessment: Phase 3 (Washington, DC: 2018).

209 Tom Lambert and Afar Consulting, Yemen Multi-Sector Early Recovery Assessment, (EECR Cluster Yemen: UNDP, 2018), <http://earlyrecovery.global/sites/default/files/yemen-multi-sector-earlyrecoveryassessment.pdf> (accessed November 14, 2019).

210 Reuters, "Lines as Far as the Eye Can See: New Fuel Shortage Hits Yemen", September 29, 2019, <https://www.reuters.com/article/us-yemen-economy-fuel/lines-as-far-as-the-eye-can-see-new-fuel-shortage-hits-yemen-idUSKBN1WE0BF> (accessed November 14, 2019).

211 Nasser Abdulkareem, "New Fuel Crisis Deepens Suffering for Hungry Yemenis", NRC, October 16, 2019, <https://www.nrc.no/news/2019/october/new-fuel-crisis-deepens-suffering-for-hungry-yemenis/>

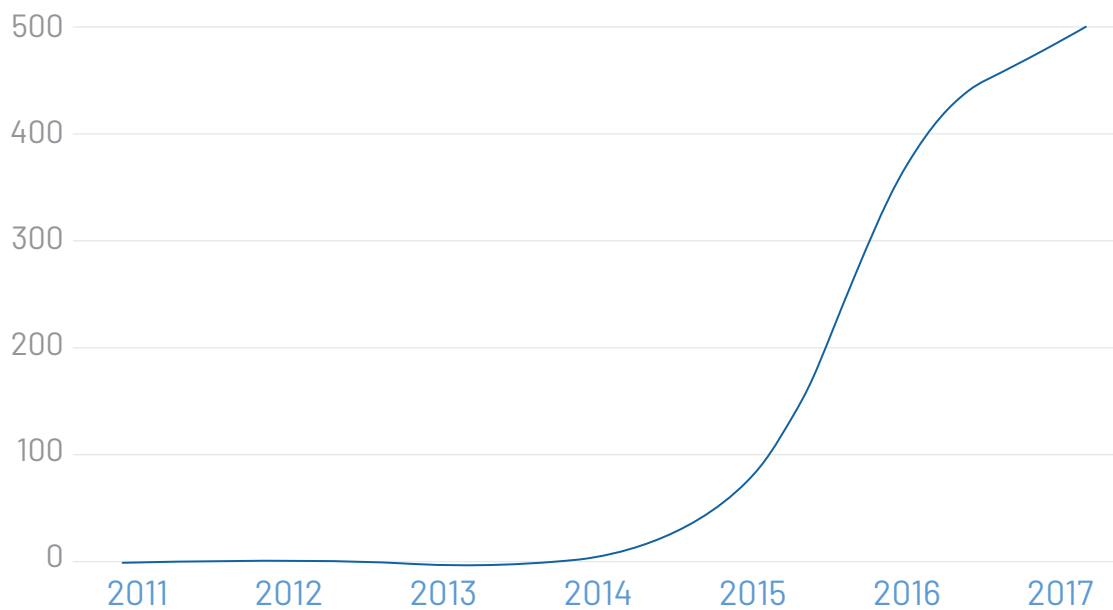
Yemen's Solar Revolution

Throughout the on-going civil war with foreign military intervention, the majority of the population have been cut off from the public electricity grid. However, as alternatives have been unavailable, the country has turned to decentralized solar energy, giving rise to an unprecedented deployment of solar (home) systems. Based on their own calculations, new household surveys, and extensive literature research the German Institute of Economic Research DIW analyzed in 2019 what they call Yemen's solar revolution.

While the report identifies central drivers for the diffusion of solar energy, it also discovers critical barriers: Since 2017, growth in the solar sector has been stagnating, since bottlenecks in the sector hamper a further diffusion.²¹⁴

In 2015 it became clear that the Yemen conflict would not see a quick end. There-fore, the solar expansion accelerated drastically towards 2016, when solar energy first became the most important source of electricity in Yemen.

Figure 34: Solar Capacity in Yemen in Megawatts



Source: International Energy Agency, 2019.

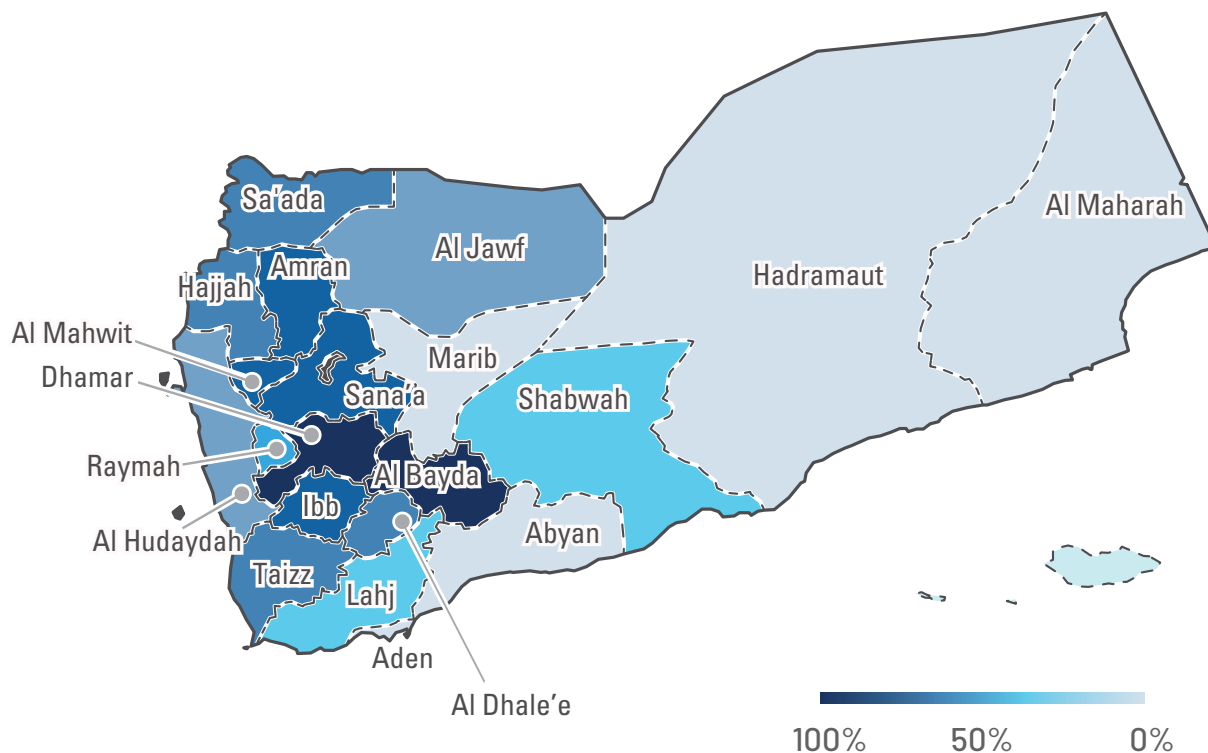
Following the collapse of the public electricity sector in 2015, coupled with the lack of fuel required for diesel generators, the solar systems market was on the rise in Sana'a. The market is entirely private. Only during 2014-2016, over 170 companies registered with the government as solar panels retailers.²¹² In 2018, IOM installed 940 solar panels on three schools in Amanat Al Asimah and Sana'a governorates, which help pump water to three districts in the city. The project supports delivery of 1 million liters of water to 55,000 people daily.²¹³

212 The World Bank Group, Republic of Yemen Restoring and Expanding Energy Access Power Sector Reengagement Note, June 2017

213 International Organization of Migration, Solar Power Delivers Water to Tens of Thousands of Yemenis, IOM News, November 7, 2018, <https://www.iom.int/news/solar-power-delivers-water-tens-thousands-yemenis> (accessed September 25, 2019)

214 DIW Berlin, Yemen's Solar Revolution: Developments, Challenges, Opportunities; Report with Policy Recommendations Based on Results from Research Projects Financed by the Federal Ministry of Education and Research and the Energy Access and Development Program (Berlin, Germany: 2019), https://www.diw.de/documents/publikationen/73/diw_01.c.683070.de/diworkompakt_2019-142.pdf (accessed September 25, 2019).

Figure 35: Share of Households with Energy Supply by Governorate



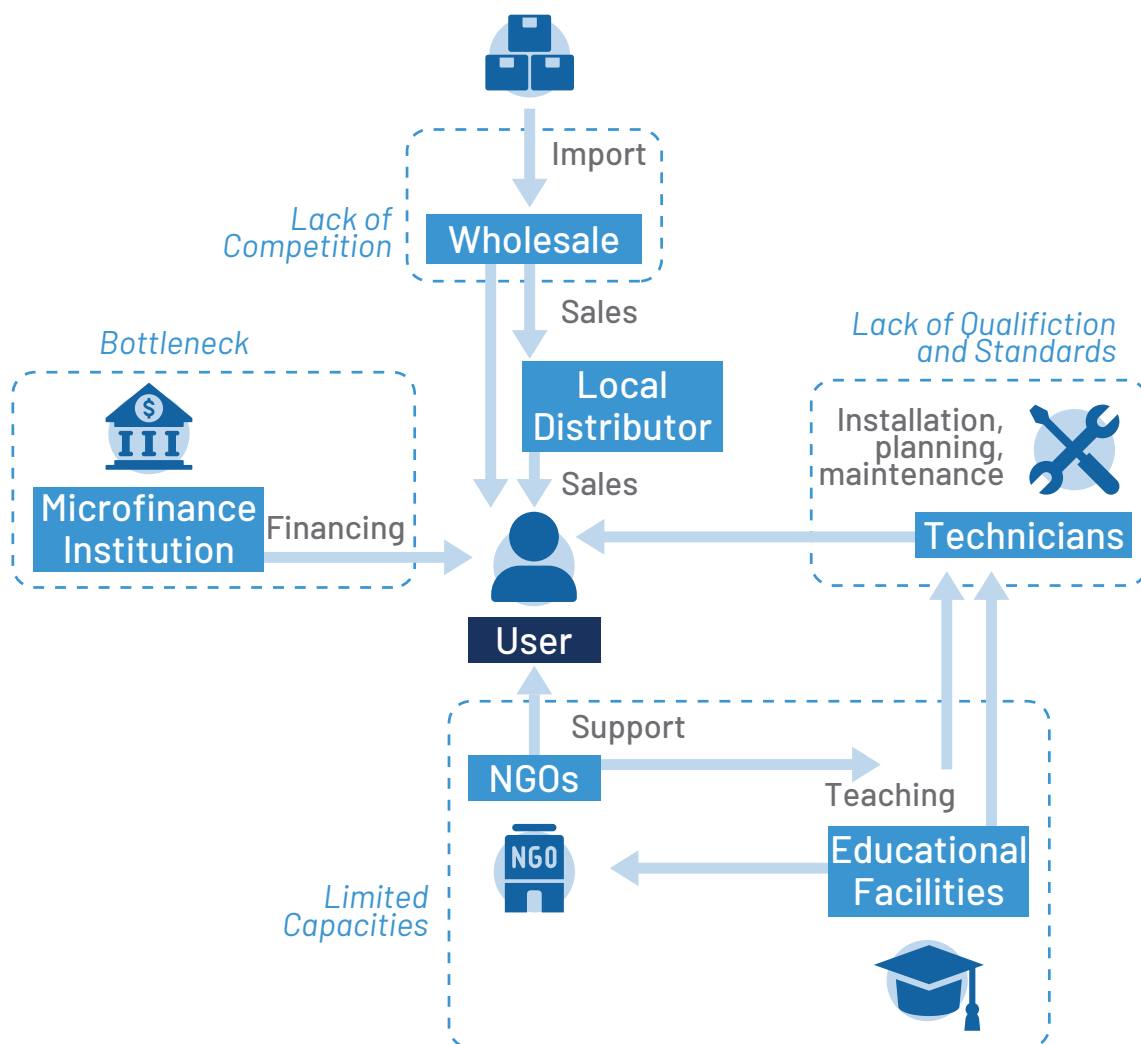
Source: DIW Berlin, EADP, 2019.

Yemen's solar revolution was primarily born of necessity. After all, households investing in solar systems have been unable to obtain electricity from other sources. However, it is remarkable that the distribution of solar systems is also roughly in line with external conditions: Solar energy usage is concentrated in the mountainous areas, while coastal and desert regions—which are usually less suitable for photovoltaic technology—exhibit lower shares.

Later, households started complaining about weak supply, short lifetimes, and (in exchange) excessive costs for solar systems. In a survey conducted in 2017, only 10 percent of households with solar systems stated that their electricity supply was sufficient.²¹⁵ The initial euphoria has given way to disillusionment, due to several issues in the Yemeni solar sector.

215 Sara Badiel, "A Glimpse of Light in Yemen: Enabling a booming solar industry through entrepreneurship and innovation", World Bank Blogs, March 29, 2018, <https://blogs.worldbank.org/arabvoices/glimpse-light-yemen-enabling-booming-solar-industry-through-entrepreneurship-and-innovation> (accessed September 25, 2019).

Figure 36: Share of Households with Energy Supply by Governorate



12 Solid Waste Management (SWM)

The main landfill, Al-Azraqain site, services Amanat Al Asimah, Sana'a, and Amran governorates. The landfill has been operational for over 40 years and has almost reached the backfilling capacity. There is no base or surface sealing installed at the site, and, consequently, the leachate is not captured.²¹⁶ Estimates suggest that 1500 tons of solid waste are generated daily in Amanat Al Asimah. There is a healthcare waste treatment facility in Sana'a city, located at the Al Azraqain landfill disposal site. The facility was expected to open in 2015 but operations were put on hold due to the conflict and lack of electricity.²¹⁷

Stakeholders and Legal Framework for Waste Management

Following the unification of Yemen in 1990, Solid Waste Management (SWM) fell under the oversight of several governmental entities. Conventionally, the Ministry of Housing and Municipalities (MoHM) had been the agency responsible since its inception in the 1970s.²¹⁸ After 1990, the MoHM was renamed the Ministry of Housing and Urban Development (MoHUD). In 1997, the administrative functions for SWM shifted to the MPWH. Then, in 1999, CCIF, a public sector entity responsible for managing the financial aspects for SWM and city improvements, was established. The Public Cleansing Law (Law 39/1999) was passed the same year and a bylaw was drafted to provide detailed regulations for the Public Cleansing Law.²¹⁹ Following the LAL of 2000, local authorities became responsible for waste collection and management, and in 2006, the responsibility for SWM came under the MoLA and the districts' LCs.²²⁰

The National Strategy for Solid Waste Management (NSSWM) tasked MoLA with the authority to reorganize and manage policy making, coordinate at the national level, as well as the supervision of the work of LCs in their own districts.²²¹ In 2008, the General Directorate for Solid Waste Management was established within MoLA as the supervising agency in charge of implementing the legal framework, issue national strategy and guidelines, coordinate with CCIFs, and distribute government funds. The NSSWM also recognized the need to revise the Public Cleansing Law and bring it in line with the decentralization process to transfer authority to MoLA and LCs. However, the escalation of the conflict in Yemen

after 2015 prevented implementation.²²²

The CIFs are managed by the governorate council. According to the NSSWM, 83 percent of the capital investment for all CCIFs came from foreign donors, but also included monies allocated by the central government.²²³ Cabinet Decree 236 of 2000 specified that at least 60 percent of the fund must be used to finance SWM activities, while the remainder should be used to finance other projects, such as urban rehabilitation and beautification. CCIF collects most of the fees through surcharges, such as a five percent surcharge on electricity bills and mobile credits.²²⁴ While local taxation is the main source of revenue for CCIF, it also receives transfers from the central government. Income sources for CCIF include five percent surcharge to the electricity bill, mobile credit surcharge, and other 23 types of fees. Following the escalation of the conflict, lack of water and electricity, reduced mobile phone coverage, and interruption of banking services led to less revenues collected by CCIF. Consequently, this affected payment of salaries of civil service and private sector employees.

Several development actors support Waste Management in Yemen, mainly through working at the institutional level and through funding provision. A limited number of interventions was implemented directly at a governorate or city level. The most prominent international organizations and development actors include the World Bank, Japan International Cooperation Agency (JICA), Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), United Nations Development Program (UNDP), United States Agency for International Development (USAID), Mercy Corps (MC), UNICEF and the International Committee of the Red Cross (ICRC).²²⁵

216 United Nations Office for Project Services, Yemen Integrated Urban Emergency Services Project (YIUSEP), Environmental and Social Management Framework (ESMF), (Copenhagen, Denmark: 2018), <http://documents.worldbank.org/curated/en/494961526464057594/pdf/P164190-ESMF-Final.pdf> (accessed September 17, 2019).

217 Conflict and Environment Observatory, How Yemen's Conflict Destroyed its Waste Management System (West Yorkshire, UK: 2019), <https://ceobs.org/how-yemens-conflict-destroyed-its-waste-management-system/> (accessed September 2019).

218 MoLA; National Strategy for Solid Waste Management, 13-17.

219 Ibid.

220 Ibid.

221 Ibid.

222 Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Country Report on the Solid Waste Management in YEMEN (Bonn and Eschborn: GIZ, 2014) https://www.retech-germany.net/fileadmin/retech/05_mediathek/laenderinformationen/Jemen_RA_ANG_WEB_Laenderprofil_sweep_net.pdf (accessed May 9, 2019).

223 MoLA; National Strategy for Solid Waste Management, 13-17.

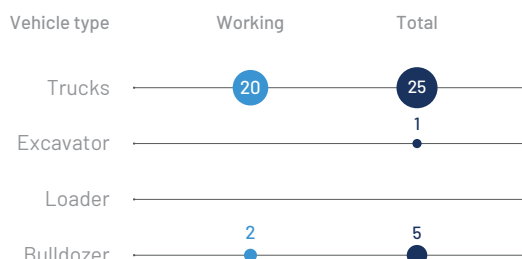
224 Olmo Formi et al, Yemen Emergency Waste Assessment (Yemen: United Nations Development Programme, 2015) <https://www.undp.org/content/dam/yemen/PovRed/Docs/UNDP-YEM-DWR.pdf> (accessed May 9, 2019).

225 Ibid.

Infrastructure and Operational Capacity

Sana'a city is divided into 17 zones for the administration of SWM. The Al-Azraqain site is the main landfill serving the Amanat Al Asimah, Sana'a and Amran governorates. It covers an area of 40 ha and has a capacity of 1500 tons/day.²²⁶ The disposal fleet status (as of August 2015) is as follows:

Figure 37: Disposal Site Fleet Status as of August 2015



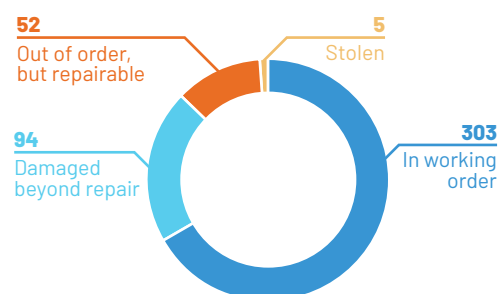
Source: UNDP, Yemen Emergency Waste Management, 2015.

Lack of bulldozers and excavators can affect proper compacting and covering of waste during the rainy season which can lead to water infiltration and increased production of leachate and groundwater pollution.²²⁷ Non-compacted soil increases the emissions of landfill gas and prevents the oxidation of methane. In addition, uncovered waste can increase the numbers of vectors, which, in turn, leads to the spread of vector-borne diseases, such as dengue fever, malaria, rabies, and leishmaniasis.

Following the escalation of the conflict in 2015, the site ceased to operate at full capacity. Staff levels at Sana'a landfill maintained its pre-conflict size, as compared to August 2015, but a reduction of up to 25 percent was observed during the airstrikes periods.²²⁸ While some waste from nearby neighborhoods was transported to Al-Azraqain, most of it ended in the transfer station, from which only part of it would then be transported to the landfill.²²⁹

During the same period, waste collection also significantly decreased with the number of monthly collections reaching 30 trips.

Figure 38: Status of Waste Collection Fleet in Sana'a, August 2015



Source: UNDP, Yemen Emergency Waste Management, 2015.

According to a UNDP assessment in 2015, the fencing at the Al Azraqain site was broken. The incident posed a risk of vector-borne diseases, spread by wandering stray dogs and livestock.²³⁰ In addition, the UNDP assessment highlighted the lack of cover soil which brings the associated risk of collapse of terrain and presence of vectors. The danger from leachate accumulation and spills or slow discharges affecting crops and scarce water resources was also reported. More recent data suggests that the site is surrounded by walls on three sites and has a wire fence on the other.²³¹ The waste processing building at the Sana'a landfill has been destroyed in 2015.²³² Furthermore, the weighbridge is damaged and nonoperational, however, reports suggest that the site may have reached its limit after having operated for years and may be overloaded.²³³

According to a recent assessment, as of 2018 only three dumpsites serve the entire city.²³⁴ Most of the neighborhoods in Sana'a reported insufficient services of solid waste collection. The sector also sustained damage as a result of the ongoing conflict, with almost a third (31 percent) of garbage trucks damaged, and 18 percent non-operating.²³⁵ The cost of damage to the SWM sector in Sana'a city is estimated between 3.43 and 4.20 million USD.²³⁶

230 Ibid.

231 United Nations Office for Project Services, Yemen Integrated Urban Emergency Services Project (YIUSEP), Environmental and Social Management Framework (ESMF), (Copenhagen, Denmark: 2018), <http://documents.worldbank.org/curated/en/494961526464057594/pdf/P164190-ESMF-Final.pdf> (accessed September 17, 2019).

232 Doug Weir, "How Yemen's Conflict Destroyed its Waste Management System," Conflict and Environment Observatory (blog), August 1, 2019, <https://ceobs.org/how-yemens-conflict-destroyed-its-waste-management-system/> (accessed July 16, 2019).

233 United Nations Office for Project Services, Yemen Integrated Urban Emergency Services Project (YIUSEP), Environmental and Social Management Framework (ESMF), (Copenhagen, Denmark: 2018), <http://documents.worldbank.org/curated/en/494961526464057594/pdf/P164190-ESMF-Final.pdf> (accessed September 17, 2019).

234 The World Bank Group, Yemen Dynamic Needs Assessment: Phase 3 (Washington, DC: 2018).

235 Ibid.

236 Ibid.

226 United Nations Office for Project Services, Yemen Integrated Urban Emergency Services Project (YIUSEP), Environmental and Social Management Framework (ESMF), (Copenhagen, Denmark: 2018), <http://documents.worldbank.org/curated/en/494961526464057594/pdf/P164190-ESMF-Final.pdf> (accessed September 17, 2019).

227 Olmo Formi et al, Yemen Emergency Waste Assessment (Yemen: United Nations Development Programme, 2015) <https://www.undp.org/content/dam/yemen/PovRed/Docs/UNDP-YEM-DWR.pdf> (accessed May 9, 2019).

228 Ibid.

229 Ibid.

Healthcare waste

In 2009, the accumulation of medical waste in Yemen was estimated to be 3,962 tons.²³⁷ Management of healthcare waste falls under the responsibility of the Ministry of Public Health and Population (MoPHP), which sets policy development for segregation, storage, handling, treatment, and disposal.²³⁸ While Yemen has ratified multilateral environmental agreements, such as the Rotterdam²³⁹ and Basel²⁴⁰ Conventions, there is no specific legislation regarding safe storing, handling, and disposal of healthcare and hazardous waste.

The Healthcare Waste Treatment Facility in Sana'a, which is the only healthcare waste facility in Yemen, is located in a separate area of the Al Azraqain site.²⁴¹ It was financed by the Social Fund for Development (SFD) and planned to be run by the CIF, which simultaneously would have covered all operational and ancillary costs. The plant was ready to start operations in March 2015, but this was delayed due to the conflict. The facility is equipped with one autoclave (2 m3 capacity and treatments cycle of 400 kg/hour), one washing machine for the waste containers, and two trucks for transporting healthcare waste. The plant is currently non-operational due to lack of fuel and funds.

Recycling Sector

The recycling sector has been significantly affected by the conflict and currently operates at a much-reduced scale, mainly through the informal sector. Across Yemen, there are over 50 registered recycling plants. Recyclables are mainly delivered through an informal network of brokers, junk shop owners, and waste pickers, most of whom are members of the Muhamasheen community.²⁴² Most of the recovered material is exported. The quality of exporters varies, with some well-established companies operating in line with international commodity trade standards and others operating these activities as a secondary business. Before the conflict, informal recycling was an important source of livelihoods for many people, including vulnerable groups of women-headed households. The waste value chain starts with the waste pickers, recovering materials from the streets and disposal sites. It then feeds into a network of junk shops, waste brokers and intermediaries, and eventually recycling businesses.²⁴³ In Sana'a city waste pickers collect metals, plastic, green waste, and paper products. Following the escalation of the conflict, there were four adult male waste pickers at Al Azraqain site and 15 (12 men and 3 boys) at the Sana'a Transit Station as of August 2015.²⁴⁴

The recycling sector has been adversely affected by the lack of electricity. While internal production slowed down, most of the recovered materials are still exported. This can be attributed to the lack of electricity that affects manufacturing capacity, which, in turn, prevents the use of recycled materials to substitute imports.

In Sana'a city, waste collection and disposal services coverage is 70 percent, significantly higher than in Al Hudaydah (50 percent), but lower than in Aden (80 percent).²⁴⁵ As of October 2015, an estimated 1,000,000 tons of debris were generated in Sana'a, Aden, Hajjah, Sa'ada, Taizz and Abyan, due to conflict-related destruction.²⁴⁶ Debris removal is further complicated by the risk of Explosive Remnants of War (ERW). Assessment undertaken during the same time reports ERW contamination in 13 governorates, including Amanat Al Asimah, which also poses significant risk to children.²⁴⁷ Daily waste generation decreased in 2015 as a consequence the conflict.²⁴⁸

237 Sweep-Net, Country Report on the Solid Waste Management in Yemen, (Sweep-Net, July 2010)

238 Olmo Formi et al, Yemen Emergency Waste Assessment (Yemen: United Nations Development Programme, 2015) <https://www.undp.org/content/dam/yemen/PovRed/Docs/UNDP-YEM-DWR.pdf> (accessed May 9, 2019).

239 Rotterdam Convention, 2244 UNTS 337; 38 ILM 1 (1999), http://www.eisil.org/index.php?sid=4ails&id=2077&t=link_details&-cat=423 (accessed May 9, 2019).

240 Basel Convention, 1673 UNTS 126; 28 ILM 657 (1989), http://www.eisil.org/index.php?sid=4ails&id=617&t=link_details&-cat=0&having=365931 (accessed May 9, 2019).

241 Olmo Formi et al, Yemen Emergency Waste Assessment (Yemen: United Nations Development Programme, 2015) <https://www.undp.org/content/dam/yemen/PovRed/Docs/UNDP-YEM-DWR.pdf> (accessed May 9, 2019).

242 Ibid.

243 Ibid.

244 Ibid.

245 United Nations Office for Project Services, Yemen Integrated Urban Emergency Services Project (YIUSEP), Environmental and Social Management Framework (ESMF), (Copenhagen, Denmark: 2018), <http://documents.worldbank.org/curated/en/494961526464057594/pdf/P164190-ESMF-Final.pdf> (accessed September 17, 2019).

246 United Nations Development Programme, Immediate Support to Solid Waste Management, Debris Removal, and to Women affected by War, through Cash for Work in Yemen (Yemen: 2017), <https://www.undp.org/content/dam/yemen/Projects/docs/Prodoc-WASH.pdf> (accessed September 28, 2019).

247 Ibid.

248 Ibid.

1. Overview

Sana'a's drastic urban expansion over the last decades has led to an increased demand for transportation services. The city's population continued to increase following the escalation of the conflict as many IDPs arrived in the city. Most of the investment within the city targeted development of the roads and intersections network, while the public transportation sector remains largely controlled by the informal sector. While the public transportation network within the center is advanced with frequently available bus and minibus services and several bus terminals, many of the districts in the periphery remain harder to reach.

Several roads have been damaged during the conflict. While some have been rehabilitated, many are still in need of reconstruction. The economic situation, coupled with lack of fuel, further affect mobility and the public's reliance on transportation.

Legal framework and organization

The two main governmental authorities responsible for managing the transportation sector are the Ministry of Interior (MoI) and the Ministry of Transportation (MoT). The former is responsible for inspecting and licensing vehicles and services, while the latter sets policy²⁴⁹ and manages airport and port facilities.²⁵⁰ In addition, the MPWH supervises the overall road infrastructure in Yemen, including development and maintenance.²⁵¹ It is not, however, involved in the development of urban roads in Sana'a and Aden.

The Land Transport Law was introduced on 30 March 2003 to provide the regulatory framework for land transportation.²⁵² Prior to this, land transportation services were provided through two syndicates in the governorate (passenger and freight transport), for which companies had to register through a lengthy and expensive process. The new law set guidelines for private companies on passenger and trucking transportation services.

For trucking companies, the law specifies the possession of a minimum of 10 trucks under 2 years old and a limited amount of 250 heavy trucks, 400 medium trucks or 300 light trucks per company. The MoT awards one-year renewable licenses based on the information each company is required to submit, which includes policies, regulations and contracts among others. The law also allows companies to submit bank guarantees in lieu of registration fees.

This led to a reduction of freight rates by 40 percent a year. For passenger transportation services, companies should own no less than 10 buses and have a number of passenger stations in various city points. All public bus companies in Yemen are private, apart from the state-owned Local Transport Corporation.

The law has not been fully enforced, mostly because of financial and technical issues but also because of an absence in human resources capacity. For instance, while in theory the law requires all transportation vehicles to be examined, in practice many vehicles considered unfit are in operation.²⁵³

Further regulations were introduced in 2004 that deal with cargo and trucks freight transport, passenger (bus) transport, and car rentals.

The Department of Technical Affairs, within Amanat Al Asimah, oversees transport projects and urban planning since 2000, and roads within the city since 2003.²⁵⁴ The Ministry of Transport and the Ministry of Interior are in charge of public transport.

249 The World Bank Group, Yemen - City and Inter-City Land Transport Sector: Strategy Note (Washington, DC: 2010), <http://documents.worldbank.org/curated/en/395881468168254654/Yemen-City-and-inter-city-land-transport-sector-strategy-note> (accessed June 22, 2019).

250 The World Bank Group, Yemen Transport Sector. Input to the Yemen Policy Note no. 4. on Inclusive Services Delivery (Washington, DC: 2017), <http://documents.worldbank.org/curated/en/636961508411397037/Yemen-transport-sector> (accessed June 22, 2016).

251 United Nations Office for Project Services, Yemen Integrated Urban Emergency Services Project (YIUSEP), Environmental and Social Management Framework (ESMF) (Copenhagen, Denmark: 2018), <http://documents.worldbank.org/curated/en/494961526464057594/pdf/P164190-ESMF-Final.pdf> (accessed September 17, 2019).

252 The World Bank Group, Yemen - City and Inter-City Land Transport Sector: Strategy Note (Washington, DC: 2010), <http://documents.worldbank.org/curated/en/395881468168254654/Yemen-City-and-inter-city-land-transport-sector-strategy-note> (accessed June 22, 2019).

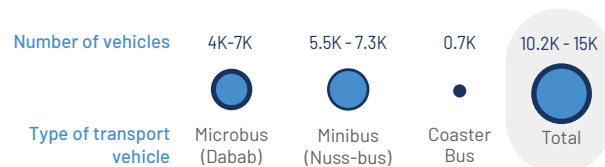
253 Ibid.

254 The World Bank Group, Yemen, Republic of Yemen: Urban transport in Sana'a strategy note, (Washington, DC: 2010), <http://documents.worldbank.org/curated/en/827131468182387385/Yemen-Republic-of-Urban-transport-in-Sanaa-strategy-note> (accessed June 22, 2016).

Infrastructure

The public transport sector is predominantly informal and most of the fleet, including buses and taxis, are privately owned. However, already prior to the conflict, most of the vehicles were old and poorly maintained. The table below presents information on the estimated number of vehicles in Sana'a city in 2005.

Figure 39: Number of passenger Transport Vehicles per Type in Sana'a City (2005)



Source: World Bank, *Republic of Yemen Urban Transport in Sana'a Strategy Note, 2005*.

High concentration of vehicles leads to congestion among the main roads, as well as high levels of pollution. Furthermore, there are an estimated 33,000 taxis operating in the city, many of which operate empty.²⁵⁵

According to the WHO, around 1,100 deaths are associated with outdoor air pollution in Yemen annually.²⁵⁶

Service coverage varies throughout the city. A 2010 study suggests that there are between 21-63 routes of passenger transportation in Sana'a, most of them are short distance.²⁵⁷ Consequently, crossing the city from north to south or vice versa requires changing the line several times. Areas on the periphery of the city have less transport services available. As a result, many people must walk long distances to reach one of the main roads.²⁵⁸ The bus terminals (Farzah) are predominantly informal. The map below reflects their locations, which were identified based on Google maps data and observations from local sources.

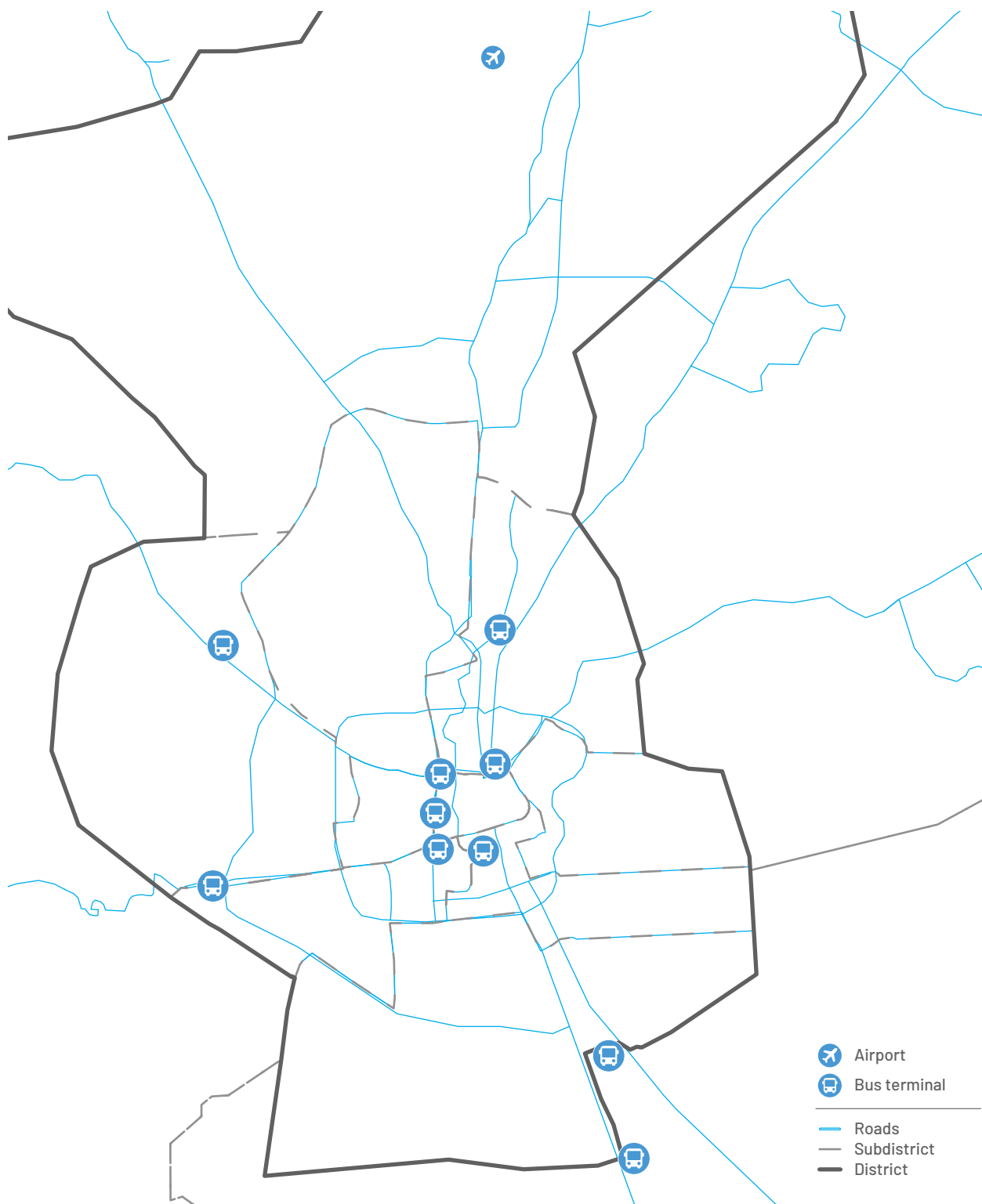
²⁵⁵ Ibid.

²⁵⁶ World Health Organization, *Country profile of Environmental Burden of Disease, Yemen*, (Geneva, Switzerland: 2009). https://www.who.int/quantifying_ehimpacts/national/countryprofile/yemen.pdf?ua=1 (accessed September 17, 2019).

²⁵⁷ The World Bank Group, *Yemen, Republic of Yemen: Urban transport in Sana'a strategy note*, (Washington, DC: 2010), <http://documents.worldbank.org/curated/en/827131468182387385/Yemen-Republic-of-Urban-transport-in-Sanaa-strategy-note> (accessed June 22, 2016).

²⁵⁸ Ibid.

Figure 40: Locations of Bus Terminals (Farzah) in Sana'a City



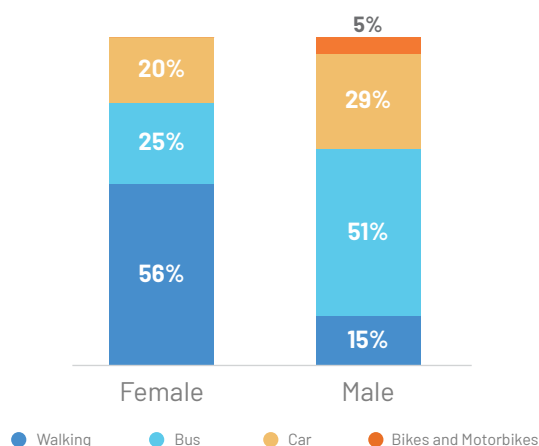
Source: DIW Berlin, EADP, 2019.

Drivers are required to get a license to operate a specific route. However, these licenses put no obligations on the drivers in terms of frequency of service provision.²⁵⁹ Consequently, the service is both unreliable and unstable and the number of operating buses varies from day to day which also results in extended waiting times.

Prior to the conflict, most of the male population in Sana'a city relied on publicly offered passenger transportation as a main transport mode. In contrast, most of the female population relies on walking to reach their destinations.

Among other factors, this has been attributed to the lack of street lightning in the periphery areas of the city and irregular public transport service. A study conducted in 2009 revealed that development of urban infrastructure had an impact on women's mobility.²⁶⁰ Central areas of the city, with many bus terminals, sidewalks and street lightening observed around 15 percent of the female population in employment, while only 8 percent of women in the periphery areas were working.

Figure 41: Transportation Modes Used in Sana'a (2011)



Source: World Bank, *Gender and Transport in the Middle East and North Africa Region Case studies from the West Bank and Yemen*, December 2011.

Road Network

The road network in Sana'a city is relatively well-developed with several 6-8 lane roads.²⁶¹ The city's road spread in a linear form, following the city's expansion along a north-south axis. The road network consists of two main ring roads: the inner ring and the outer ring (Sitteen road). Higher traffic volumes are observed within the inner ring and the main streets deriving from it. As of 2018, a quarter of the roads inside Sana'a city were damaged.²⁶² Some of the roads connecting the city with other governorates also sustained damage, while others remain closed due to fighting. This includes the highway connecting Sana'a to Marib City and to the oil and gas fields north of Marib governorate.²⁶³ The cost of damage to transportation sector in Sana'a city is estimated to be between 70.3 and 86.0 million USD, representing a third (31 percent) of the total cost of damage in 16 assessed cities.²⁶⁴

In 2013, Sana'a city had the highest number of traffic accidents in Yemen. This has been attributed to several factors, including poor rules enforcement, lack of traffic signals, lack of pedestrian crossings and poor parking practices.²⁶⁵ For example, double parking can be regularly observed even when there is an available parking space. By 2015, the number of traffic accidents in Sana'a city drastically dropped by more than 50 percent. This may be attributed to limited mobility during the escalation of clashes, as well as decreased usage of personal vehicles due to the fuel shortages.

²⁵⁹ Ibid.

²⁶⁰ The World Bank Group, *Gender and transport in the Middle East and North Africa region : case studies from the West Bank and Yemen* (Washington, DC: 2011), <http://documents.worldbank.org/curated/en/403431468347334980/Gender-and-transport-in-the-Middle-East-and-North-Africa-region-case-studies-from-the-West-Bank-and-Yemen> (accessed August 12, 2019).

²⁶¹ The World Bank Group, *Yemen, Republic of Yemen: Urban transport in Sana'a strategy note*, (Washington, DC: 2010), <http://documents.worldbank.org/curated/en/827131468182387385/Yemen-Republic-of-Urban-transport-in-Sanaa-strategy-note> (accessed June 22, 2016).

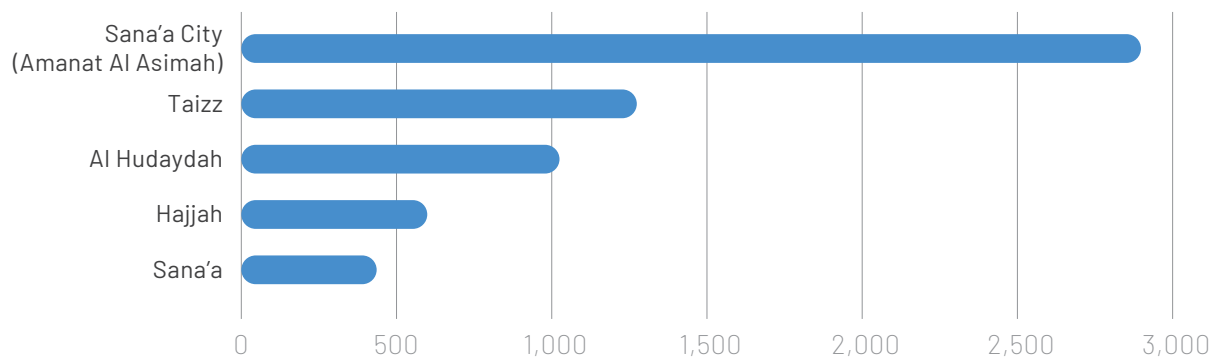
²⁶² The World Bank Group, *Yemen Dynamic Needs Assessment: Phase 3* (Washington, DC: 2018).

²⁶³ Ibid.

²⁶⁴ Ibid.

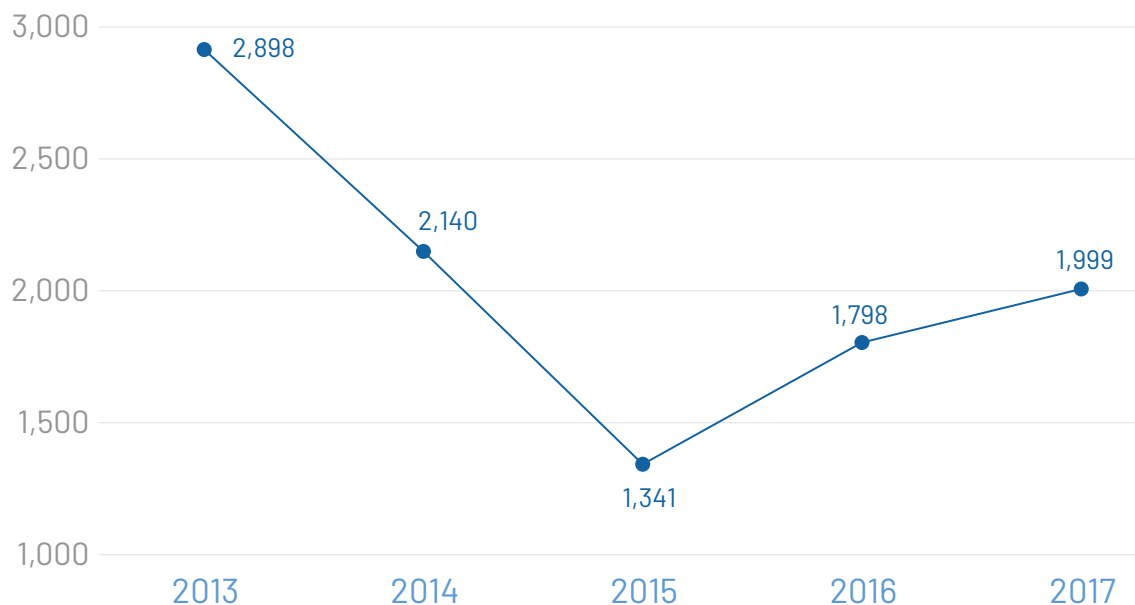
²⁶⁵ The World Bank Group, *Yemen, Republic of Yemen: Urban transport in Sana'a strategy note*, (Washington, DC: 2010), <http://documents.worldbank.org/curated/en/827131468182387385/Yemen-Republic-of-Urban-transport-in-Sanaa-strategy-note> (accessed June 22, 2016).

Figure 42: Governorates with the Highest Reported Number of Traffic Accidents (2013)



Source: CSO, Statistical Yearbook, 2013.

Figure 43: Number of Reported Traffic Accidents in Sana'a City (2013-2017)



Source: CSO, Statistical Yearbooks 2013, 2015, and 2017.

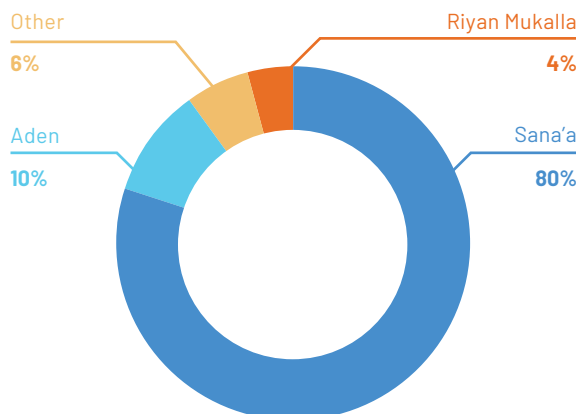
There is an acute fuel shortage, which also affects other sectors, such as transportation, water and sanitation, energy, health and education. As of August 2019, the price of diesel reached 430 YER per liter, constituting a 186.7 percent increase as compared to pre-conflict prices.²⁶⁶ The price of petrol during the same period rose to 365 YER per liter, or a 143.3 percent increase since the start of the conflict.

²⁶⁶ Ministry of Planning and International Cooperation, Food and Agriculture Organization of the United Nations and Food Security Technical Secretariat, Monthly Market Monitoring Bulletin, Issue: 49 (Yemen: 2019), https://fsccluster.org/sites/default/files/documents/fao-fsis_and_mopic-fsts_-market_monitoring_bulletin_-_august_2019_-english_.pdf (accessed September 18, 2019).

Sana'a Airport

Sana'a International Airport is the largest airport in the country. As of 2007, the airport was handling around 1.7 million passengers, representing 80 percent of all passengers and 87 percent of international passengers.²⁶⁷ On average, there were 38 scheduled flights per day. It is equipped with one runway of 3,200 meters, an apron with 27 parking spaces, and passenger terminal.

Figure 44: Estimated Proportion of Air Passengers in Yemen per Airport (2007)



Source: World Bank, Republic of Yemen Air Transport Sector Strategy Note, September 2010.

The GoY commissioned the construction of the second international airport, near the new one, which was expected to be completed by 2010, however, the construction was delayed. The total cost was estimated to be 460 million USD, and the airport was expected to have a new terminal, apron, and a runway of 3,500 meters.²⁶⁸ Following the construction of the new airport, the old one was expected to act as a military and state airport.

Sana'a airport has been closed since August 2016 and only caters to UN humanitarian operations at a reduced capacity²⁶⁹. It was reported that the airport sustained damage to its runways, hangars, and aircraft. According to the Ministry of Health, this has prevented many people from travelling abroad to receive medical treatment. According to the damage assessment conducted by UNOSAT, UNITAR in May 2017, 70 structures and transportation vehicles were affected, with 18 of them destroyed, 32 severely damaged and 20 moderately damaged.²⁷⁰ In addition, 32 impact craters were identified. It should be noted that while the Minister of Transport in December 2018 stated that the airport was ready for civil and commercial flights²⁷¹, the airport remains closed to commercial flights at the time of writing.

²⁶⁸ Ibid.

²⁶⁹ The World Bank Group, Yemen Dynamic Needs Assessment: Phase 3 (Washington, DC: 2018).

²⁷⁰ UNOSAT, United Nations Development Programme, Damage Assessment of Sana'a International Airport, Sana'a Governorate, Yemen (as of 3 Jun 2015), (Yemen: 2015), <https://relief-web.int/map/yemen/damage-assessment-sanaa-international-airport-sanaa-governorate-yemen-3-jun-2015> (accessed August 27, 2019).

²⁷¹ Civil Aviation and Meteorology Authority, "Civil Aviation Safety and Security Commission Discusses the Readiness of Sana'a International Airport", CAMA News, December 9, 2018, <http://www.cama.gov.ye/en/index.php/cama-head-office/news/19-civil-aviation-safety-and-security-commission-discusses-the-readiness-of-sana-a-international-airport> (accessed August 27, 2019).

²⁶⁷ The World Bank Group, Yemen, Republic of - Air transport Sector Strategy Note (Washington, DC: 2010), <http://documents.worldbank.org/curated/en/129741468340297352/Yemen-Republic-of-Air-transport-sector-strategy-note> (accessed August 29, 2019).

Overview

Across Yemen, the number of subscribers to mobile and internet networks has been steadily increasing in the last 15 years. Prior to 2015, almost 90 percent of the population in Yemen were connected to mobile networks. The number of these subscriptions increased from 3 million in 2006 to a peak 18.36 million in December 2015.²⁷² Thereafter, there was a sharp decline by four percent at the end of the year and the numbers remained to a relatively steady 16 million in 2016.²⁷³ Recent data indicate a further decrease 11 percent in mobile penetration across Yemen since 2015.²⁷⁴

The Ministry of Communications (MoC) was established in 1991 and later renamed to the Ministry of Telecommunications and Information Technology (MoTIT). The telecom sector underwent considerable reform prior to the escalation of the conflict. According to the United Nations Conference on Trade and Development (UNCTAD), this included new legislation, a restructuring of the MoTIT, and the establishment of a regulatory body monitoring the network.

Infrastructure and Operational Capacity

Prior to the conflict, there were 13,000 km of fiber optic across Yemen that connected to the international submarine fiber in Aden, Al Mukalla and Al Hudaydah.²⁷⁵ Although the level of structural damage is difficult to assess, most of the fiber network in Yemen runs above ground which increases its vulnerability and likelihood to interruptions. The telecommunications infrastructure is mostly located in Sana'a.

Media sources reported that in July 2018, the fiber optic cable was damaged in three places in Al Hudaydah, disrupting Internet to 80 percent of the country.²⁷⁶ The telecommunications companies and main infrastructure are located in Sana'a.

In 2018, as a part of Yemen Dynamic Needs Assessment (DNA), the World Bank surveyed 141 Communication assets in 16 Yemeni cities. Results indicate that eight assets are partially damaged, which includes two towers and base stations, three Information and Communications Technology (ICT) facilities and three shelters and power, while seven ICT assets were completely destroyed, including five towers and base stations, two ICT facilities.²⁷⁷ In Sana'a city specifically, out of 42 assessed ICT facilities, three (seven percent) were damaged and one was destroyed (two percent).²⁷⁸ The damage cost to the Communications sector in Sana'a is estimated to be 0.3 million USD.²⁷⁹

According to the 2017 Statistical Yearbook, there were 407 internet cafes in Sana'a city, representing almost a third of all internet cafes in Yemen. In addition, the city hosts over 6,000 call centers as of 2017, the highest number across all Yemen, and three times more than the second highest - Aden.²⁸⁰ Internet cafes are popular amongst Sana'a residents, especially students, as prices of purchasing own equipment along with the subscription fee is unaffordable for many households.²⁸¹ For example, students rely on Internet access to access information to supplement their university studies. Also, in 2013 the first women-only Internet café opened in the city. In 2018, it was reported that out of 45 surveyed internet cafes in Sana'a, 38 (84 percent) were either fully or partially operating, while 7 (16 percent) were permanently closed. It was also reported that one facility was operating on solar energy, which provided 18 hours of power supply daily.²⁸²

272 Naomi J. Halewood and Xavier Stephane Decoster, Yemen: information and communication technology (ICT) (Washington, DC: The World Bank Group, 2015), <http://documents.worldbank.org/curated/en/337651508409897554/Yemen-information-and-communication-technology-ICT> (accessed November 6, 2019).

273 Ibid.

274 The World Bank Group, Yemen Dynamic Needs Assessment: Phase 3 (Washington, DC: 2018).

275 Naomi J. Halewood and Xavier Stephane Decoster, Yemen: information and communication technology (ICT) (Washington, DC: The World Bank Group, 2015), <http://documents.worldbank.org/curated/en/337651508409897554/Yemen-information-and-communication-technology-ICT> (accessed November 6, 2019).

276 Ali Mahmood, "Houthis Cut off Internet to 80 percent of Yemen", The National, July 5, 2018,

<https://www.thenational.ae/world/mena/houthis-cut-off-internet-to-80-per-cent-of-yemen-1.747535> (accessed November 6, 2019).

277 The World Bank Group, Yemen Dynamic Needs Assessment: Phase 3 (Washington, DC: 2018).

278 Ibid.

279 Ibid.

280 Central Statistical Organization, Statistical Yearbook 2017, available at <http://www.cso-yemen.com/content.php?lng=en-glish&id=690> (accessed April 15, 2019).

281 The World Bank Group, Yemen Dynamic Needs Assessment: Phase 3 (Washington DC: 2018).

282 Ibid.

Service providers

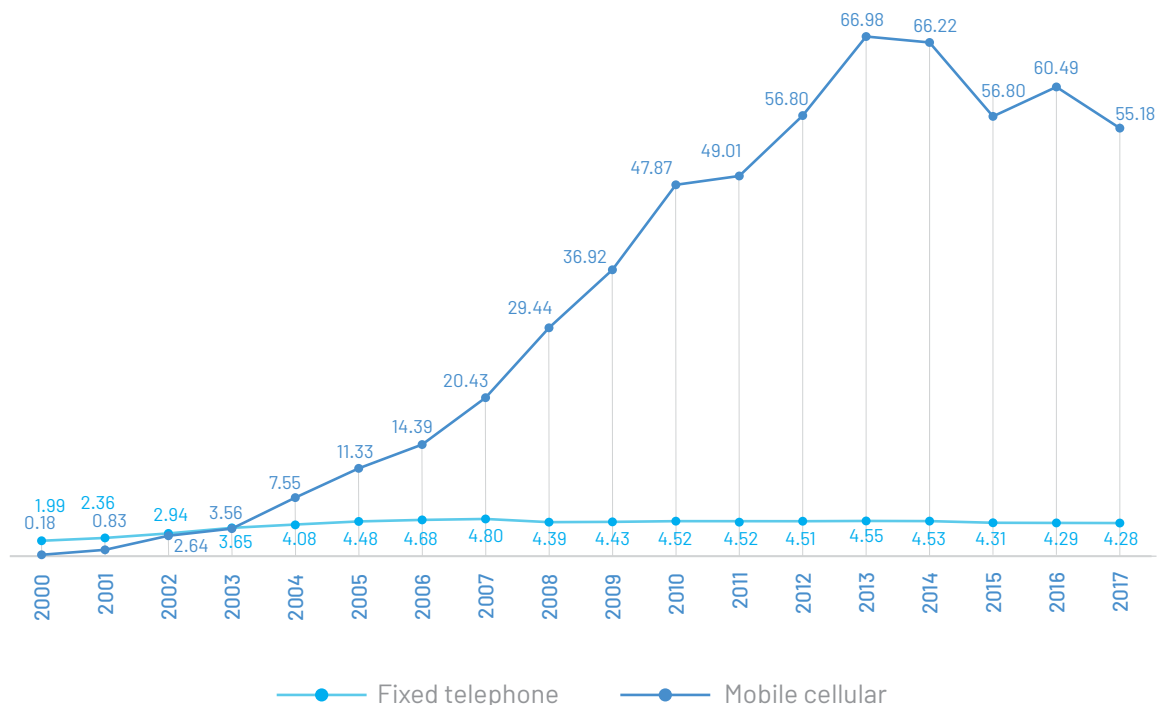
There are four mobile phone operators in Yemen: Yemen Mobile, MTN Yemen, Sabafon, Y-Telecom. The Yemen Mobile, a state-owned operator and was the only given permission to provide 3G services.²⁸³ As of 2016, MTN Yemen held the highest market share in Yemen (36.4 percent), followed by Yemen Mobile (27.5 percent), Sabafon (30.7 percent), and Y-Telecom (5.4 percent).²⁸⁴

According to World Bank data,²⁸⁵ mobile phone subscriptions have decreased in Yemen from 65.9 per 100 people in 2013 to 54.4 per 100 in 2017. The fixed telephone subscriptions rate is low, with 4.2 subscriptions per 100 people as of 2017.

TeleYemen is the only telecommunications company providing international direct dialing services.

According to United Nations Economic and Social Commission for Western Asia (UNESCWA), internet services have been available in Yemen since 1996. The usage, however, remained below five percent up until 2007. The first Internet provider was TeleYemen who enjoyed a monopoly position on the market before YemenNet was launched in 2002. Currently, YemenNet is the main Internet provider in Sana'a, and is the only network providing 3G services. Internet subscription has increased from 1.2 percent of the population in 2006 to 26.7 percent in 2017. However, there were only 1.68 fixed broadband subscriptions per 100 inhabitants in 2018.²⁸⁶

Figure 45: Fixed Telephone and Mobile Cellular Subscription per 100 People



Source: World Bank data.

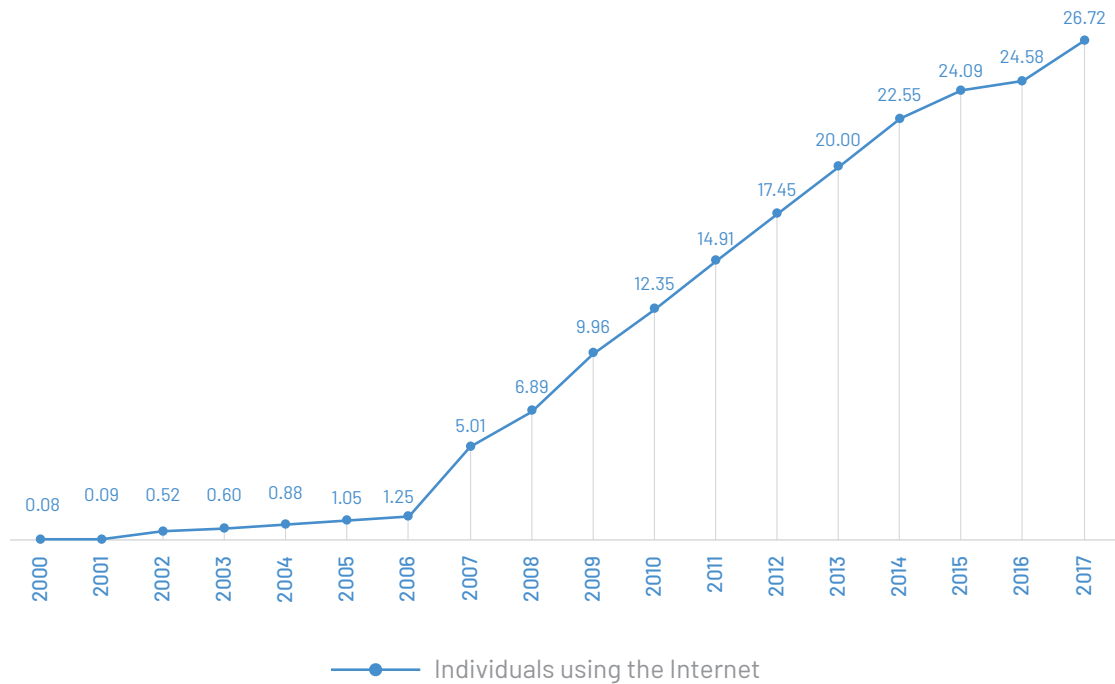
²⁸³ Ibid

²⁸⁴ Ibid.

²⁸⁵ World Bank Data, Fixed telephone subscriptions (per 100 people) - Yemen, available at <https://data.worldbank.org/indicator/IT.MLT.MAIN.P2?locations=YE> (accessed April 15, 2019).

²⁸⁶ International Telecommunication Union Data, Fixed-broadband subscriptions statistics, available at <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx> (accessed April 15, 2019).

Figure 46: Share of Population Using Internet in Yemen



Source: World Bank data.

Mobile and internet subscription rates have been rapidly increasing in Yemen since early 2000s. Following the escalation of the conflict in 2015, mobile penetration in Yemen decreased by 11 percent. While assessments' data suggests that at a national level and in Sana'a city specifically, damage to ICT infrastructure have been limited, this is most likely an underestimation, caused by difficulties to assess communications infrastructure through remote sensing. Most of the fiber network in Yemen runs above ground, which may increase its vulnerability to damage.

In Sana'a, internet cafes remain one of the primary points of access to internet services due to associated high costs of purchasing own equipment and subscription rates. Reports indicate that Internet cafes are especially popular amongst students, who use publicly available information to complement their university studies.

15 Recovery priorities



Housing

1. Improve urban growth management and integrate recent growth with the existing city.



Economy

2. Remove barriers for economic growth to investment in infrastructure.



Services

3. Health and education services.



Environment

4. Green and healthy Sana'a by focusing on water, sewage and waste networks.



Heritage

5. Develop a heritage conservation plan with focus on the old city.



Social Cohesion and Governance













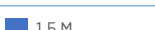


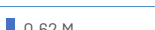














6. Strengthen efficient and transparent governance processes

Sana'a Strategic Urban Recovery Priorities

This section identifies the key areas, based on analysis in the city profile, that are of strategic importance for the urban recovery of Sana'a. Initial damage assessments by local damage assessment committees (see tabel 7 below) reveal that the water, agriculture and electricity infrastructure have seen the largest damages in terms of dollar value. This matches reports from the ground that note a general lack of electricity, also observable is the notable drop in nightlight output, and reports of reduced access to water. However, these needs that are apparent now, are not only the result of damages due to the war, but also due to poorly managed urbanization processes that have structurally created unequal and insufficient access to services across the city.



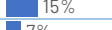
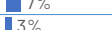






Even though repair projects of key infrastructure facilities will form the basis of restoration of services, a drive to better manage the consequences of these recent urbanization processes in the medium term will be critical to improve access to services for all the population. Therefore, the priorities listed below recognize that both short and medium/term programs should be considered to facilitate durable urban recovery. Following the key pillars of urban recovery, the following six strategic priorities can be identified for Sana'a.

Table 7: Damage to Critical Infrastructure by the Committee for Documenting Physical Damages

Type	Dollar	RA	Percent	Comment
Water infrastructure	 7.3 M	 1.8 B	 31.7%	Destruction of tanks, artisional wells, pumping stations
Agriculture	 7.2 M	 1.8 B	 31.6%	
Electricity	 3.8 M	 0.9 B	 16.5%	Damaged poles, distribution boards, transformers
Educational infrastructure	 2.2 M	 0.5 B	 9.7%	
Technical education	 1.5 M	 0.3 B	 6.7%	
Directorate General of cleanliness	 0.62 M	 0.1 B	 2.7%	
Health infrastructure	 0.10 M	 0.02 B	 0.5%	
Public Works and Highways	 0.06 M	 0.01 B	 0.3%	Damage as a result of direct strikes
Bridges	 0.05 M	 0.01 B	 0.3%	
Telecommunications	 0.03 M	 0.009 B	 0.2%	
Total	23 Millions	5 Billions		

Source: Presidency of the Council of Ministers, Shared with UN-Habitat in January 2020

Table 8: Initial Summary of Damage to Buildings and Constructions per District

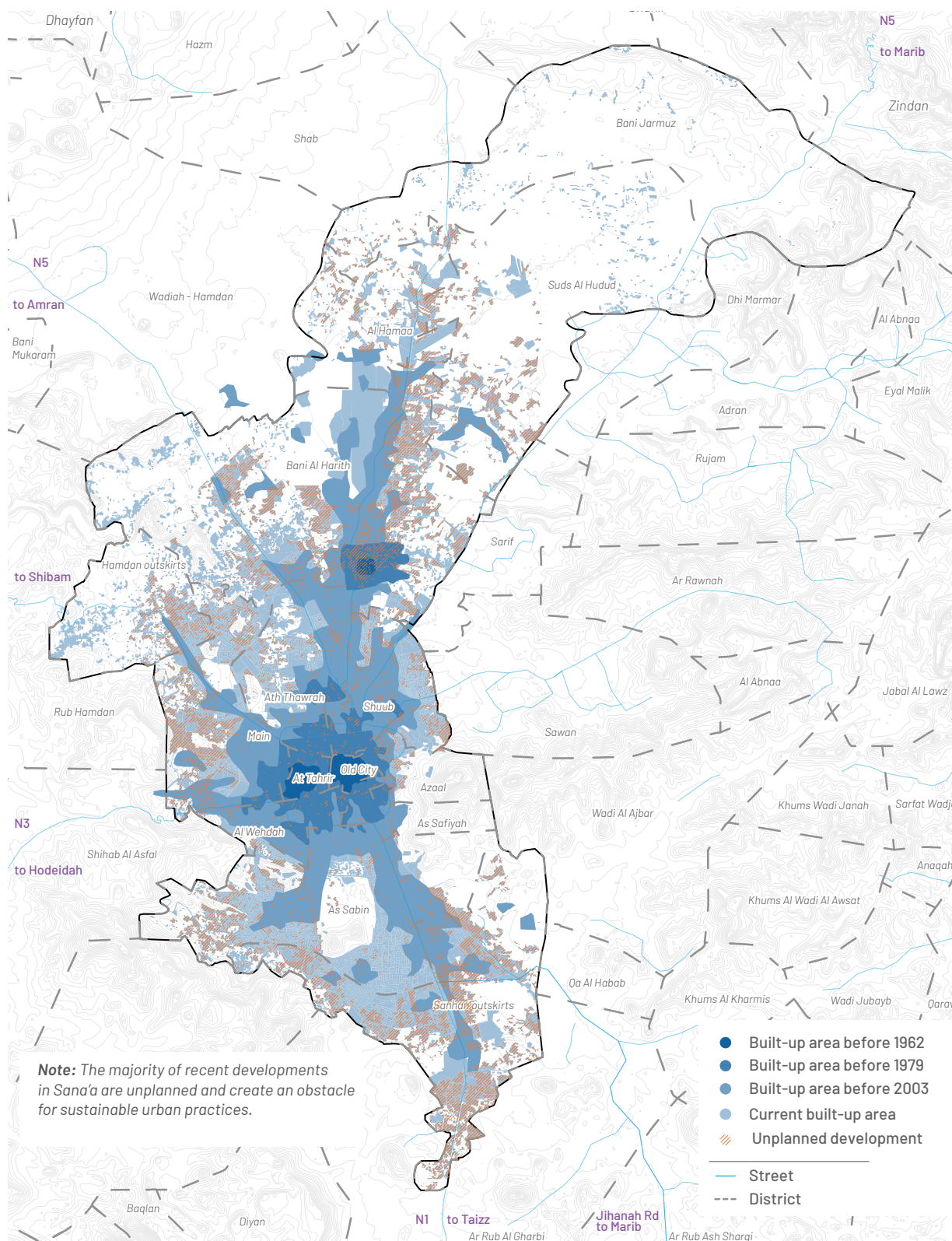
District	Number	Percentage
Azaal	6,451	 45%
Al Sabaeen	3,219	 22%
Bani Al Haarith	2,109	 15%
Shaoob	982	 7%
Al Saafia	453	 3%
Old City	309	 2%
Maeen	277	 2%
Ath Thaura	218	 2%
Al Wehda	209	 1%
Al Tahreer	151	 1%
Total Yemen	14,378	100%

Source: Data Shared by Amanat Al Asimah with UN-Habitat in January 2020.

1. Better-managed urban growth and re-integration of recent growth areas

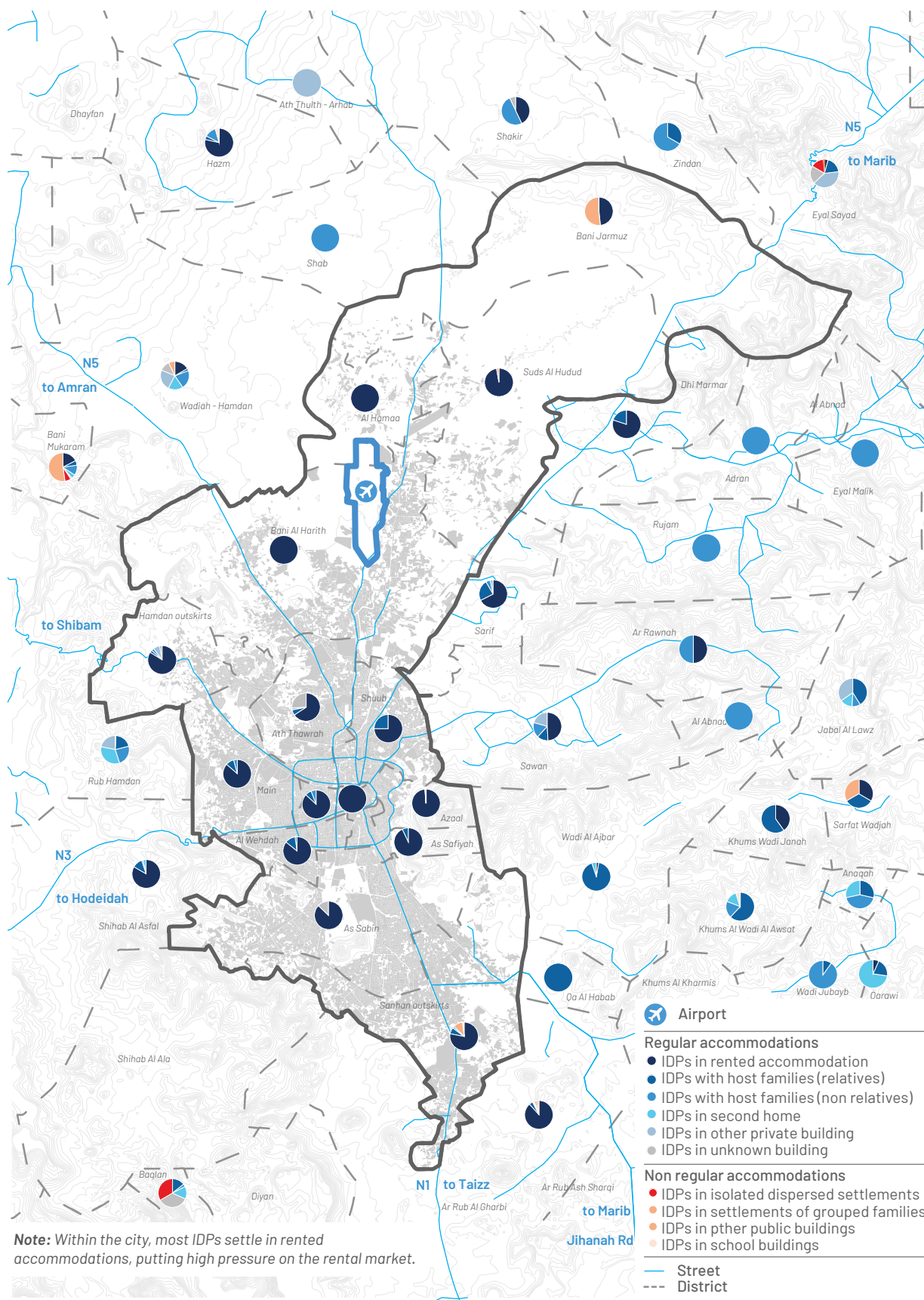
Natural population growth and internal migration to the capital Sana'a as a result of the conflict has led to high growth rates in Sana'a. However, this growth has not been evenly distributed across the city. As some neighborhoods have seen significantly more IDPs, resulting in considerable pressure on the host communities, which in many cases were served by an already overburdened service network. The cost of land suitable for housing has risen significantly as well, due to the lack of serviced land for further development. As a result, there is a growing gap between housing supply and demand for low-income groups, which currently is not addressed by the government nor the private sector. The poor distribution of land has also led to the expansion of informal and unplanned settlements and created a mismatch of housing and employment opportunities. This affects host communities and IDPs alike: more than three-quarters of IDPs are currently in need of rental subsidies. Focusing on housing subsidies alone, however, will not address the problem of restricted housing supply, which requires an increase of the housing stock, for example through an increase in the supply of serviced land. Although underpinned by the uncertainty of the ongoing conflict, there is much that the government can do to improve urban development and enforce equitable access to housing or land development. At a minimum, it could develop a city-wide growth management plan which:

- Facilitates a dialogue between the various institutional stakeholders concerning the articulation of a single urban vision for Greater Sana'a, taking into account the social fabric of the society, and addressing issues such as services, commercial, industrial and recreational spaces;
- Assesses existing unplanned areas that have sprung up in recent years, and on a case-by-case basis clarify the legal status of these areas clearing the way for informal settlement upgrading programs.
- Indicates areas in which future growth will be allowed, indicating road reserves and public space provisions to be respected;
- Identifies urban infill areas as well as areas that have potential for densification, for Example through vertical extensions of buildings;
- Sets growth boundaries around protected areas, such as environmentally sensitive areas;
- Identifies areas on neighborhood level that are currently overburdened due to a population higher than designed for (high burden on services) and areas that have lower populations than designed for (low burden on services);
- Identifies policies and investments aimed at rebalancing populations between high and low burden areas, expediting the provisions of suitable land for housing.

Figure 47: Unplanned Development in Sana'a City ,UN-Habitat (2019)


Source: JRC, Sana'a CDS (World Bank) and Google Earth.

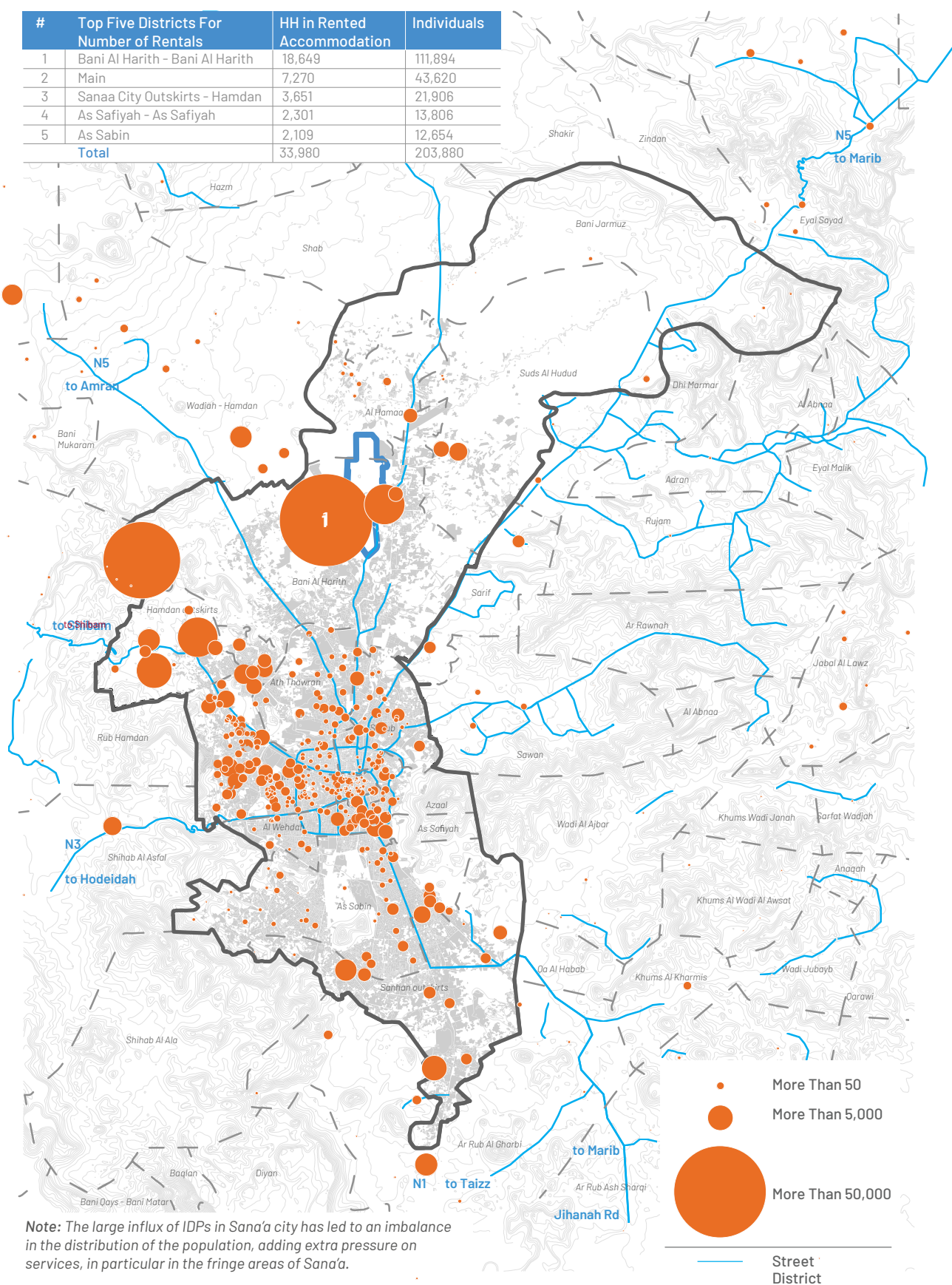
Figure 48: IDPs in Sana'a by Accommodation Type ,UN-Habitat (2019)



Source: JRC and IOM Round 37 displacement data.

Figure 49: Influx of IDPs in Sana'a City , UN-Habitat, 2019

#	Top Five Districts For Number of Rentals	HH in Rented Accommodation	Individuals
1	Bani Al Harith - Bani Al Harith	18,649	111,894
2	Main	7,270	43,620
3	Sanaa City Outskirts - Hamdan	3,651	21,906
4	As Safiyah - As Safiyah	2,301	13,806
5	As Sabin	2,109	12,654
Total		33,980	203,880



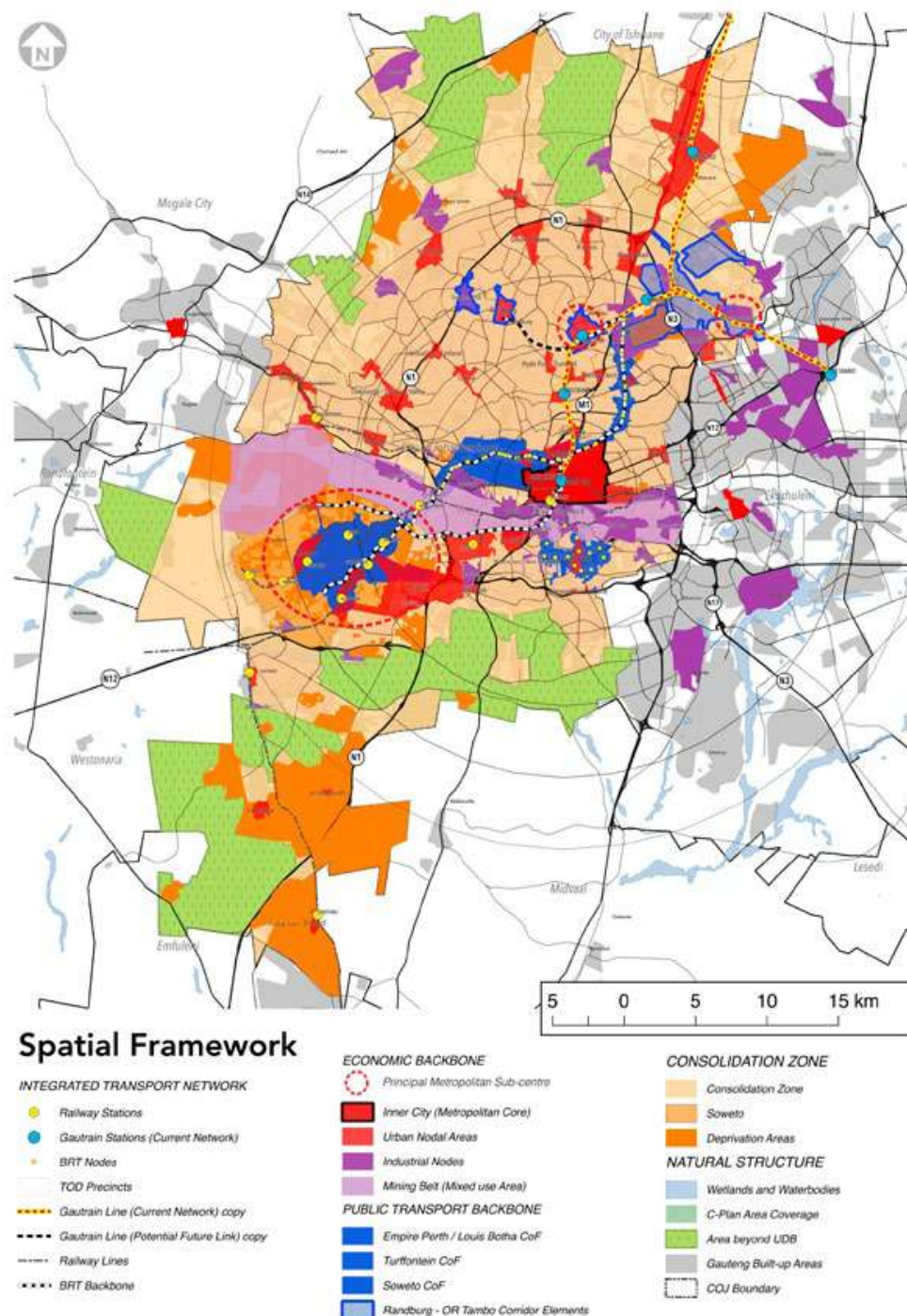
Growth Management Plan

Sana'a is in need of a growth management plan that not only considers extension areas, but also incorporates concepts for sustainable urban development, economy, and service provision in already existing areas. An example for this is the Spatial Development Framework 2040 of Johannesburg, developed with support of UN-Habitat in 2015.

The spatial concept for Johannesburg 2040 builds on the spatial vision for the future city as a Compact Polycentric City.

The concept entails a series of strategies and interventions in focus areas and city-wide. The spatial concept envisions Johannesburg as a hierarchy of dense mixed-use priority transformation areas, corridors and nodes, that integrates the natural ecological system as a structuring layer, and that are connected by an efficient public transit system

Figure 50: Spatial Development Framework in Johannesburg



Source: City of Johannesburg, 2015.

2. Reorientation of the economy and invest in improved service networks

The decline of the value of the YER has led to an increase in price of basic commodities, in particular food. As a result, poverty and unemployment rates are high, and the previously rare phenomenon of begging has spread.

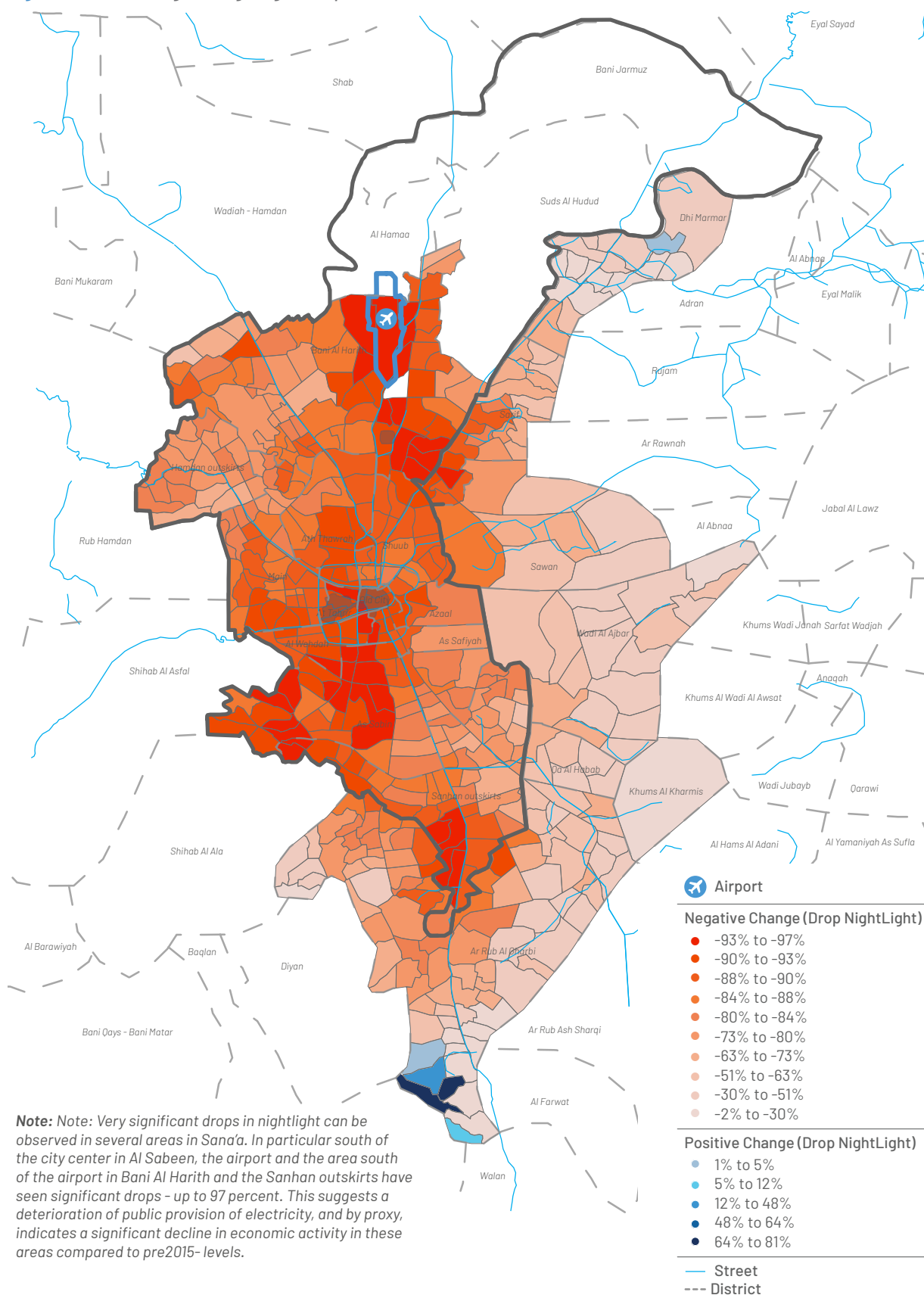
Economic recovery is the basis for improving self-reliance of the affected population and to enable community groups to reduce unemployment. Even though the current political situation in relation to the central bank and weak currencies will continue to be the major impediment, there are also a few 'structural' challenges that are a drag to economic recovery. These relate partly to the infrastructure networks, and partly to untapped potentials in the current economy. Recognizing these barriers for economic recovery, the following actions are recommended:

Restore the public electricity network

Sana'a's electricity shortage is one of the major constraints for economic development as a lack of reliable supply is limiting industrial production, reliance on generators make businesses and household budgets increasingly vulnerable to oil price changes. Already before the war, a lack of funds prevented regular maintenance of the components of the electrical network. Airstrikes have completely destroyed some transformers, including near the old city of Sana'a while in some cases distribution boards and cables have been stolen. In many neighborhoods, households and businesses have installed generators in several neighborhoods connected through random electricity networks installed by the owners - sometimes damaging the networks of the General Electricity Corporation. Furthermore, these generators often cause disturbances while operating as they produce noise and vibrations affecting buildings in the city.

- Consider disconnecting some heavy industry sectors from the main energy grid in order to reduce the loads on the network.
- Recover the main electricity substations (Al Qa'a, Tahreer), and reconnect to disconnected neighborhoods.
- Prepare a detailed technical study to put electricity underground, making them less vulnerable to deterioration and damages.
- Expand the use of renewable uses of energy in public spaces, e.g. through solar street lighting.

Figure 51: Percentage in Nightlight Output in Sana'a from 2014-2019, UN-Habitat (2019)



Source: Earth Observation Group, NOAA National Centers for Environmental Information. Data processed by PNGK.

Focus on the road and public transport infrastructure to increase productivity

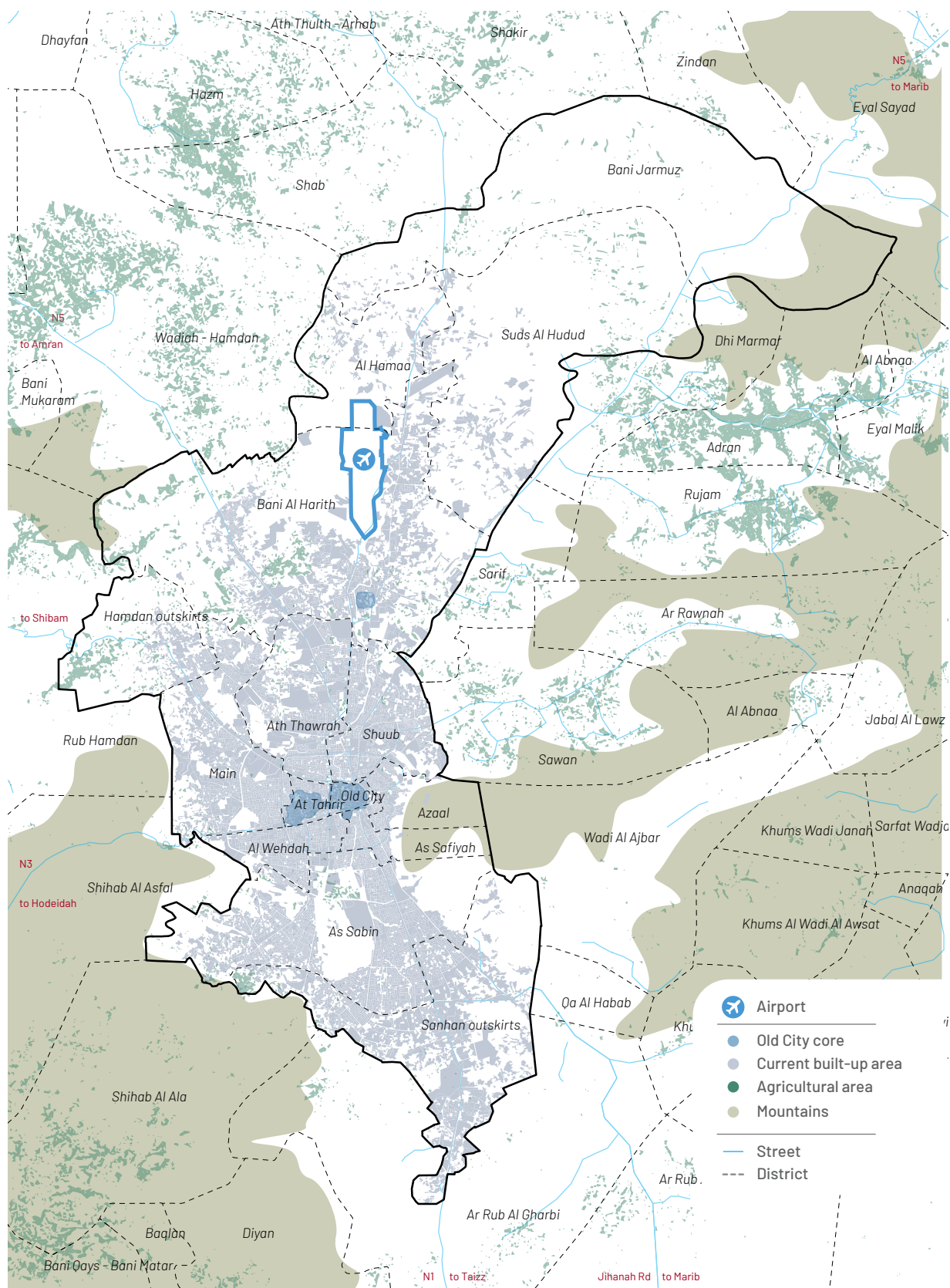
The existing road network in Sana'a is incapable of absorbing the increase in traffic due to internal migration and traffic congestion has significantly increased during the crisis. Congestion is exacerbated due to the absence of a mass public transit network and a growing reliance on cars and minibuses. A lack of space for the construction of highways due to the natural constraints of the surrounding mountain ranges as well as obstruction of road reserves by private ownership of land and camps are limiting the expansion of infrastructure.

- Develop a new transport plan supporting the above-mentioned urban development plan.
- Complete previously planned asphalt projects within the capital.
- Complete previously planned intersections and construction of tunnels and bridges, repair bridges that have been damaged, and implement an emergency plan for current congestions.

Re-orient parts of the economy

- Diversify farmlands and crops to meet local demands for staple commodities and reduce dependency on foreign deliveries beyond the short term. Cash crop substitutes that are available and in demand may be coffee and almonds, especially the former when considering the decline in certain bean types due to climate change.
- Upgrade tourism infrastructure and improve its income generating capability. Tie handicrafts to the tourist industry to improve retail as a driving force for urban development and generation of income. Retail dynamics in Yemen are well-represented, diversified, and connected to the traditional structures of marketplaces, or souks. The souks are well-integrated into the urban and the cultural fabric of Yemeni cities, and their model of trade and sociability have spread from the central core of the cities into the suburbs. If well-tended and regulated, it might turn them into drivers for the modernization of trade practices.

Figure 52: Agricultural Areas in and Around Sana'a , UN-Habitat (2019)



Note: Urban developments have largely displaced agricultural lands within Sana'a, and hillside areas are more difficult to cultivate.

Source: JRC, Google Earth and NDVI analysis.

3. Health and education plan

Some priorities for the health and education sector include the following:

- Preparation and implementation of local awareness plans reducing the spread of infectious diseases and epidemics such as COVID-19.
- Equip health facilities, medical diagnostic and therapeutic requirements and provide them with qualified human staff.
- Provide maternity care services, childhood and family planning in all health facilities and encourage the private sector to participate in the submission.
- Promote the development of school health services.
- Encourage and stimulate the private sector to invest in vocational training for the development of specialized centers and institutes.
- Encourage private sector investments in the field of health, public education, higher and specialized education and repair damages to buildings.
- Raise the efficiency of health services and the expansion of base benefit from all segments of society
- Continue health services for the entire population and the fight against diseases and epidemics.

4. Green and healthy Sana'a by focusing on water, sewage and waste networks

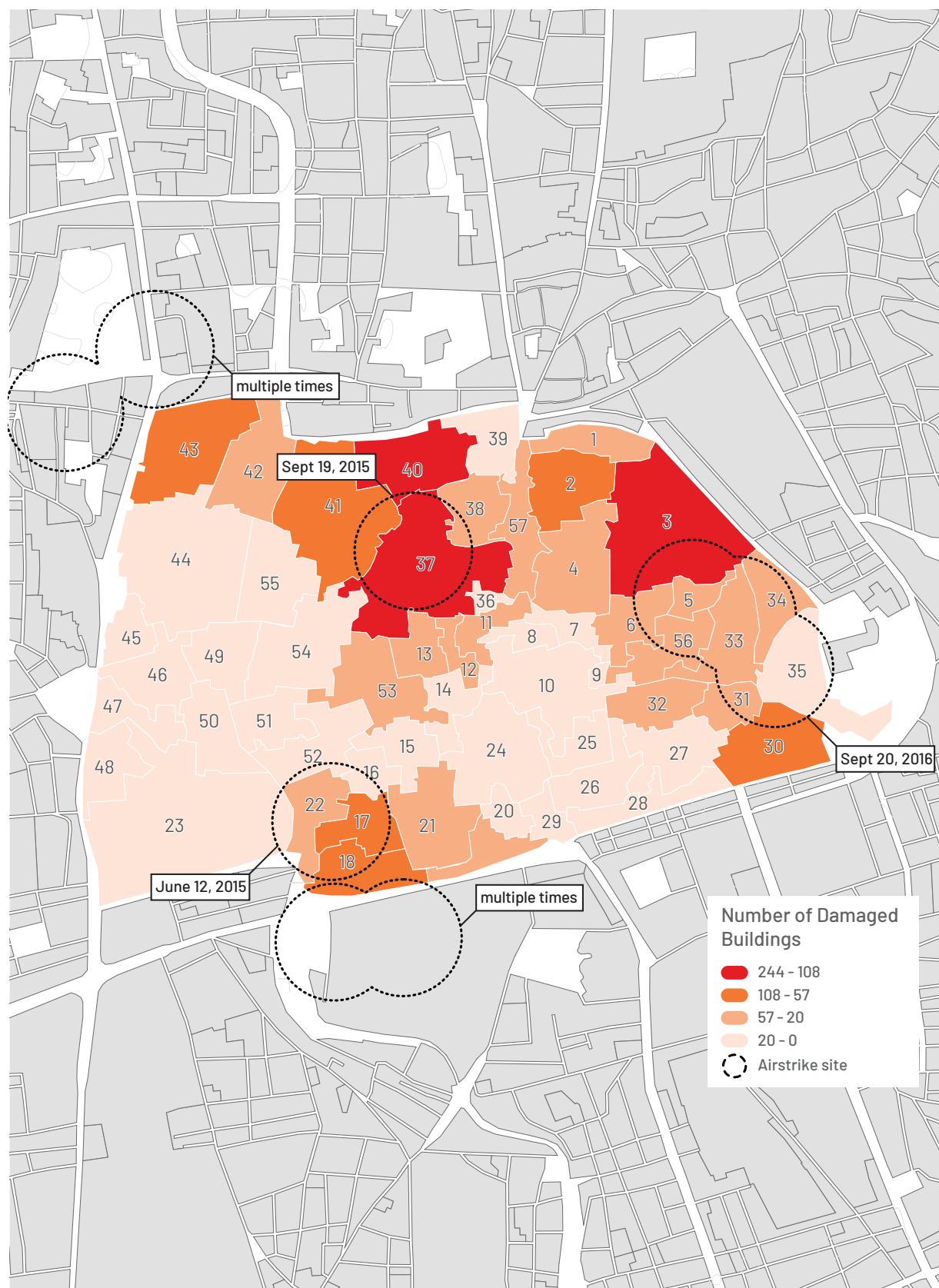
Currently, the sewage network covers about 60 percent of Amanat Al Asimah. As a result, a significant proportion of the population does not have access to safe water supply and adequate sanitation. Estimates suggest that 1500 tons of solid waste are generated daily in the capacity, and the current Al Azraqain landfill has almost reached backfilling capacity. While customary urban water management practices have proven successful in the past, technological advances allowing water extractions from ever deeper aquifers at larger volumes has led in increasingly unequal access to water, and a lowering of groundwater levels. Some priorities to address these challenges include:

- Monitoring random extractions of the groundwater, developing a permit system limiting extraction volumes;
- Upon indications of the growth management plan, expand the distribution services of current water networks to outlying, unserved areas;
- Expand the sewage services by increasing the proportion of treated water from sewage plants, doubling their daily capacity from 50.000 to 10.000m³;
- Develop an integrated system for the collection and treatment of solid waste;
- Develop an integrated public space network with sufficient connected green areas.
- Involve the private sector for investments in critical water management infrastructure.

5. Develop a heritage conservation plan with focus on the old city

The Old City of Sana'a has been severely damaged in recent years, not only due to the conflict but also due to longstanding lack of investments. UNESCO recently conducted an assessment within five zones in the old city of Sana'a of 2540 heritage buildings, of which more than three-quarters have been severely damaged. Furthermore, about 17 percent of the water network in the old city of Sana'a is completely damaged and desperately needs both rehabilitation and expansion, taking into account the growing population. A significant number of manholes (14 percent) for the water network, as well as for the sewerage networks need replacement or maintenance. A heritage conservation plan, supported by the appropriate funding mechanisms for investments, is urgently needed. Some actions include addressing the electricity cables, which are vulnerable for tampering and hamper the view on the historic city. For Example, this can be addressed by completing the lighting of the squares, streets, lanes and open spaces (Mugshamas and Bustans) in the old city and Wadi al-Sa'ela by way of solar energy in accordance with the specifications for a world heritage site.

Figure 53: Damage to one of the Old City Centers within Sana'a ,UN-Habitat (2019)



Source: Source: Based on UNESCO Surveys.

6. Strengthen efficient and transparent governance processes

Poor coordination between different sections of the municipalities have made it difficult to effectively plan for projects that are in line with wider policy goals. Build information management capacities within the municipal government, for example by:

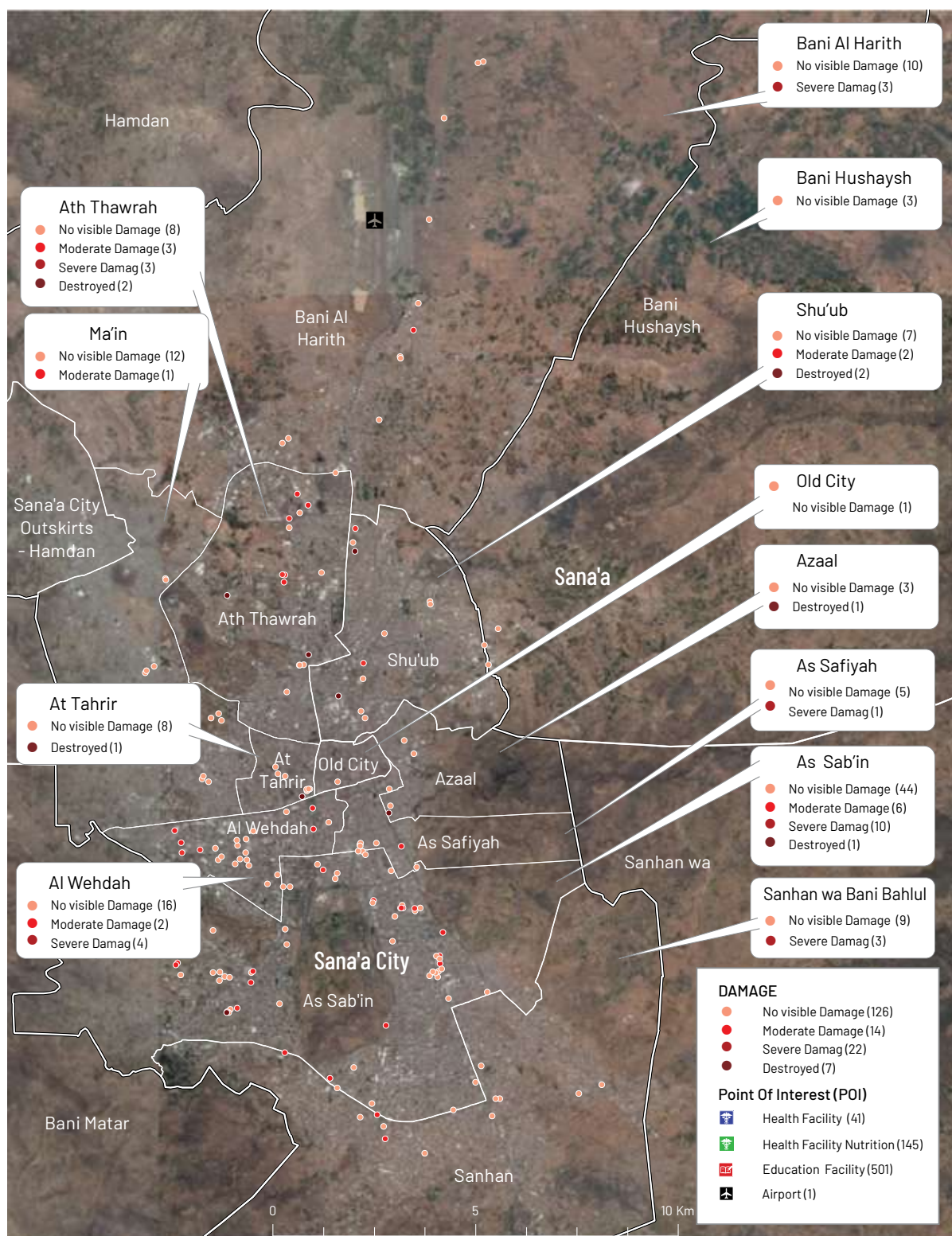
- Developing an information management system follow-up of projects indicated in a strategic plan.
- Such a system should allow for priority scoring based on strategic areas indicated in a growth management plan. Furthermore, the system should allow scoring based on sustainable development goals and include risk assessment capabilities in line with requirements for international donors and investors. Furthermore, if coupled with mechanisms for coordination between various relevant authorities, this should foster a better integrated approach to urban development
- Developing an online land registry to boost the land market by increasing transparency in land transactions.
- Reviewing, enforcing, and expanding existing blueprints on how to regulate qat taxation.
- Linking humanitarian response plans to the governorate medium-term development goals.

ANNEXES

Asset Verification Results

The team identified multiple areas within the city of Sana'a based on verifying satellite imageries from JRC (2019) and Digital Globe (May 2020) for 169 buildings, in addition to real pictures (February & March 2020). After that iMMAP GIS unit has `triangulated data from different sources, compiled GPS coordinates and analyzed it as shown on the map below:

Figure 54: Assessed Locations to Verify Damages



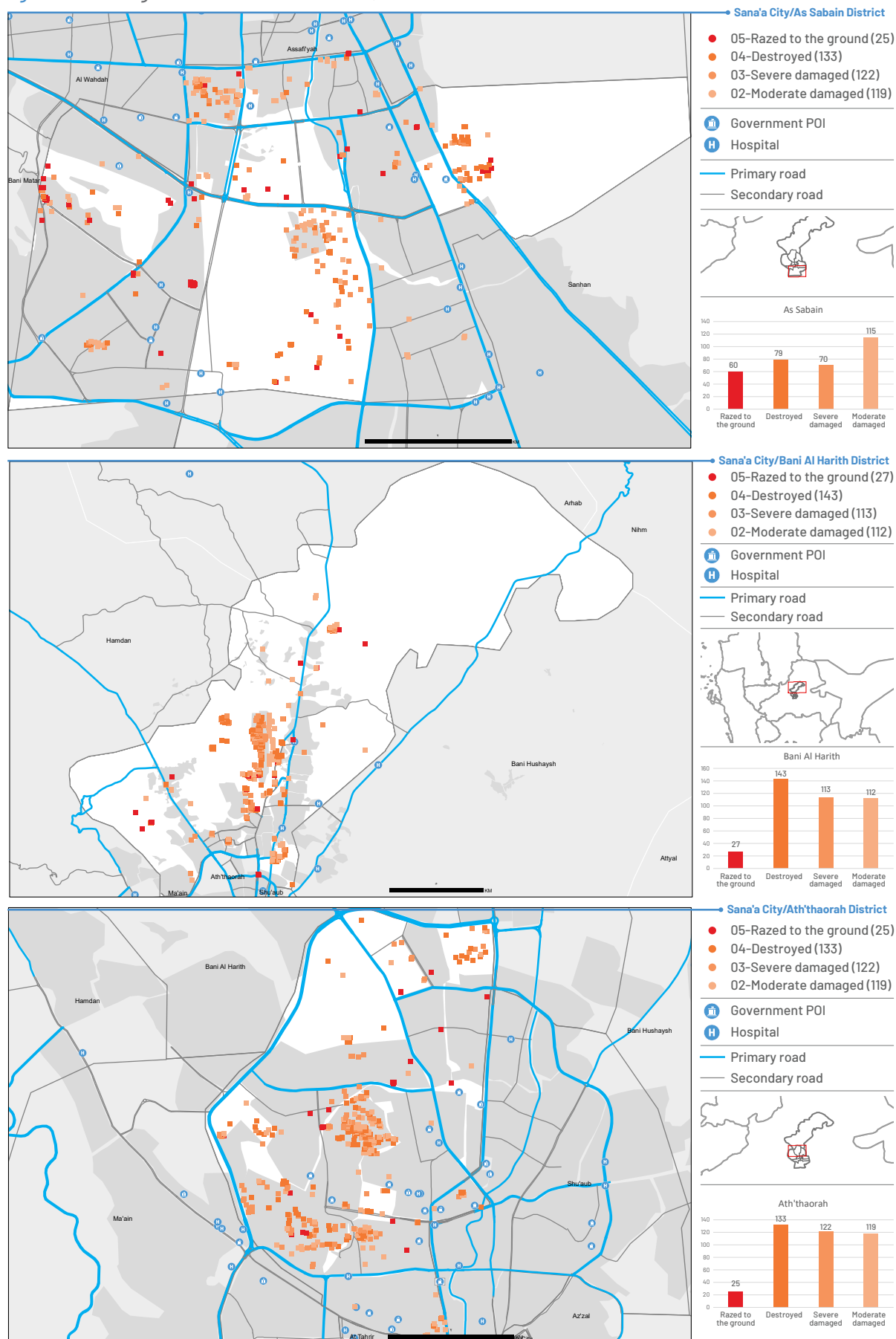
Map Name: Sana'a City Assets Verification , Date Created: 28 May 2020, Datum/Projection: WGS_84, Data sources: OCHA, UNOSAT, OSM, Digitalglobe 2019
Disclaimer: The boundaries, names and designations used in this map do not imply official endorsement or acceptance by iMMAP.

Satellite imagery has shown that Ath'thaorah, Bani Al Harith and As Sabain districts, respectively, have the highest number of damaged buildings. For the most part, damages in Sana'a have mostly been localized and/or clustered, wherein actors mostly targeted the airport, the Presidential Palace area, military camps and the residences of senior officials.

Nonetheless, Sana'a has received the third highest number of airstrikes in Yemen (173 out of 1376)²⁸⁷ but no major clashes occurred on the ground.

287 Intelyse Data, June 9, 2020.

Figure 55: Damage Assessment in As Sabain, Bani Al Harith and Ath'thaorah Districts



Date Created: 14 April 2019 Datum/Projection: WGS84

Damage data source: JRC (Joint Research Center) in support of UN-Habitat (2014-2018 comparison)

Disclaimer: The boundaries, names and designations used in this map do not imply official endorsement or acceptance by UN Habitat

The asset verification results showed that the damages on the ground are similar to evidence shown in satellite images and field images. Moreover, satellite imagery can be relied on in rapid asset verification when assessing damage on a large scale as a substitute for field assessments that may be difficult to conduct in all areas during periods of armed conflict and political tension.

Figure 56: Photos from Field Asset Verification



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