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Water, crises and conflict in MENA: how can water service providers improve their resilience?

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Protracted conflicts in the Middle East and North Africa (MENA) region have left tens of millions of people in need of humanitarian and development assistance to have access to water. But the capacity of local water service providers (state-owned and private) to maintain adequate levels of services has decreased as conflicts and population movements across the region have continued, mainly towards urban areas. Other actors including United Nations agencies, international organisations, local NGOs and independent – often informal – water providers have played an important role in filling gaps in supply. This study analyses all these actors' responses to continuing the supply of water during conflicts, focusing on factors of resilience building that particularly concern local service providers.

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Acronyms

ACWUA	Arab Countries Water Utilities Association
BVWE	Bekaa Valley Water Establishment
CDR	Council for Development and Reconstruction (Lebanon)
CMWU	Coastal Municipalities Water Utility (State of Palestine)
CSO	Civil society organisation
EPR	Emergency preparedness and response
EU	European Union
GDP	Gross domestic product
GIZ	German Development Agency (Germany)
GPS	Global Positioning System
GVC	Civil Volunteer Group (Italy)
ICRC	International Committee of the Red Cross
IDP	Internally displaced person
ITS	Informal tented settlement
JMP	Joint Monitoring Programme
LCRP	Lebanon crisis response plan (Lebanon)
LOST	Lebanese Organisation for Studies and Training (Lebanon)
LWSC	Local water and sanitation corporation (Yemen)
MCM	Million cubic metre
MDG	Millennium Development Goal
MENA	Middle East and North Africa
MoEW	Ministry of Energy and Water (Lebanon)
MWI	Ministry of Water and Irrigation (Jordan)
NGO	Non-governmental organisation
NLWE	North Lebanon Water Establishment (Lebanon)
NRW	Non-revenue water
O&M	Operations and maintenance
PMU	Programme Management Unit (Jordan)
PWA	Palestinian Water Authority (State of Palestine)
SDG	Sustainable Development Goal
UN	United Nations
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
WAJ	Water Authority of Jordan (Jordan)
WASH	Water, sanitation and hygiene
WE	Water establishment (Lebanon)
WSC	WASH service centre (Iraq)
WSUP	Water & Sanitation for the Urban Poor
YWC	Yarmouk Water Company (Jordan)

Summary

This research has aimed to learn from experience in the Middle East and North Africa (MENA) region of responding to the impacts of conflicts and large population movements on water-supply systems. It seeks to analyse the resilience capacity of water utilities, with a particular focus on Syria, Iraq, Yemen, the State of Palestine and the two in-depth case studies of Jordan and Lebanon. While the research focuses on the urban environment, water supplying refugee and internally displaced person (IDP) camps and settlements is also explored. Three main objectives have framed the study:

- Identifying responses made by utilities and supporting actors involved in water service provision,
- Analysing what has worked well and what has not, and
- Making recommendations to guide future development and humanitarian urban water programming in the region.

The findings are based on the analysis of the information provided by selected key informants from 10 countries through 69 interviews and 19 questionnaires between October 2016 and March 2017. The key informants belong to international and local organisations/United Nations (UN) agencies, government bodies and regulators, local service providers, civil society organisation (CSOs) and water-user associations.

Context overview

Since 2011, conflicts have left an estimated 50.25 million people in need of humanitarian water, sanitation and hygiene (WASH) assistance in the entire MENA region. The wave of protracted wars in the region and resulting political and economic crises have physically affected entire societies. They have also caused the displacement of between 22 and 24 million people, corresponding to nearly one third of the total number of displaced people in the world. The conflict in Syria alone has led to 6.5 million IDPs and 4.8 million fleeing as refugees to neighbouring countries, whose water systems were already fragile. In Jordan and Lebanon, more than 80 per cent of Syrian refugees have settled in urban areas.

Pre-existing vulnerabilities

The root causes of the current issues in water provision developed long before the start of the recent series of conflicts in the MENA region. Water services have long been undermined by numerous political, infrastructural and governance challenges. Pre-existing issues include unsustainable management practices and the high reliance of countries on diminishing and already-scarce freshwater resources. These have made water systems even more vulnerable to the impacts of conflicts, exposing them to short- and long-term risks of collapse.

Responses from different actors involved in water supply

There is a wide range of actors involved in water provision. They have addressed the impacts of conflicts in a number of different ways. However, many responses have been made as reactive measures, as opposed to proactive approaches where preparedness could have helped mitigate the impacts. In the majority of contexts, studied responses have run the risk of increasing vulnerability of water systems, by creating a dependency on non-renewable resources and/or external support.

In countries affected by conflicts, immediate actions made by utilities have included reliance on contingency stocks, repairs and replacement with spare parts to respond to physical damage made on water infrastructure (all countries) and the use of generators during power disruptions (Yemen, Syria, Iraq, Libya, Palestine). However, with the continuation of conflicts, population movements and the associated impacts, utilities' ability to continue regular supply has typically decreased with time, either gradually or as a result of repeated disruptions. This has rendered them unable to meet everyone's water demands. As utilities' service levels have diminished, other actors have started or increased activities.

The humanitarian and development sectors – non-governmental organisations, international organisations and UN agencies – have filled the gaps. But the focus is mainly on refugees and IDPs in camps and collective centres. There is much less focus on those living with host communities in urban areas. Operations during relief phases have commonly consisted of directly providing water, for example through water-trucking operations or bottled water. Urgent repairs and provision of goods such as generators and fuel for power supply have also occurred during emergency phases. But how resilient are these measures in the long term?

More support during stabilisation and development phases have included rehabilitating infrastructure and drilling additional boreholes. In addition, more structural 'soft' interventions such as training staff and community mobilisation have aimed at addressing utilities' embedded vulnerabilities. In all countries, the private sector and particularly small-scale operators (water trucks and vendors, but also construction contractors) have also filled an important gap in supply, working either with utilities, humanitarian/development organisations, or independently.

Towards resilience building

'Resilience' refers to the ability of a system to anticipate, absorb, accommodate or recover from shocks and stresses. In this paper, we argue that water supply will better resist the threats posed by conflicts and further impacts if utilities have stronger resilience capacities.

In the water sector, we recognise that resilient systems are characterised by flexibility, resourcefulness and responsiveness, redundancy (in systems' design or with the availability of spare resources), modularity (self-organisation) and safe failure (minimum damage). Furthermore, we argue that working towards sustainability and equity goals will help build stronger resilience. As per sustainable objectives, protecting a system against damage to social, environmental and economic components is a pre-requisite for resilience. Supplying everyone equitably with water services also helps build a stronger service system.

Key findings: resilience of water service providers in MENA

Our research demonstrates that in order to build short- and long-term resilience, utilities need to break patterns of growing vulnerability. As such, they need to take into account pre-existing issues, and to consider future development. Their capacities will be reinforced with more efficient resource management and with enhanced relationships with the communities that they serve. In this study, we aim to demonstrate that humanitarian and development interventions are more sustainable and equitable when they are coordinated with local actors, and when they are able to adopt a supporting role as opposed to a substitution role.

Each of the following recommendations, grouped in four main themes, refers to resilience building along all of the preparedness, stabilisation, and development phases during protracted crises. In that sense, we suggest that support provided for relief and quick recovery is complemented by continuous bolstering activities, as well as by assisting in developing emergency preparedness and response capabilities of utilities.

Build utilities' resilience through efficient resource management

- Emergency plans and contingency stocks should be in place to enable utilities to reduce risks of service disruptions.
- Human resources and internal capacity can be sustained during crises and enhanced over time when utility staff are well trained and able to multitask.
- Reducing non-revenue water (NRW) increases utilities' financial viability and autonomy while helping to serve more water to affected people.
- Efficient use of water and energy resources provides more sustainable solutions.
- Ensuring data are up-to-date helps to inform decision-making in relation to actual needs, particularly in camps, but also in urban settings where rapid changes have led to increased diversity.

Make humanitarian and development interventions sustainable

- Better analysis and understanding of the needs and capacity gaps of utilities by humanitarian and development agencies is required.
- Relief-type support to help services recover quickly can be complemented by continuous bolstering and adapting emergency preparedness and response capabilities.

Work more closely with the private sector

- Partnerships with independent providers (formal and informal) provide multiple benefits to utilities.
- Stronger/enforced regulatory frameworks to monitor independent water provision activities is required.

Maintain strong relationships with communities

- Closer engagement of utilities with communities is necessary to maintain relationships and to improve accountability and trust.
- Community mobilisation can render water services more efficient where social tensions affect service provision.

1 Introduction

1.1 Tens of millions in need of water in MENA

Waves of conflicts in the Middle East and North Africa (MENA) region have left an estimated 56.6 million people in need of humanitarian assistance (UNICEF 2017e). The conflicts and resulting political and economic crises have physically affected entire societies with casualties and infrastructure damage, as well as causing the displacement of 22 to 24 million people (IOM 2016). The protracted nature of conflicts has reduced governments' and communities' abilities to cope with cumulative impacts over time. These have increased the burden on already-vulnerable water systems and have cast a shadow over the region's development.

The conflict in Syria alone has led to 6.5 million internally displaced persons (IDPs), and 4.8 million (nearly half the country's pre-war population) fleeing as refugees to neighbouring countries (OCHA 2016a). This has had implications for vulnerable host communities in urban hubs of Jordan, Lebanon and Egypt. Conflicts in Iraq have displaced 4.2 million people, while a total of 8.3 million are currently in need of water, sanitation and hygiene (WASH) aid (OCHA 2016c). Escalating conflicts in Yemen from 2015 have led to 14.4 million people requiring assistance for access to safe drinking water and sanitation, an increase of 8 per cent since late 2014 (OCHA 2016b).

However, the sustainability of water service systems was already compromised in various parts of the region before 2010. In MENA, the vast majority of people across the region were connected to safe water-distribution networks at home, making levels of water service provision considered as high in comparison to other regions of the world. Yet a complex combination of long-standing factors was already exposing many of the existing water-supply systems to degradation, and they have been further aggravated by the impacts of conflicts since 2011.

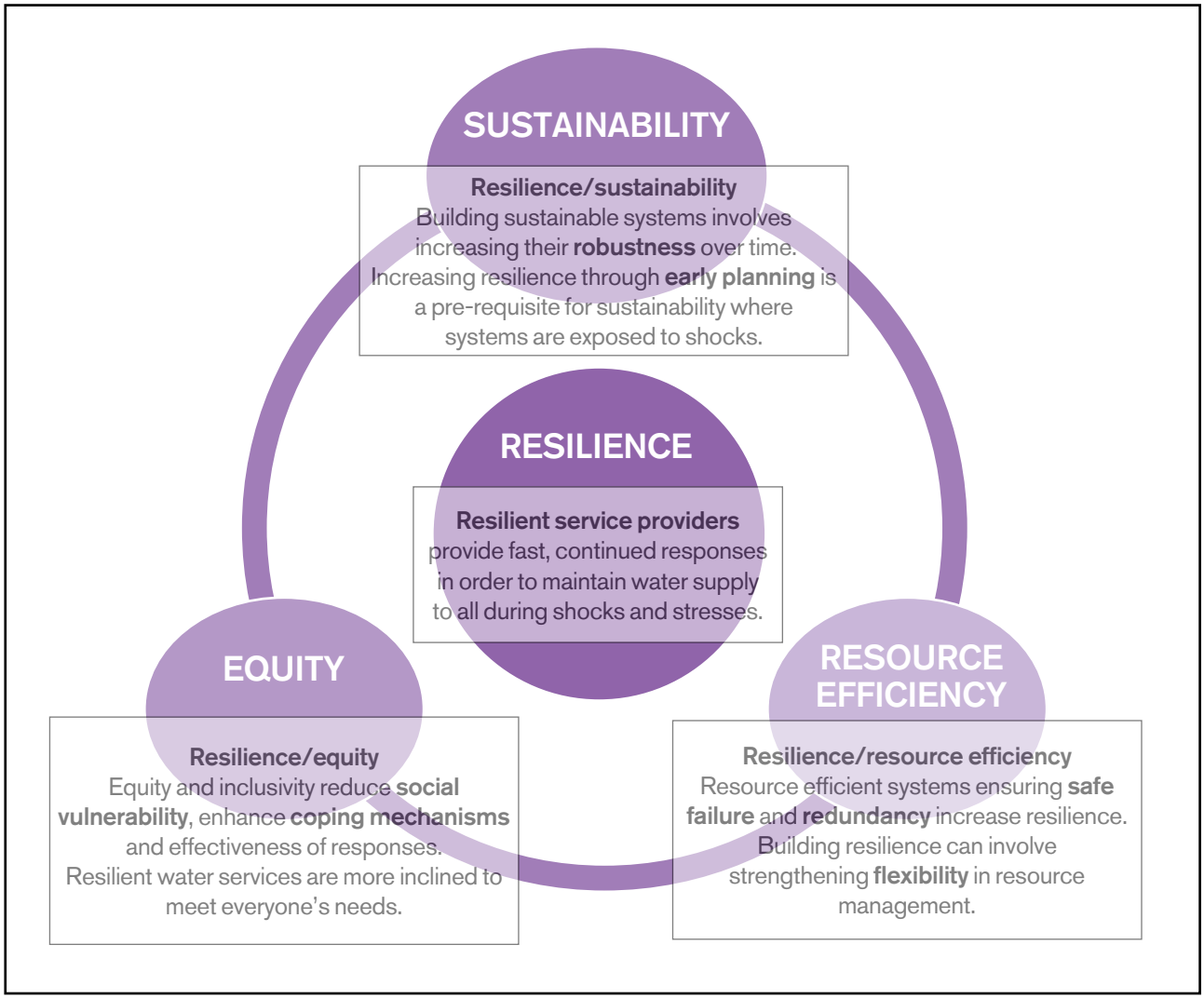
Joint Monitoring Programme (JMP) data show 52 million people in MENA were deprived of access to an improved source of water before 2010 (UNICEF and WHO 2015a). The Millennium Development Goal (MDG) drinking water targets of 2015 were not achieved in eight countries in the region, including Iraq, Yemen, Syria, Libya, Palestine and Lebanon (UNICEF and WHO 2015b). In fact, access to water – and WASH more broadly – could be far worse than reported by national statistics as the statistics themselves have struggled to keep up with constant changes. Currently, water utilities across the region have seen their capacities to respond to populations' water needs decrease.

1.2 Exploring opportunities for building resilience

In this paper, we argue that water-supply systems will better resist the threats posed by conflicts and further impacts if service providers have stronger resilience capacities. Besides this, if MENA countries are to meet the Sustainable Development Goal of 'ensuring availability and sustainable management of water and sanitation for all' (SDG6) by 2030, service providers will have to enhance their capacity to respond to the range of complex challenges they currently face. This study particularly explores opportunities for utilities to build resilience so they can better face challenges that might continue to undermine their ability to provide an acceptable level of service. 'Resilience' refers here to the ability of a system to anticipate, absorb, accommodate or recover from adverse shocks and stresses, including through learning and adapting to change, as well as to transform (IPCC 2014; Walker *et al.* 2004).

Capacities are reinforced with efficient resource management over the short and longer terms, with strong coordination with other actors involved in water service provision, and particularly local actors, and with enhanced relationships with the communities that they serve (Dodman *et al.* 2017; Elmqvist *et al.* 2014; Meerow *et al.* 2016; Tanner *et al.* 2016). With regard to the water sector, we recognise that resilient systems are characterised

Figure 1. Conceptual framework of the study

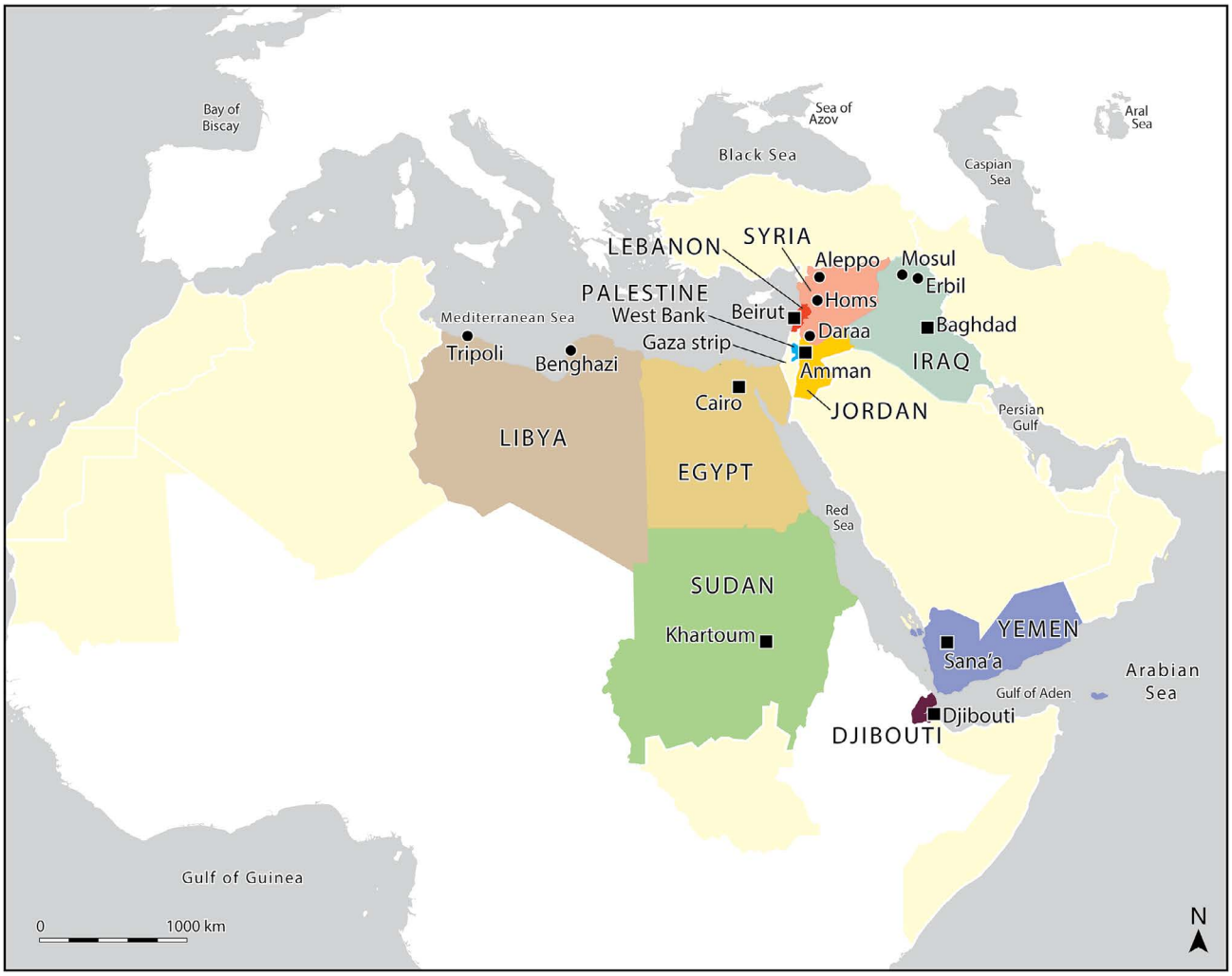


by flexibility, resourcefulness and responsiveness, redundancy (availability of spare resources), modularity (self-organisation) and safe failure (minimum damage) (Martin-Breen and Anderies 2011; Barthel and Isendahl 2013).

Furthermore, we argue that sustainability, equity and resource efficiency have mutually reinforcing objectives with resilience-building agendas. Figure 1 outlines the conceptual framework of the study, showing the overlapping agendas between resilience and sustainability, equity and resource efficiency in water service provision.

- **Resilience and sustainability**: Building resilience requires planning and anticipation to prepare for a range of threats over different periods of time (Chelleri *et al.* 2015). As a pre-requisite for sustainability, resilience involves protecting a system against potential damage to the social, environmental and economic components of that system. At the same time, building a sustainability agenda opens opportunities for building resilience not only over the short term but also the long term.
- **Resilience and resource management**: We argue that resilience and resource management are also strongly linked. A resource-efficient agenda for utilities and other service providers will help them to become more resilient by reducing exposure to the risks of shortfalls in essential inputs during conflicts and during recovery (eg water, fuel, staff and knowledge, financial resources) (Dodman *et al.* 2017).
- **Resilience and equity**: Furthermore, we argue that equitable approaches in service provision reduce social vulnerability across societies. Inclusivity, as a mechanism that contributes to equity, reinforces links between stakeholders and can improve coping mechanisms adopted by different actors, and effectiveness in responses. Additionally, in the context of water service provision, resilient systems provide better scope for everyone to be served equitably (Jobbins *et al.* 2016). In many MENA countries, embedded social inequalities are prevalent due to complex political contexts that increase their vulnerability: resilience building therefore requires redressing such inequalities (Ölund Wingqvist 2010).

Map 1. Countries of the Middle East and North Africa region studied in this report



1.3 Why this study?

Few recent studies have investigated the way in which recent conflicts have affected water supply in MENA countries from the perspective of local service providers. With the purpose of filling this gap, our research aims to learn from recent impacts of conflicts on water provision, and to compare the types of responses from utilities and supporting actors to ensure continuity of water services. The research was developed with two audiences in mind: service providers and supporting agencies and organisations. We seek to share lessons from service providers' past experiences across the region in responding to crises and maintaining water supply. By doing so, we aim to highlight ways in which utilities can build resilience for the future. Our research also seeks to point out to policymakers, humanitarian and development practitioners, and donors the range of challenges faced by utilities in order to improve the assistance and support that can benefit them.

The following three objectives have framed our research:

- To identify responses that have been made by utilities and supporting actors involved in water service provision in contexts of conflicts and population displacements (refugees or internally displaced people).
- To analyse what has worked well and what has not, and to identify what the barriers or critical success factors have been.
- To make recommendations that can guide future development and humanitarian urban water programming in the region.

This research results from a partnership between the United Nations Children's Fund (UNICEF), the International Institute for Environment and Development (IIED), and Water & Sanitation for the Urban Poor (WSUP). It was funded by UNICEF and by IIED through the Department for International Development (DFID)-supported Urban Crises Learning Fund. This partnership has sought to contribute to in-depth understanding of how the humanitarian sector can effectively operate, to reflect on past humanitarian responses and fill evidence gaps.

1.4 Scope of the research

- **Countries studied**: The research explores water provision systems across the MENA region, and particularly in Syria, Iraq, Yemen, the State of Palestine, Jordan and Lebanon.
- **Water services**: Water provision systems are central to the study. However, given the close relation of water services to sanitation and hygiene services, we refer to WASH services in several occasions throughout the text. While the research focuses on the urban environment, water supplying refugee and IDP camps and settlements is also explored. The commonality between the case studies in this research is that populations living in different types of locations (eg cities, camps, settlements), are each being served by one common water system.
- **Utilities and 'secondary' providers**: Utilities are defined as the formal entity that has a mandate to provide water to the general population (they can be national or local, public or private). Our research primarily focuses on utilities (primary service providers), and then on other actors involved in service provision (secondary service providers) which include NGOs/UN agencies and small-scale private operators.
- **Conflicts and population movements**: 'Crises' are here referred to as the recent conflicts and their socio-political and economic impacts on water services in MENA. These have varied largely from one context to another. While our research explores responses made by utilities to some of the direct and physical impacts of conflicts on water systems (eg bombing on infrastructure in Syria), in particular we assess cases where water systems have been stretched with the accumulation of impacts over time, including with large population influxes in Jordan and Lebanon.

1.5 Methodology

An in-depth literature review was conducted before collecting primary data. Four broad categories of respondents were identified:

- International and local organisations/UN agencies
- Government bodies and regulators
- Local service providers
- Civil society organisations and water user associations.

We interviewed 69 individuals from each of these categories involved in water provision in ten countries. Answers to 19 questionnaires were analysed. In addition, field research was carried out in Jordan and Lebanon, the two selected country case studies (see Appendix 1).

2

Impact of conflicts: water services under stress

BOX 1. KEY FINDINGS: IMPACT OF CONFLICTS ON WATER SERVICES UNDER STRESS

- Water scarcity, unplanned urbanisation, climate change, but also the unsustainable use of water resources are some factors that have posed water governance challenges prior to the current conflicts. They have exposed water provision systems to threats at the onset of conflicts. As crises became protracted, utilities' vulnerability have increased, and exposed them to decline.
- Direct and indirect impacts of conflicts have led to further socio-environmental, economic and political impacts on service providers and have exacerbated their vulnerability. As seen in Yemen and the State of Palestine, but also in Lebanon, the more the impacts have accumulated, the harder it has been to re-dress levels of water services.
- Large population movements resulting from conflicts have added more complexity with water services having to adapt to increases in demand. In countries like Jordan and Lebanon, water services were either not reaching all parts of the population, or providing sub-optimum services prior to recent refugee influxes. Utilities have faced increasing problems in meeting everyone's needs.

2.1 Pre-conflict vulnerabilities

Here, 'vulnerability' is referred to as the state of susceptibility to harm from exposure to shocks and stresses, and from the absence of capacity to adapt (Béné *et al*. 2012; Adger 2006). In the context of this research, exploring ways for service providers to strengthen resilience (and by extension service provision systems) requires the identification of these pre-existing vulnerabilities. The following are the range of pre-existing challenges in MENA which we identified.

2.1.1 Water scarcity and climate change

MENA has been one of the most arid regions of the planet for several thousand years (Greenwood 2014). Today, the region is home to about 6 per cent of the world's population but has access to less than 2 per cent of the world's renewable freshwater resource (Moustakbal 2009; see also Box 2). It includes 14 of the countries that will be the most 'water-stressed' in the world by 2040 and nine of them are identified as 'extremely water scarce'.

MENA is considered as the most water-scarce region in the world (Maddocks *et al*. 2015). While in 2014 Lebanon had an amount of total renewable freshwater resources per capita of 770m^3 per year, Jordan had only between 120 and 200m^3 of renewable water resources per person per year (FAO 2014; Mercy Corps 2014). This is approximately a fortieth of the global average and a ninth of the MENA average (ie 7,000–8,900 and

1,150m^3/capita/year respectively) (Badran 2016). Most MENA countries have been facing major institutional challenges to address the physical scarcity they face. Many have relied on modern technologies to supply water, for example through desalination. Added to these, conflicts have led to 'water crises' (ie insufficient access to potable and domestic water for a given period caused by development and/or humanitarian issues). Government policies can play a greater role than so-called natural events in the creation of water scarcity (FAO 2007; Mercy Corps 2014; Stewart 2013).

More recent extreme weather events associated with climate change have led to a further decline in the availability of water resources. Particularly in the Upper Jordan River Basin, mean annual temperatures could increase by up to 4.5 degrees Celsius and there could be a 25 per cent decrease in mean annual precipitation by the end of the century. Increased aridity suggests an increase in the number of countries in the region being below the level of absolute scarcity. With currently less than an averaged 200m^3 of renewable freshwater available per capita per year, Jordan is already one of the most water-scarce countries in the world (Greenwood 2014).

2.1.2 Disputes over water

Water itself has been the cause of many tensions and inequalities in the region. Disputes over transboundary sources have arisen between countries where one side or the other has been accused of taking 'more than their fair share' by their neighbours (Greenwood 2014: 154). Important inequalities within countries have also created tensions, where wealthy users have enjoyed the cleanest and cheapest water, whilst the poor have often lived in polluted areas where water is often both more expensive and of poor quality (Devlin 2014; Tropp and Jägerskog 2006).

2.1.3 Water allocation between sectors

Agriculture has historically played an important role in the economic development of the region and countries' reliance on water has increased, particularly for large-scale irrigation. Water has also been used for the production of energy through the construction of dams. For example, Iraq has one of the largest dams of the region in Mosul, which has a water storage capacity of 11.1km^3 and produces energy for 1.7 million people (Al-Ansari and Knutsson 2011). Such dependency has started to pose problems as needs for food, energy and water have continuously increased with the growing population's demand, which in turn has also made countries more vulnerable during times of droughts (Farid *et al.* 2016). Virtual water imports to make up for freshwater deficits (eg by importing food grown with water elsewhere) have not always been possible for lower-income countries with weak purchasing power (ICRC 2015a).

BOX 2. WHAT IS WATER SCARCITY?

Different terms exist to refer to the lack of water or water shortages experienced at different scales (eg household, community, city, country or region), and over different timescales (eg temporary due to conflict or long-term due to climate change). In this report, 'water scarcity' refers to the yearly amount of renewable freshwater per capita (in m^3) within a country territory. Different levels have been identified: 1,700m^3/capita/year being regarded as 'water stressed', 1,000m^3 as 'high scarcity', and 500m^3 'extreme scarcity'.

However, it can be easy to misinterpret these terms outside a given geographic and socio-economic setting. Water is never scarce in absolute terms, but it is perceived as scarce under specific allocative and institutional circumstances (Ioris 2012). In fact, nearly all major cities produce a sufficient volume of potable water to meet more than satisfactory human health and sanitation needs. Water scarcity goes beyond a sole physical insufficiency of resources: it is also a product of uneven social distribution and unsustainable management practices (Swyngedouw 2006).

Scarcity of water actually results from a combination of physical, institutional and technical factors:

- Physical scarcity in availability of freshwater of acceptable quality with respect to aggregated demand, in the simple case of physical water shortage.
- Scarcity in access to water services, because of the failure of institutions in place to ensure a reliable supply of water to users, or to the inability of households to afford a connection/the costs of water.
- Scarcity due to the lack of adequate infrastructure (irrespective of the level of water resources) due to financial constraints.

In the last two cases, countries may be unable to capture and distribute resources due to limited financial resources, to a lack of institutional willingness or to a lack of capacity to maintain and manage them appropriately.

2.1.4 Urbanisation challenges

About 170 million of the region's 300 million people (nearly 57 per cent) reside in urban areas (UN-Habitat 2016). Except in Egypt, Syria and Yemen, all MENA countries have experienced significant urbanisation over the past 30 years (Madbouly 2009). The entire country of Lebanon is itself considered as urban (UN-Habitat 2011a). According to UN projections, 280 million people out of 430 million in MENA (65 per cent) could be urban by 2020 (World

Bank 2008). Rapid urbanisation in MENA, like many other regions in the world, is accompanied by inadequate social and infrastructure development to respond to everyone's needs, thereby putting existing services at risk.

2.1.5 Increased reliance on depleting resources

By the beginning of the twenty-first century, diminishing renewable groundwater resources and population growth pushed countries to develop projects extracting water from new sources. For example, the Disi project in Jordan was developed to extract fossil water from a large aquifer and supply Jordanians with domestic water until 2022 (see Appendix 2). The aquifer's total supply capacity has now been reached, leaving the country's population in need of new water resources (Interview 1, 9th October 2016). In Gaza, the Palestinian Water Authority (PWA) has initiated the construction of two desalination plants. While these interventions relieve water-supply systems stretched to the maximum, they remain insufficient to meet the needs of the population or to enable the recharge of the strained aquifer on which it relies (EIB 2016; Interview 18, 13 October 2016).

2.2 Post-2011 revolts and further instabilities

A wave of conflicts started in 2011 in several MENA countries and continue to engulf the region in violence. Wars have physically affected societies through casualties and infrastructure destruction. As the conflicts have continued a range of further social issues have emerged across the entire region. They have caused multiple political and economic instabilities affecting societies and putting barriers to service providers meeting populations' basic needs. In the water sector, such instabilities have increased the strain on utilities' abilities to cope, eventually leading to declines in levels of service, and leaving populations in need of humanitarian assistance.

The Syrian war is one of the bloodiest conflicts of the century. Since 2011, attacks have even targeted civilians, humanitarian actors and the facilities necessary for basic service provision. Damage to pumping stations and other water infrastructure has been particularly severe in rural Damascus, Idlib, Homs and al-Raqqa. Six years of continuous conflicts have deepened insecurity, reduced availability of services and led to steady economic decline. Water itself has been used as a 'weapon of war' (DuBois King 2015). Its use for political negotiations in besieged areas such as Eastern Aleppo led to the loss of control of the network by utilities, and therefore exposed entire populations relying on it. Before the crisis, 96 per cent of the population in Syria had access to water from the main network. In the cities of Aleppo and Homs, coverage was reaching 100 per cent. Today, about 70 per cent of the population in Syria lacks access to sufficient domestic water, and to adequate drinking water (OCHA 2015; Interviews 4, 6 and 9 from 9, 10 and 11 October 2016; Questionnaires 14–15, 30 January 2017).

Another case is that of the Iraqi civil war. Since 2014, it has plunged the country into chaos. Conflicts in Iraq have restricted access to many areas leading to major challenges supplying populations with basic services. Similar to Syria, the strategic weaponisation of water has led to the destruction of water infrastructure, population centres and industrial facilities. During the battle for Mosul that started at the end of 2016, almost 650,000 people were left without access to water from the network for six weeks following an attack on pipelines. This population was therefore forced to find alternative sources of water, often from poor-quality sources. UNICEF estimates that 10 million people are currently being affected by the war in Iraq, of which 4.7 million are children. Despite a high incidence of population displacement (currently 3 million individuals), many have returned to their homes where public service provision is limited or completely non-existent (UNICEF 2016b; UNICEF 2017d).

2.3 Large population movements

2.3.1 The emergence of camps and settlements

Conflicts and associated crises have forced millions of people to leave their homes and to move elsewhere within or outside their country – and 4 out of 10 displaced people in the world are in MENA. While movements of Syrian refugees have been highly mediatised, Syria is also the country with the highest number of IDPs in the world, with 6.8 million people (Interview 4, 9 October 2016). Large population displacements have significantly impacted the region in multiple ways. They have changed the demography of the region and added pressure on hosting populations, often already fragile before the influx of IDPs or refugees.

A large number of IDP/refugee camps have emerged across MENA as a result of population movements. While the estimated average life of refugee camps across the world is 20 years, many of them are expected to exist for several decades (Milner and Loescher 2011). Camps can vary in many different ways. Some are planned by international organisations, with or without the involvement of host governments, others are self-settled (settlements). Differences of camps have influenced levels of water services. Camps located near cities and towns, where there is an existing water provision system, tend to be easier to supply, for example because of the possibility to expand the existing network. It is more problematic to serve camps and settlements located remotely from urban areas.

For example, in Jordan, five major camps have appeared since the start of the influx of Syrians to the country. Zaatari camp, an emblematic example of the refugee crisis, was hosting 130,000 Syrian refugees in 2014 (79,000 today), and is one of the biggest refugee camps in the world (Plotner 2014). Zaatari was hastily opened, whereas Azraq camp was planned over several months in collaboration with the government (see Appendix 2).

2.3.2 Refugees/IDPs living with host populations

While millions currently live in camps in MENA, the very large majority of refugees and IDPs have settled with host populations in urban areas. In fact, settled camps have become the exception rather than the norm (Mosello *et al*. 2016). Many refugees and IDPs rent accommodation. The poorest have settled in sub-standard buildings, empty shops, community halls or garages. In Lebanon, Syrians have pitched tents on privately owned land or on the periphery of towns. More than 400 informal tented settlements (ITS) are now registered around the country (see Appendix 3). This has posed multiple challenges to water providers to supply them (Box 3). Population influxes have added pressure on supply systems which have had to respond to considerably higher levels of demand.

2.4 A problem of cumulative impacts

As argued by ICRC (2015a), 'even without recent droughts and ongoing conflicts, many Middle Eastern states would be struggling to meet the basic water needs of growing urban populations'. Aligning with this statement, we argue that the accumulation of various issues and the range of unsustainable management practices in MENA are to be considered as having contributed to current problems.

Current impacts must be analysed through the way they have affected water-supply mechanisms, here referred to as 'systems'. Systems require inputs in order to function. Therefore, water provision systems are disrupted when one or several inputs (ie resources) are missing or under pressure. Building on ICRC (2015b), inputs are categorised here as essential human, physical and economic resources:

- **Human resources** refers to people and associated operations and planning processes (eg utilities' staff, small-scale entrepreneurs, contractors).
- **Physical resources** include hardware and consumables (eg water, electricity, infrastructure, equipment, water treatment material).
- **Economic resources** relate to the financial input used to invest in staff, material and any other sub-systems (eg capital).

BOX 3. SERVING REFUGEES/IDPS DISPERSED WITHIN URBAN AREAS

Refugee/IDP populations in camps and settlements have typically received higher humanitarian attention than displaced people living in urban areas. However, the majority of displaced populations across MENA has settled with host communities meaning the challenge has been greater outside the camps. In Jordan and Lebanon, displaced people living off-camp represent 80 per cent of the total number of refugees.

While supplying water to camps and settlements presents challenges, there are further barriers to reaching displaced populations dispersed within urban areas. It can be difficult to identify, track and target IDPs with interventions according to their needs which differ to host populations. One reason for this is that many refugees living in urban areas are not registered and it is therefore difficult to identify their needs. Besides, refugees and IDPs tend to settle in communities which are already marginalised. In this instance, the protection of vulnerable groups becomes more complicated in these areas where poverty and insecurity are endemic.

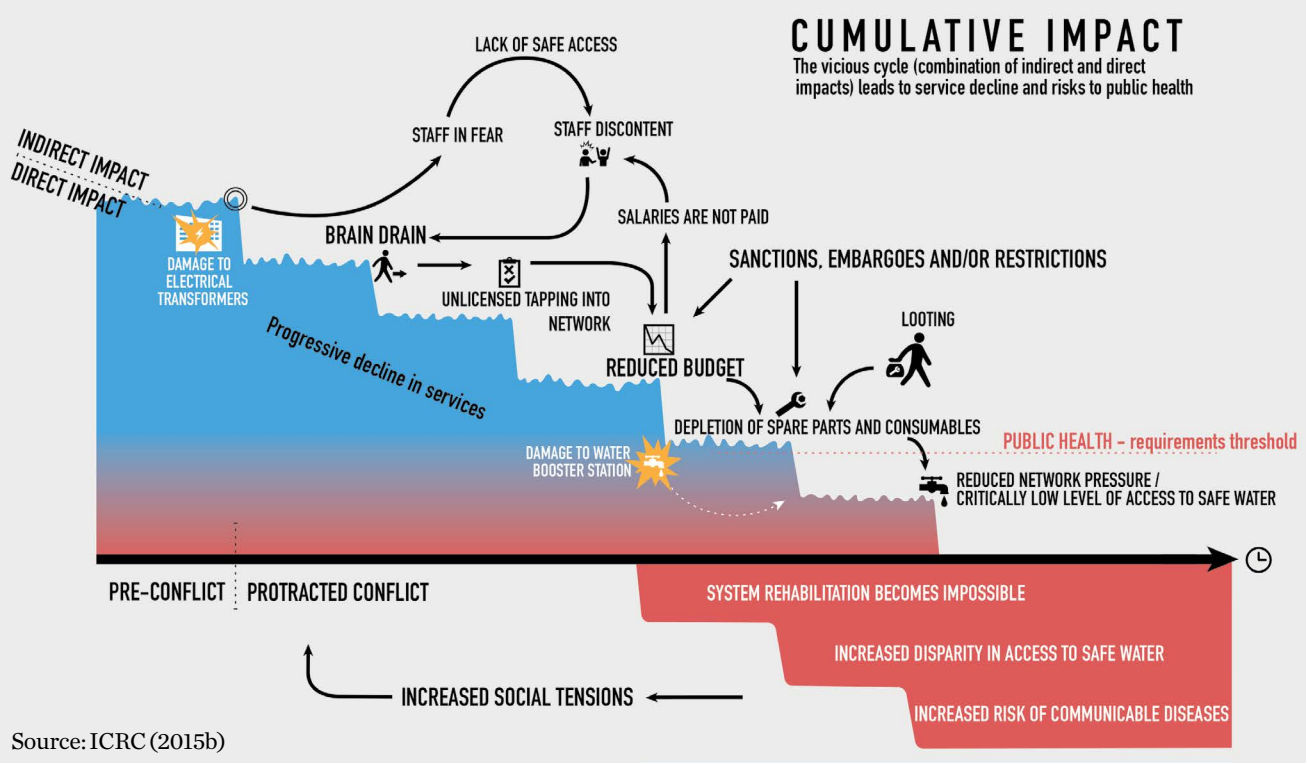
In Lebanon, UNICEF reports that thousands of Syrians already worked and/or lived in the Bekaa Valley with host populations before the influx of refugees in 2011. Besides, as residency fees are sometimes too high for households, many families choose not to pay for registration but find alternative ways of obtaining help.[1] The government estimates 500,000 Syrians are not registered with the United Nations High Commissioner for Refugees (UNHCR). Given the lack of updated socio-demographic data, it has been difficult for UNICEF and their implementing partners to identify and to provide these families with water services. Many have settled in sub-standard accommodation in the poorest areas, where access to basic services is limited. While these populations are the most vulnerable, they also are those whose needs are the least visible (Interview 46, 16 November 2016; Interview 63, 23 November 2016).

2.4.1 Direct and indirect impacts

A range of direct and indirect impacts on water provision systems have resulted from protracted conflicts and their effects in MENA. Direct impacts refer to immediate and physical impacts caused by armed conflicts (eg damage

[1] Since the time of writing, a decision was made to lift these fees.

Figure 2. Impacts on service systems



Source: ICRC (2015b)

to infrastructure, death of technicians and repair crews). Indirect impacts affect an associated component of a system, usually in the short to medium term. Indirect impacts include the exodus of staff leading to a lack of personnel with required expertise within utilities. Such phenomena lead to a reduction in the quality of service provided (less frequent maintenance, lack of knowledge, lower level of planning). Another example is that of loss of access to water resources in besieged areas.

2.4.2 Cumulative impacts

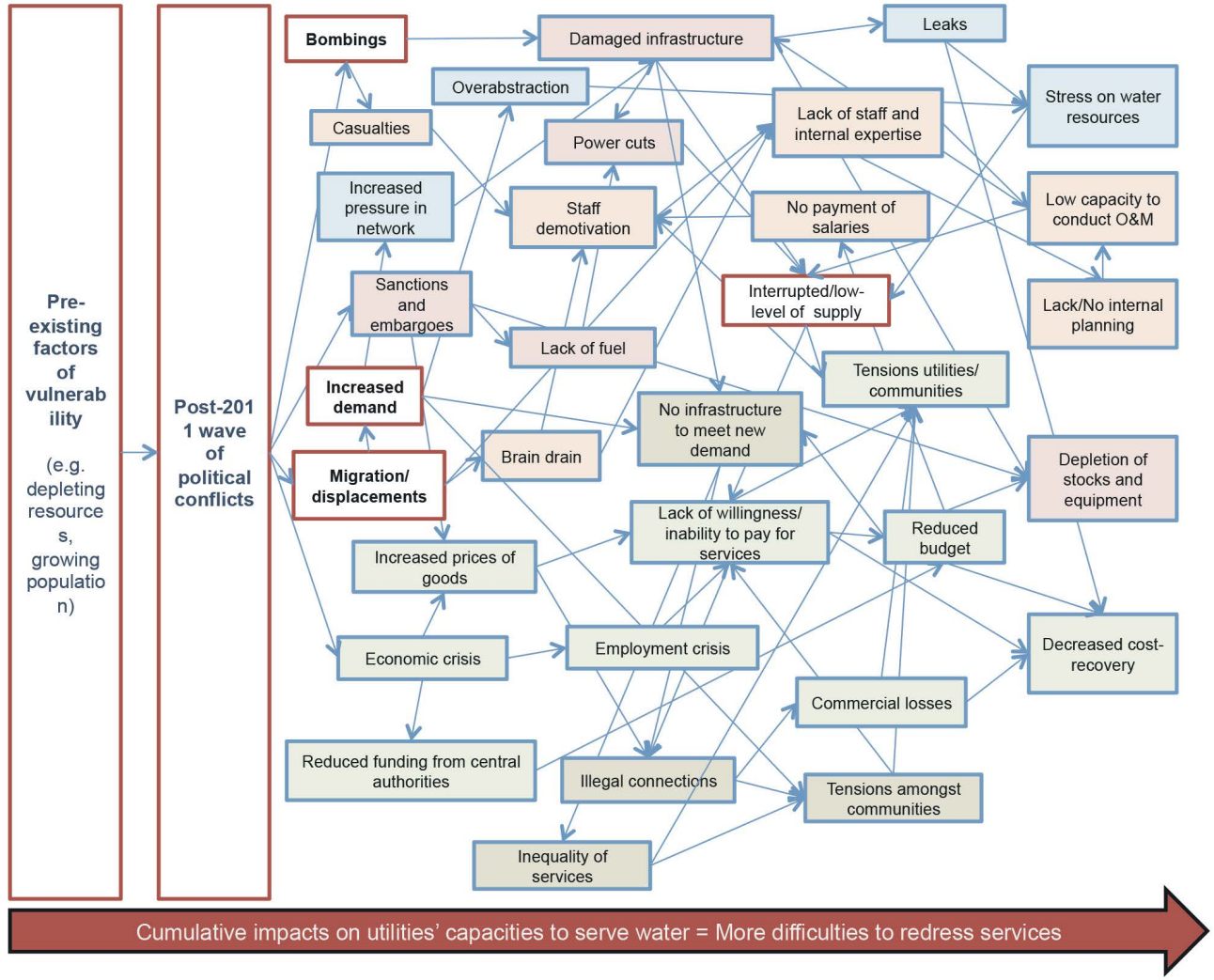
These are impacts that have accumulated over the long term and tend to bring about more difficult challenges to overcome. Cumulative impacts are the most difficult impacts to recover from. As illustrated in Figure 2, cumulative impacts refer to the long-term deterioration in the performance of essential services (ie service decline) through incremental direct and/or indirect impacts on one or more of the critical components of essential services. Figure 3 represents examples of chains of causes and consequences leading to utilities' decreased capacity to maintain levels of services. It highlights the interconnectedness of issues in this web of impacts and risks of cascading effects. Pre-existing vulnerabilities (left side of the diagram) are included as factors having influenced the consequences of conflicts which put growing pressure on the resources necessary to provide services (right side of the diagram). This does not exclude that conflicts have also introduced new issues at the same time.

Cumulative impacts are more difficult to recover from and require challenging work. Yet humanitarian agencies tend to target direct impacts but not indirect or cumulative ones (ICRC, 2015b). This is typically due to the large scale of the work needed to restore any service. For example, the disruption of supply due to a damaged pumping station can more straightforwardly be addressed than an ageing infrastructure system with unrepaired leakage causing water losses, drops in pressure, and the contamination of pipes.

2.4.3 Risks to populations

Continuous or persistent deterioration of water-supply mechanisms expose populations to health risks. Extreme cases of cumulative impacts have resulted in disease outbreaks. These can be caused by factors ranging from repeated attacks on treatment plants to the need for a population to rely on water resources of which the quality is not monitored, or which lack protection and are polluted by faecal pathogens. Yemen has suffered from multiple cholera outbreaks since the start of the conflicts. Many people without access to water have become reliant on wells they have dug themselves and from which they extract polluted water. The multitude of impacts, their interconnectedness, and accumulation over time give complex challenges to utilities. Responses often occur as a direct reaction to visible impacts, rather than in addressing root causes of the issues.

Figure 3. Examples of impact chains decreasing water utilities' capacities in MENA



Legend

Cause analysed	Impact on human resources	Impact on water resources
Impact on infrastructure/ equipment/stocks	Impact on economic resources	Indirect impact at social and institutional level

3

Ensuring continuity of supply: responses from different actors

BOX 4. ENSURING CONTINUITY OF SUPPLY: KEY FINDINGS

The nature of crises, their impacts and duration have determined the ways actors have responded. Humanitarian agencies have typically joined local governments to intervene at the onset of crises to ensure minimum access to safe drinking water to affected populations. The nature of response from relief to stabilisation to development has generally aimed at evolving as soon as crises have stabilised. Yet this evolution has rarely been a continuous smooth progression along these stages in practice.

Humanitarian aid has been considerably high in MENA, including for the WASH sector. Syria, Iraq and Palestine received some of the highest amounts of international aid in the world in 2014. Countries like Jordan have mobilised more funds for development than for humanitarian assistance. NGOs, international organisations and UN agencies have typically filled immediate gaps in water supply by directly providing water to affected populations during relief phases.

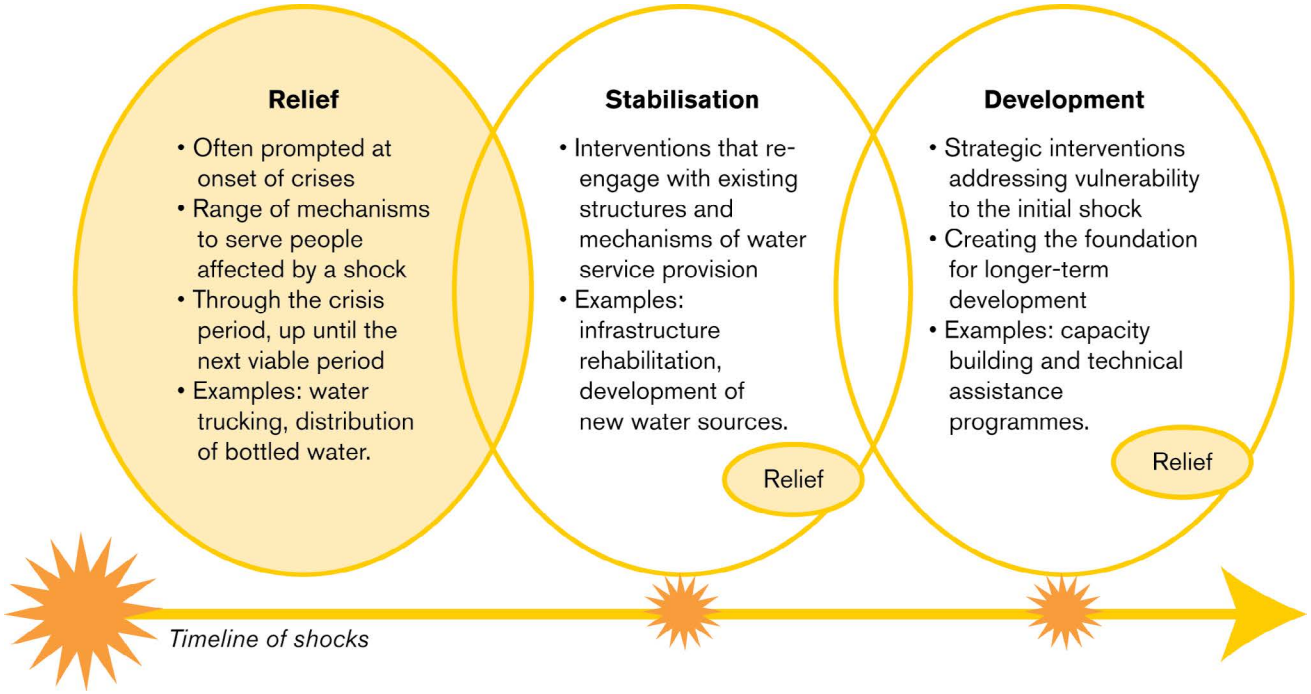
The private sector, and particularly small-scale providers, have filled an important gap in supply. Activities of independent operators and vendors have exploded across countries in MENA, including in urban areas where large proportions of refugees/IDPs have settled. In some cities, the majority of the populations have been relying on these small-scale providers, many of which operate informally.

In many countries where piped water systems became dysfunctional, 'secondary providers' became the primary water providers for the population. Independent operators have in many instances represented more reliable providers to populations than utilities (eg besieged areas in Syria).

The nature of crises in affected areas which are served by particular water systems have determined the nature of the responses by different actors – many of which were new actors who intervened to support local providers. Some responses highlighted below are directly relevant to zones of conflicts where bombing has caused casualties and damaged infrastructure, whereas other responses are more relevant to zones of migration. The paper is centred on the resilience of formal service providers (ie utilities that are either state or privately owned) but given the important part they play in service provision other actors' roles are discussed:

- **NGOs, international organisations and UN agencies**: the range of local and international organisations from the development and humanitarian sectors which have provided assistance to maintain water services in order to help address unmet water needs. They operate under specific mandates and durations of interventions might largely vary, often influenced by donors' requirements.
- **The private sector**: this includes independent providers, such as large contractors, well owners, water truckers (companies or individuals) and bottled-water vendors. This implies formal and informal actors (eg providers selling water without a licence).

Figure 4. Timeline of how shocks affect water provision and programming



This chapter aims to provide an overview of the spectrum of responses provided by different actors in service provision to ensure minimum access to water for all.

Certain humanitarian theories see crises typically evolving from 'relief' to 'stabilisation' and 'development' phases. Yet the distinctions are often nuanced and more complex, particularly in the MENA region, because protracted conflicts cause successive shocks. Front lines of conflicts often move back and forth and the conflict dynamics are constantly changing. Therefore, organisations have to be as prepared as possible to be able to increase support to service providers during times during which opportunities present themselves. Figure 4 shows how successive shocks that re-activate the need for relief are among the reasons preventing aid interventions in the Middle East and North Africa region from smoothly progressing towards development activities that help build resilience.

Humanitarian relief is usually reactive and unlikely to tackle underlying issues. By contrast, more structural support during stabilisation and development phases is the core of resilience building. The more resilient a service provider is, the less need there is for relief-type interventions. Where emergency-type support such as water trucking becomes imperative, implementation should aim to make relief-style coping mechanisms unnecessary as quickly as possible (ICRC 2015b).

3.1 How utilities and international agencies respond to shocks

In contexts of sudden interruption of the network during conflicts, but also in areas receiving refugees/IDPs, utilities have relied on contingency stocks to continue supplying water to the population. Those with facilitated access to contingency stocks, and with suitable equipment (eg storage containers, repair kits, water treatment materials, diesel generators), have been able to provide emergency supplies to people in a timely manner. In most cases, however, humanitarian support has been necessary to ensure rapid response.

3.1.1 Immediate responses: humanitarian actors as service providers

Mobilisation of humanitarian assistance has been considerable in MENA, including for the WASH sector. Flows of international financial aid have continuously increased over the past few years. Globally, government donors and European Union (EU) institutions account for the large majority of this assistance (US$21.8 billion in 2015) in comparison to private donors (US$6.2 billion). In 2014, Syria, Iraq, Palestine and Jordan were four of the five countries receiving the highest amount of international aid in the world (Development Initiatives 2016).

For WASH activities specifically, UNICEF has been leading operations in partnership with national governments in most countries, and operating with international and local implementing NGOs. Support has consisted of ensuring access to a minimum quantity of safe water through emergency methods, and/or through the engagement of humanitarian organisations with utilities in procuring necessary specialised items such as booster pumps.

In war zones where infrastructure is directly impacted, utilities' staff have had to either contract external companies or conduct their own quick repairs on pumping stations, treatment plants, power stations or pipes to

BOX 5. WATER SUPPLY IN HARD-TO-REACH AREAS: THE CASE OF ALEPPO CITY

Water has been used as a weapon of war in the Syria conflicts. In Aleppo, the water-supply system passes through areas controlled by different opposition groups (Figure 5). Armed groups have intentionally cut supply from this network. Utilities, with support from humanitarian agencies, have derived water from other provinces or pump extra water to the city's piped network from existing underground wells. Elevated areas not reached by piped water are supplied by a fleet of water trucks. Water is highly rationed in the entire city.

Furthermore, Eastern Aleppo (where the two main pumping stations serving the city of 1.8 million people are located) has been exposed to severe bombing. At times, technicians from the utility in charge have not been able to enter the areas and repair vital infrastructure. The International Committee of the Red Cross (ICRC) negotiated access to enter these zones for its repair teams. ICRC has also worked with a team of about 150 trained volunteers who have played a key role in undertaking essential repairs, and in helping bring material to areas in times of prevented access.

As the conflicts have continued and the main network system has become too vulnerable, ICRC, the Syrian Arab Red Crescent and local community water boards have developed alternative sources of water. They have rehabilitated old wells, many of which have not been used for decades. Over 100 sources are now in use to serve the population of Aleppo. ICRC has developed a GPS-enabled map to communicate the location of the newly restored wells to the people of Aleppo. As most Syrians have access to the internet through 3G networks, a web-based application displaying the map has enabled it to be shared via social media. Through the use of the map, civilians have been able to locate the nearest and safest water points when supply in the main network has been cut.

Sources: Interview 6, 10 October 2016; Interview 32, 9 November 2016; Malla and Davison (2015).

ensure the network could continue serving populations. This has required staff availability with appropriate expertise, the availability of the needed material (eg spare parts), and efficient logistical arrangements. In contexts like Mosul in Iraq or Aleppo in Syria, assessments and repairs have been prevented by restricted access to affected areas due to the presence of armed groups (Box 5). In situations of power cuts and fuel embargoes, utilities and humanitarian teams have joined efforts to keep power lines functioning, sometimes relying on stand-by generators with sufficient capacities to maintain pumping systems.

Influxes of refugees have rendered situations more complex. Population displacements require fast and coordinated efforts to provide basic services to newcomers. In the contexts of Jordan and Lebanon, national governments have considered their countries unable to accommodate large-scale influxes of Syrians and left international agencies taking the lead in the response. Organisations like UNHCR would often be the first present to coordinate arrivals and the settlement of camps. The provision of bottled water or simple distribution systems through communal taps have been common practices adopted by UN agencies and NGOs to supply water to refugees in camps during relief. Water-trucking activities have also developed along with water storing at household level in camps, usually cost free. Water trucking has usually been used as a short-term method to serve refugees/IDPs living in urban areas. However, by being dispersed amongst host communities, serving them has been more problematic for humanitarian actors (Box 3).

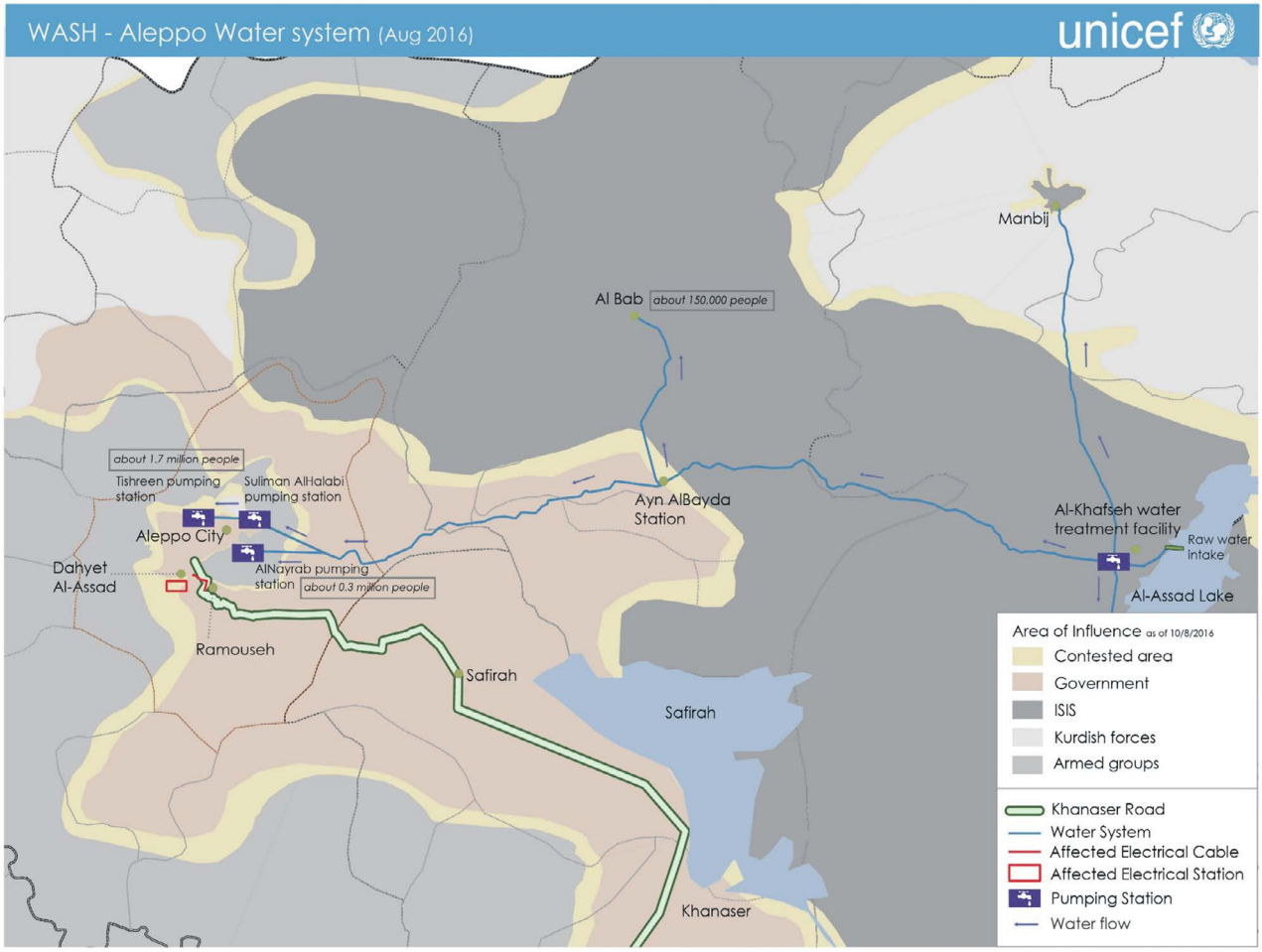
3.1.2 Stabilisation-recovery: humanitarian actors in a complementing role

As conflicts have persisted and displaced populations have remained, moving away from temporary emergency methods of water supply has been required. Where access to water sources is prevented, and where there has been higher demand for supply, humanitarian agencies and/or development agencies have worked with local governments to find alternatives or develop new sources of water. In Homs, for example, the water authority has recently dug 85 wells and connected them to the existing network to supply its population.

Many international agencies have helped local utilities to rehabilitate infrastructure as part of stabilisation interventions. NGOs have also helped utilities repair infrastructure through the provision of spare parts. Humanitarian assistance has also consisted of providing consumables (eg fuel, chlorine) through particular contractual arrangements. This has helped utilities to maintain their levels of consumables to a minimum to prevent shortage, for example in situations of looting.

In areas where refugees and IDPs have settled, there needs to be more sustainable solutions than trucking and distribution of bottled water. In some cases, several months or several years following the start of crises, humanitarian and development agencies and/or local utilities have connected camps to the public water network. However, as discussed in more detail below, this type of initiative has been context specific. In countries like Lebanon and Jordan, the political and economic implications associated

Figure 5. Water-supply system to Aleppo



Source: UNICEF (2016a)

with these interventions have caused local governments to prevent such approaches (Appendices 2 and 3).

3.1.3 Towards structural approaches: humanitarian actors in a supporting role

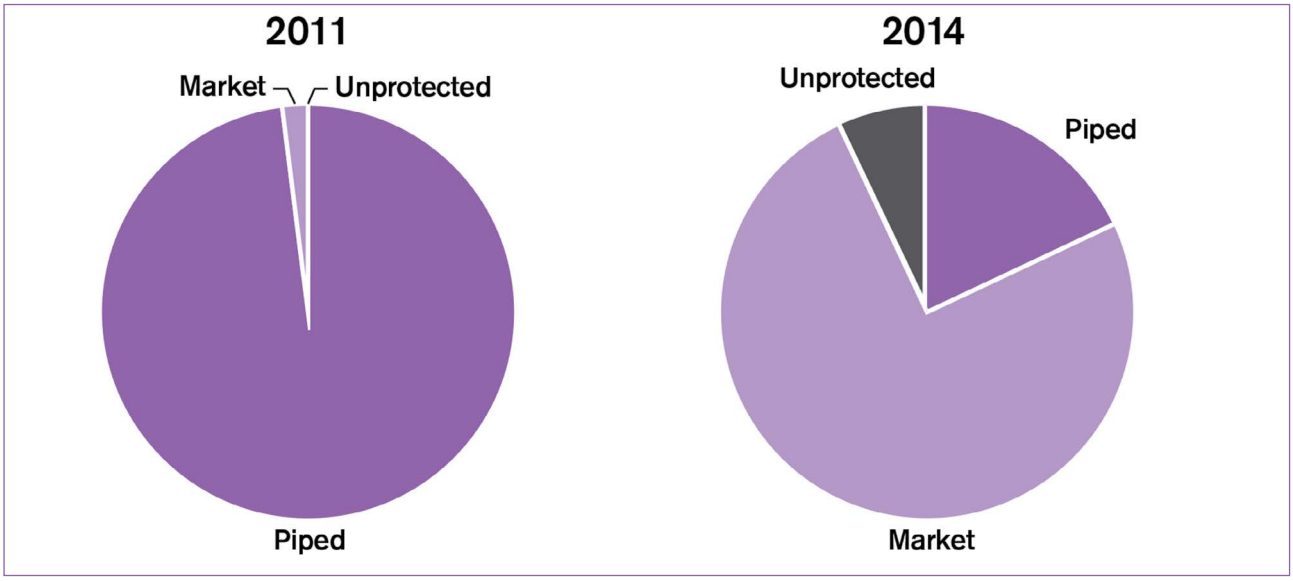
In their desire to move away from substituting and complementing roles, international agencies have adopted approaches that would indirectly support service provision. This means that as an alternative strategy from direct supply, an increasing number of international programmes have moved away from direct supply and supported utilities' existing systems. Situations such as conflicts and population movements lead to socio-economic instabilities, and utilities have generally struggled to cover their costs and maintain financial viability. In certain circumstances, international agencies such as UNICEF have provided financial support to utilities by directly covering staff salary costs in order to retain personnel.

As situations evolve, they create opportunities for more structural approaches in international interventions and agencies have developed activities aimed at achieving longer-term outcomes. These have often turned into 'software' activities as opposed to 'hardware' interventions which tend to be more common during relief (eg rehabilitating infrastructure, digging boreholes). Software activities include capacity building of local service providers such as training utilities' staff. Other development approaches include work with communities, such as behaviour change to conserve water at the household level. In camps, international organisations like Oxfam have developed community mobilisation programmes to maintain relationships with people, communicate efficiently with them, and sometimes enable them to take part in the operation and maintenance of water service systems (eg training to undertake rapid assessments of water needs in the camp).

3.2 Independent service providers

Activities of the private sector have largely increased since the start of the MENA conflicts affecting state service-provision systems. Although already prominent before the conflicts, activities conducted by private operators and vendors have risen considerably across the region in the past few years. People have had to increase water storage at home and rely on private truckers to fill their water tanks.

Figure 6. Change in sources of water in Daraa, Syria: 2011–2014 comparison



Source: WASH Working Group S. Syria – Amman (2015).

These factors have led more and more individuals to sink boreholes, and to truck water extracted from the ground. Increasingly, government authorities have relied on these types of private wells to ensure continuity of supply and have made arrangements with owners to support this.

In the occupied Palestinian territories for example, Israeli jurisdiction has stopped providing water to Palestinian communities. The PWA has secured special partnerships with closely located agricultural well owners to supply these communities through the network (Questionnaire 9, 9 January 2017). Many agricultural wells are now connected to reservoirs and work with the State of Palestine to serve West Bank populations through the domestic water distribution system. In Gaza, 68 per cent of drinking water comes from private water-trucking companies (Questionnaire 10, 15 January 2017).

Private vendors have also been critical in areas controlled by armed groups where access by utilities and international organisations has not been possible. For example, rebellions in Daraa, Syria, have prevented water provision to populations by the utility responsible for the city. Figure 6 shows the increase in coverage by water vendors since the onset of the civil war.

The role of private vendors has also been particularly important in urban areas to serve IDPs/refugees who are unable to access the water network, for example due to the absence of connections for their household. A recent study conducted in Lebanon shows that the large majority of refugees living in urban areas (residential and non-residential structures) rely on bottled water for drinking water (UNHCR *et al.* 2016).

4

Challenges to resilience building

BOX 6. CHALLENGES TO RESILIENCE BUILDING: KEY FINDINGS

Utilities' growing difficulties in managing internal resources

The absence of contingency stocks and/or emergency plans to secure continuity of supply has made utilities reliant on external support at the onset of crises. The continuity of conflicts has put a growing strain on utilities' physical, human and economic resources. Levels of services provided have consequently decreased. Repeated damage to infrastructure, depleting stocks of material and consumables, lack of skilled staff, and/or financial burdens have all contributed to decreasing utilities' ability to respond, and enhanced their exposure to further shocks.

Dependency on depleting freshwater resources

The MENA region has faced considerable challenges due to water shortages, enhanced by the growing impacts of climate change on water resources. Conflicts and population displacements have added to the stress on resources, and therefore made water management more complex for utilities. Although context dependent, water authorities in the MENA region tend to focus on increasing water production instead of demand-management strategies for improving services and reducing pressure on existing resources. This has led to countries becoming more dependent on resources that cannot serve growing populations over the medium and long term, although issues with the management of current resources have remained unaddressed.

Difficulties of moving along the relief-development continuum

Political blocks have often prevented the development of permanent systems to serve displaced populations in hosting areas, particularly in Jordan and Lebanon. As a result, many international agencies have had to continue endorsing substitution roles in service provision as opposed to taking a supportive role. This has resulted in high financial costs instead of strategic investment in the development of sustainable systems and capacity building of local service providers.

Multiple provision systems add to complexity

The presence of a large number of stakeholders in water services has rendered responses to crises in the region complex. While humanitarian actors have provided vital assistance to millions across the region, their presence has also developed certain risks of increasing local vulnerabilities. Insufficient coordination has led to fragmented interventions, sometimes increasing inequalities of service provision and limiting opportunities for utilities' capacity building. Particularly in urban settings, little coordination with independent local operators has also added to the duplication of distribution systems, some of which have developed outside of regulatory mechanisms.

Utilities struggle to recover costs while customers become increasingly frustrated

In many MENA countries, utilities' cost-recovery capacities were already low before the recent conflicts began, and state-owned utilities have been supported with direct financial support from central governments. The latter income has, however, been unsustainable and many countries have developed dependency on international funding. Conflicts and economic crises have resulted in the continued decrease in utilities' revenue collection from customers. Citizen's frustration with service providers and a decrease in trust in public authorities have further contributed to a reluctance to pay for water services. This 'domino-effect' problem has created growing gaps and tensions between utilities and customers, while increasing reliance on humanitarian organisations.

This chapter aims to analyse the range of initiatives undertaken by service providers through a resilience perspective. It explores the difficulties faced by different actors in responding quickly. It also analyses how responses can help service providers to be more resilient, and questions the extent to which such responses have been able to address pre-existing vulnerabilities or prevent them from increasing.

4.1 Why utilities struggle to maintain levels of services

4.1.1 Absence of emergency stocks and equipment

In many countries, the absence of contingency plans to safeguard infrastructure and equipment from exhaustion has led to the lack of availability of alternative water-supply mechanisms, emergency wells, or the lack of spare equipment and materials on several occasions. Utilities have therefore been highly reliant on external help to ensure the continuity of supply in such situations.

Access to power has been one of the greatest challenges faced by water service providers in MENA. In Yemen, water-supply systems have been impacted by the destruction of power transmission lines, and fuel embargoes across the country. The lack of fuel and increased fuel prices has resulted in Sana'a and second biggest city Taiz only receiving water to their networks four to five times a month. Oxfam reported that more than 40 per cent of the water-supply system that the NGO supports in Hajjah are no longer operating due to fuel shortages (Oxfam International 2015; Interview 21, 13 October 2016).

Experience shows emergency events are hardly predictable, and therefore difficult to prepare for in advance. Aleppo and Damascus had strong service-provision systems before the crisis, but the conflicts posed major challenges to them when it came to responding. Despite strong internal staff capacity, they were not prepared to react immediately and had no easy access to contingency stocks.

4.1.2 Infrastructure under strain

Prolonged conflicts have required investment in operations and maintenance for rehabilitation and in preventative maintenance that have often not been possible. These have increased exposure to risks of disruption to supply systems. Furthermore, many cities in MENA countries have old infrastructure. Ageing infrastructure has suffered from disrepair and leakages, often the result of a severe lack of investment. This has made service-provision systems more vulnerable to shocks as poorly maintained infrastructure is more easily damaged. Pre-existing systems would not have been built to respond to a sudden large-scale increase in demand. For example, piped networks are designed in consideration of current populations and anticipated population growth rates. Pumping more water into the system and increasing the pressure in pipelines, in order to supply more households, will increase losses through leaks and risks causing weakened pipes to burst.

Serving higher numbers of customers with limited water resources has also required utilities to reduce the frequency of supply through the network. A non-pressurised system during periods of rationing also increases the possibility of negative pressures being created in pipes and contaminated groundwater being drawn in to the pipe through leaks. In many cities and towns across the region, water could only be supplied a few hours every two or three weeks, pushing populations to conserve water as much as possible and to store it in the home where it is at increased risk of becoming contaminated if there is insufficient chlorine residual in the water. As a consequence, systems have been under strain and at increased risk of contamination, resulting in a decline in the quality of services. Although investing in water infrastructure is a long-term endeavour which can involve upgrading thousands of kilometres of pipes, benefits identified from such investment can be considerable.

4.1.3 Brain drain: decreased internal capacities

ICRC (2015a) has identified the lack of human capacity as one of the major challenges for water supply in the Middle East. The 'brain drain' phenomenon has been a particularly highly damaging indirect impact across the region. Emigrations of trained and qualified people fleeing conflicts have had significant consequences on utilities' internal capacities. Absences of workers, understaffed teams, or lack of training have caused gaps in the human resources able to respond to the impacts of conflicts. Reductions in personnel have led to delays in the repair of damaged infrastructure, lack of maintenance, the freezing of revenue collection and reduced knowledge of internal systems. Accumulating over time, a lack of expertise and loss of knowledge have also affected internal management and planning.

In Iraq, conflict, insecurity and unemployment have driven continued emigration of trained staff out of the country. During protracted conflicts, the needs for repair and maintenance have increased, while the availability of skilled professionals to carry them out has been reduced. As a consequence, water supply has significantly deteriorated due to poorly maintained infrastructure and low human technical capacity within the sector (Interview 10, 11 October 2016). Utilities' scope for response in such situations has often been limited, meaning that remaining capacity has been stretched to the maximum, leading to higher staff demotivation.

4.1.4 Lower financial viability

Financial constraints during conflicts/crises: Utilities' financial resources have been strained in multiple ways with the impacts of crises. Constraints during conflicts/crises include costs of repairs, higher fuel prices, looting and non-payment of bills by customers, which have all added to the financial burdens of local water providers. Non-revenue water, due to both leaks and illegal connections, is a major problem across the region (Box 7). Faced with increased difficulties in recovering costs, utilities have largely relied on external financial support to continue operating. Support has come from different sources, but the majority of financial aid has come from the international community, through grants or loans.

Unmet financial needs: Despite high financial aid distributed to MENA, needs for financial assistance have remained unmet in the water sector but also in many others, including education and food security. While Iraq's UN-coordinated appeal covered 82 per cent of its needs in 2016, Syria and Yemen received 77 per cent, Palestine 49 per cent, Libya 48 per cent and Djibouti only 34 per cent (UNICEF 2017e). In Lebanon, the Office for the Coordination of Humanitarian Affairs (OCHA) reports that more than US$ 5 billion of funding has been allocated to the country since 2012 (FTS 2017). The EU has allocated €80 million of this for water since the beginning of the crisis (Interview 66, 23 November 2016). UNICEF has its biggest WASH programme in Lebanon (Interview 37, 14 November 2016). But nevertheless, as the crisis persists, local utilities in the country report a growing need of support (Interviews 51 and 60, 17 and 21 November 2016).

Increased dependency on external financial support: Funding challenges concern all sectors worldwide, in both development and humanitarian contexts, and there are multiple reasons associated with these challenges. While many claim a lack of funds, others argue that aid has not always gone through the appropriate channels, or not been strategically spent at the local level (World Humanitarian Summit 2015). Assistance aimed at reducing utilities' debts or covering immediate costs has helped to provide a continuing water supply to populations over the short term. But a common risk has been observed in the development of dependency on external funding. For example, in Jordan and Yemen, central governments have subsidised utilities by covering energy bills or by paying staff salaries in order to retain personnel. Continued over the long term, this factor has highlighted the lack of utilities' financial autonomy. Not only is it economically unsustainable, it also runs the risk of worsening utilities' capacities to become financially viable.

4.1.5 Complex water resource management

High water consumption by the agricultural sector: MENA conflicts and their impacts have posed great stress on already-vulnerable water resources across the region. As mentioned above, MENA countries' economies heavily rely on agriculture and food production which require significant quantities of water resources. Interconnectedness between energy, food and water have posed important challenges to governments which have had to re-orientate strategies for water allocation between sectors. Yet some countries continue using considerable amounts of water for agricultural purposes, leaving populations with minimum amounts of freshwater. In Yemen, where renewable freshwater resource per capita is less than 200m^3 per year, about 33 per cent of the country's water consumption is used for the production of qat, a plant that is chewed for its stimulant qualities (Wulfsohn 2013; Interview 21, 13 October 2016).

Developing new sources despite unaddressed issues with current sources. Many governments have opted to develop infrastructure to extract water from new sources, in order to reduce water deficits in their country. The widespread development of megaprojects in particular has reflected a trend in production strategies, as opposed to strategies where demand is better managed or where supply systems are made more efficient. Increasing production has run the risk of putting further stress on limited water resources while the following existing issues and inefficiencies remain insufficiently addressed:

- **Over abstraction and pollution** of groundwater have led to the depletion of aquifers. Underground aquifers – most of which straddle international boundaries – are often the only natural source of water in most arid and semi-arid MENA countries. Aquifers have not been able to replenish at the same rates as extraction rates across the region. In Gaza and Jordan, limit groundwater levels have already been reached. In countries like Lebanon and Libya, low water tables in coastal areas have resulted in seawater intrusion. Besides this, poor wastewater treatment practices have also contaminated groundwater resources.
- Secondly, with the impacts of conflicts, water utilities suffer from **important physical water losses**. In Syria, 60–70 per cent of water in the network was estimated to have been lost due to leakage in 2014, partly by conflict-related damage, but also because of ageing infrastructure (ICRC 2015a). Many utilities have increased pumping rates in order to maintain pressure in systems with leakages. However, higher pumping rates have led to even further water losses.
- **The lack of water conservation practices** has resulted in even more waste of resources. The agricultural and industrial sectors are largely responsible for water wastage. Flat tariffs and poor regulations (eg building regulations) do not provide incentives to save water. Although representing less significant amounts, water conservation at the household level tends to be low, and especially in urban areas (eg Jordan). Water authorities report that this would reflect a lack of awareness by the public of the needs to conserve water resources.

BOX 7. THE PROBLEM OF NON-REVENUE WATER (NRW)

What is non-revenue water? NRW refers to water that does not generate revenue for the utility. It is the difference between the amount of water put into the distribution system and the amount of water billed to consumers. It is commonly measured as physical and commercial losses. Physical water losses (eg leaking or burst pipes) can be due to infrastructure problems. Physical losses can be due to lack of expertise and capacity to fix leakages. Commercial water losses refer to incorrect billing (arising from poor customer databases, errors in meter reading, and inaccurate meters), and unauthorised connections to the network. Illegal connections can be simply cases of theft, but can also be caused by too-high tariffs or due to the water network not reaching all potential customers (WSUP 2017).

Challenges in addressing NRW: It is not realistic to expect utilities to eliminate all commercial and physical losses. However, while activities to reduce commercial losses are technically easy to conduct, they can also lead to tensions. For example, disconnection of illegal consumers or customers who do not pay may result in hostility towards a utility and its staff. Field staff working on detecting illegal connections or on installing meter readers are exposed to risks of being victimised. Reduction of physical losses can be far more expensive than commercial losses. It requires significant technical know-how and must be carried out extensively to achieve results.

MENA conflicts and increases in NRW: MENA conflicts have substantially increased NRW rates. Regional rates range from 32 per cent in Egypt, 60 per cent in Lebanon and 70 per cent in Syria (Raslan 2013; Dardenne 2013). Bombings and attacks have deteriorated the infrastructure and staff capacity to repair leaks, which also makes customers less likely to pay for services. Economic crises have also made it difficult for people to pay their bills. While newcomers in hosting districts could represent new customers, governments are sometimes reluctant to connect them to the network. Unauthorised consumption rates may have increased because of the absence of infrastructure to serve them, or the legal complexity for refugees to register as customers with utilities.

4.2 Limits to humanitarian and development organisation support

4.2.1 Discoordination and fragmented interventions

Discoordination among humanitarian and development actors: Experiences of emergency responses in conflicts have shown that if the arrival or presence of a large number of humanitarian agencies is not coordinated efficiently, the response can be impeded. This phenomenon has occurred in MENA and presented multiple challenges for management and strategic planning (Luff 2014). Large numbers of organisations getting involved with different levels of expertise and varying agendas have posed challenges impeding short- and long-term decision-making. In Lebanon alone, 144 humanitarian and development organisations have joined the Inter-Agency Coordination Group to provide assistance in various sectors. The agendas through which they operate have often overlapped too, leading to further duplication or fragmentation of activities.

The existence of two channels of funds for recipient countries poses some challenges in the continuity and overall coherence of interventions. One the one hand, funds for humanitarian assistance tend to target displaced populations. One the other hand, funds for development mostly focus on host populations. Some countries like Jordan have attracted more funds for implementing national water and sanitation construction plans (see Appendix 2).

Discrepancies between funders' agendas and local needs: Conditional funding mechanisms, restricted funding and short-term agendas have been identified as common causes of fragmented interventions. Utilities interviewed for this study have reported that support provided by external organisations and the associated conditions attached to funds do not always reflect their requirements (Interviews 31 and 51, 24 October and 17 November 2016). Many aid organisations have short-term funding cycles that do not necessarily match the scale and duration of a challenge. When not adapted to the local contexts, programmes have therefore resulted in disappointing outcomes.

Besides this, many organisations have little experience in structural responses to provide support to utilities in the procurement of specialised items required to ensure continuity of supply. Some organisations also lack necessary capacities such as engineering and therefore must contract external companies to design systems.

Little involvement of local actors in the planning and management of funds has also run the risk of increasing such discrepancies. This has also often undermined local socio-political and economic systems in many instances, while representing very high costs to UN agencies and NGOs. While pre-defined conditions limiting scope and duration of interventions is not a new issue in the humanitarian and development sectors, fundamental problems in this area remain unaddressed.

4.2.2 Political blockages to making interventions sustainable

Political barriers: Humanitarian programmes have hit multiple political barriers limiting the sustainability of interventions and preventing humanitarian agencies from moving towards sustainable interventions. In some refugee/IDP hosting areas, local governments have been opposed to the development of more sustainable water distribution systems for newcomers, due to the socio-economic and political implications associated with their presence. International agencies have had to continue providing emergency-type support at high financial costs, for example through water trucking. Government bodies have given different explanations for these political blockages, including the high costs of investing in the expansion and rehabilitation of infrastructure (sometimes above utilities/local governments' resources and capacities) and the reluctance to provide infrastructure for refugees/IDPs which could encourage their permanent settlement.

Blocked humanitarian operations: As a result, this has led to blocked humanitarian operations. International agencies which are currently filling gaps in supply and find themselves substituting the service provider role have faced difficulties in planning for exit and moving towards stabilisation and development phases of operations. This also represents missed opportunities to invest funding more sustainably. In Lebanon, water-trucking operations are continuing in the Bekaa Valley, despite the protracted nature of the Syrian war. Refugees who have lived in the country for six years are unable to return home. The question of infrastructure development to meet their needs has raised much concern on the part of government. As the availability of international funding is decreasing, humanitarian and development actors have had to make drastic decisions. Recent plans have considered the reduction of potable water trucked to camps. The gap would have to be compensated with untreated groundwater coming from local boreholes and supplied for various domestic (non-consumption) purposes (see Appendix 3).

Further implications for populations and utilities: Furthermore, continuing with an emergency-type water supply runs the risk of causing additional issues. Such circumstances have left water supply in a status quo with many populations underserved. Humanitarian actors have continued with business-as-usual activities, while populations have remained in a 'permanent temporariness' affecting their future as much as their everyday life. In situations of protracted conflicts, such assistance has made entire populations reliant on practices that cannot be sustained over time. For example, in Sudan, water was provided to IDPs living in informal settlements by humanitarian agencies at no cost. Given the financial challenge this represents, the Ministry of Water Resources has looked for solutions by installing kiosks through which IDPs could start paying for water. However, following years of free supply to people, such a transition has been difficult to introduce (Interview 16, 13 October 2016).

4.3 Private sector: operating in the shadows

4.3.1 Risks associated with activities operating outside regulations

As described above, the MENA region has seen an increase in the activities of private-sector service providers since the start of the conflicts. However, a large proportion of private-sector service providers serving populations operate without a licence and outside of regulatory mechanisms and policy frameworks.

- **Over-abstraction**: Many in the private sector, including those engaged in agriculture, have seen opportunities in drilling boreholes to extract groundwater that can be sold to service providers for domestic use. As seen in Jordan and Yemen for instance, drilling operations occurring without formal control means that many individuals have abstracted water at overwhelming rates, and thus have contributed to the depletion of aquifers.
- **Bad water quality**: Drilling, transport and delivery operations occurring outside formal monitoring procedures all pose a threat to populations' health. Water is exposed to contamination at any stage from processing to endpoint, while water delivery without conducting quality tests has increased risks of disease outbreaks. In Lebanon, the informal sector plays a significant role in water provision. As demonstrated by a recent JMP data-collection programme conducted as part of the SDGs, activities occurring outside quality-monitoring standards have led to the supply of highly contaminated water to populations (Box 8).
- **High prices**: The informality of operations has given flexibility to providers to set tariffs themselves, often leading to higher water costs than official utilities' tariffs. For example, in Homs (Syria), private vendors have been selling water at a rate of US$2/m^3, as opposed to US$0.08/m^3 (US$0.10 before the war) (Interview 9, 11 October 2016). This is a major challenge to populations whose revenues are low, particularly in areas unreached by the public network and where there is no alternative for safe water access.

4.3.2 Overlooked opportunities for the private water sector

Parallel water distribution systems: The development of independent water distribution systems in parallel to public supply systems, in addition to those developed by humanitarian/development agencies, creates high inefficiency in the water sector. The duplication of systems

BOX 8. POOR WATER QUALITY AT HOUSEHOLD LEVEL: THE CASE OF LEBANON

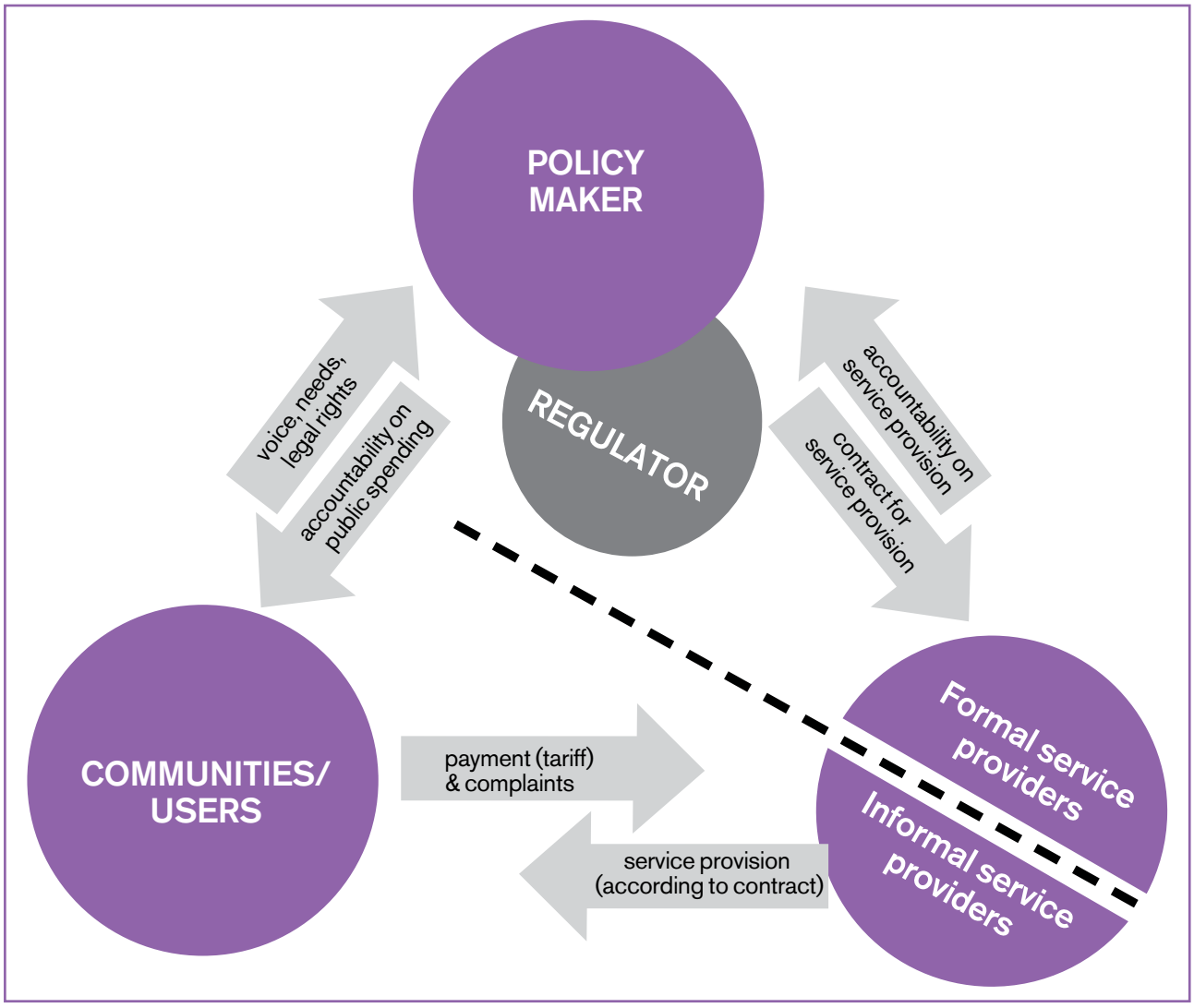
Water services in Lebanon have been characterised by a lack of comprehensive monitoring of the quality of water supplied to populations.

A recent Joint Monitoring Programme (JMP) study conducted by UNICEF has used Sustainable Development Goal (SDG) indicators to assess water service provision, taking into account water quality. The survey has revealed high contamination levels of water at household level across the country, including widespread *E. coli.* Results have shown higher contamination where water has been supplied by water tankers. This issue has been even more pronounced in informal settlements, which mostly rely on water trucking.

The issue of water quality is compounded by the fact that households often combine water sources (from the public network, wells, and/or water trucks) and store it at household level. Therefore, if water coming from the public network stored in a tank meets quality standards, it might be contaminated by water coming from a different source that has not been monitored. This makes the identification of the location and source of contamination difficult.

While water services were previously assessed through MDG indicators showing 98 per cent of safe water supply, SDG indicators – which now take better account of water quality – reveal that Lebanon is a long way off meeting the target of 'safely managed drinking water services'.

Figure 7. Most commonly observed service provision framework with formal/informal providers in MENA



Source: UNDP and UNICEF (2015)

often results from discoordination between international agencies and local actors. Besides, poor regulatory systems are often the cause of increased informal activities. In Iraq, independent providers have often operated without licence simply because of the government's lack of staff available to issue permits and their incapacity to deal with bureaucracy requirements within a short period of time.

UNDP and UNICEF (2015) argue that accountability challenges in the WASH sector can be found where divisions exist between formal and informal service providers. The model of service framework they have developed and in which such divisions exist can be applied to the countries studied in this paper (Figure 7). These divisions also concern the weak link between informal providers and the state (policymakers). These need to be overcome in order to reinforce service systems.

Working with small-scale providers – beyond a duty: The role of small-scale providers is often overlooked despite their important role in filling gaps in supply. That is particularly true in areas remaining unreached by formal providers, where entire communities have relied on the activities of private providers to be served with water services. This means that these providers have crucial knowledge of local needs and have developed mechanisms to meet them. In addition to keeping better track of services which operate outside of formal channels, and mitigating the risks outlined above, working with small-scale providers also offers opportunities to serve unreached areas. Furthermore, informal providers often have legitimacy with local populations and it may often be appropriate for utilities to engage with them in order to gain acceptability and accountability.

Increasing gaps between utilities and customers: Conflicts and further crises have posed increasing challenges to utilities to deliver and maintain services. These water providers have seen their financial resources and operating and maintenance capacity decrease. Meanwhile, customers have received poor services. Insufficient revenue collection faced by utilities partly relates to customers' unwillingness to pay for such services. Often referred to as a 'chicken-egg issue', it has been undermined by a lack of trust or confidence in the utility, thereby creating a vicious cycle. As explained above, irregular services have pushed citizens to rely on alternative sources of water provision, generally more expensive and not always meeting quality standards.

Tensions amongst communities: Besides complaints between providers and customers, tensions amongst communities have also added additional barriers. Much of the increase in tensions is due to inequality in supply, either real or perceived, amongst populations. While tensions typically existed between poor and high-income areas before conflicts, they have also emerged between displaced people and host communities. Indeed, where humanitarian assistance has focused on refugees/IDPs, lack of attention on host communities has increased further frustration. This has been particularly observed in situations where newcomers have settled in urban areas of past migration (eg in Jordan and Lebanon with previous waves of migration from Iraq and Palestine). Since migrants tend to settle in already-strained and poorer neighbourhoods of cities, these have created pockets of poverty, to which more recent settlers bring added complexity.

4.3.3 Complexity in diversity: how can service providers deal with social tensions?

Complexity in diversity: Populations, and particularly in urban areas, are highly diverse and unequal. Decades of migration in MENA, and more-recent large population movements due to conflicts, have resulted in social diversity amongst communities. In fact, the word 'communities' rarely refers to homogenous units. That means that different people have been affected by crises in different ways according to their identities and socio-economic and legal status (Brown *et al.* 2015). Such diversity has posed challenges to service provision which would require different approaches to different communities, without reproducing inequalities amongst populations. Challenges for water companies have been to understand better these social complexities, so that they can meet everyone's demands.

Many local and international organisations have developed community mobilisation programmes to serve multiple purposes, including efficiency in WASH service provision through the creation of water committees. While some of these programmes have presented opportunities to enhance social cohesion at community level many have failed to last. In the Bekaa Valley of Lebanon, waves of emigration related to seasonal work, and recurrent evictions of refugees have prevented the implementation of such programmes. As a consequence of fragmentation and absence of platforms to reach citizens in rapidly changing environments, service providers have faced further blockages in relating to and serving communities.

5 Successes in responses

This chapter describes examples of resilience and successful adaptation practices that have enabled both rapid response during emergency and stabilisation/development where embedded issues are addressed. In this last case, these examples aim to highlight how utilities and actors supporting service provision have attempted to break cycles of vulnerability. Resilient utilities have been able to provide immediate responses to shocks, thereby needing less external support.

Resilience is assessed through the perspectives of sustainability, equity and resource efficiency. While some measures taken might have enabled sustaining service provision, such measures would not be resilient if not economically, socially and environmentally sustainable over the long term (three pillars of sustainability). Inclusion/exclusion being sub-dimensions of equity, it is also argued that service providers have been less able to operate in appropriate conditions when marginalisation patterns have led to an increasing gap between them and their customers. On the contrary, increasing inclusivity through better engagement with communities has tackled inequalities and improved service provision in multiple ways. In addition, resource-efficiency approaches have helped service providers to be more resilient by reducing exposure to risks of shortfall in essential inputs required to maintain water supply.

5.1 Utilities: managing resources efficiently

5.1.1 Contingency planning and self-reliance for equipment and stocks

Redundancy and safe failure: As two key characteristics of resilience, redundancy and safe failure have enabled service providers to ensure the continuity of services. Redundancy has enabled the availability of spare infrastructure, equipment and material in case of failure with existing mechanisms (eg back-up generators, secondary pumps). 'Safe failure' refers to minimum damage in systems, where service delivery is maintained even when certain components fail. Strongly related, they both refer to the reduction of dependency on single sources of inputs (Dodman *et al.* 2017). For example, in Syria, it has included access to secondary wells and emergency treatment equipment. In Aleppo specifically, ICRC has supported the water board to ensure they constantly have a three-month stock of consumables ('buffer') (Interview 32, 9 November 2016).

Contingency planning has helped utilities to prepare to quickly respond to emergency situations. It has enhanced utilities' resilience by reducing exposure to risks of shortfalls in equipment and supplies. This has required making decisions in advance about the management of resources, and being aware of the range of technical and logistical responses. In the case of equipment, contingency planning has involved mobilising supplies to deal better with 'backlogs'. Identifying critical components (those that are not safe to fail) is also key in addressing system vulnerabilities, while enhancing resilience.

The occurrence of repeated shocks tends to result in developing learning for building preparedness. For example, in the State of Palestine, a series of national crises plans have been prepared for various emergencies. The 2016 WASH sector contingency plan (State of Palestine and WASH Cluster 2016) lists the activities required to meet emergency needs in an efficient and coordinated way to isolated or displaced populations. For the Gaza Strip, these have been developed to enable the local utility Coastal Municipalities Water Utility (CMWU) to have an action plan to serve Gazans during times of conflict. As part of a joined initiative between CMWU and ICRC, decentralised warehouses have been used for emergency stocks only. There is a minimum of one decentralised warehouse for emergency storage in each governorate, each of them being managed by a CMWU local manager. In several events, this system has enabled the fast and efficient supply of water and materials to populations in need (Questionnaire 9, 9 January 2017).

Limiting reliance on emergency plans: While alternative options for emergency situations enable service providers to address the impacts of shocks quickly, relying on emergency plans over long periods of time can limit resource efficiency. In such terms, redundancy is fundamentally at odds with resource efficiency. Indeed, relying on spare resources over the long term can be highly inefficient and unsustainable.

To ensure redundancy during power cuts, local water utilities in Yemen have increasingly used back-up generators. However, they have faced considerable financial costs in relying on small generators to maintain water pumping over the long term. This has led to escalating water prices. For example in the capital Sana'a, delivery costs of 500 litres of trucked water used to be YR4,500 before the crisis, but rose to YR10,000 in 2015 (approximately US$40) (Oxfam International 2015). To address such issues, UNICEF in Al Hudaydah has supported the local utility by installing direct electricity lines and by building pilot solar systems to reduce reliance on the weak electricity grid and on standby generators (Interview 5, 9 October 2016; Questionnaire 7, 4 January 2017). While yet too limited to produce enough energy to service entire water systems, investing in renewable resources has demonstrated a step towards the development of independent and sustainable systems.

5.1.2 Staff preparedness and capacity building

Preparing for emergency response: Preparedness is a key factor of efficient management of human resources enabling resilience to sudden shocks. Self-organisation and flexibility are other important factors influencing the effectiveness of responses. This requires training of personnel, coordination plans and stand-by arrangements. Emergency plans have provided guidance for rapid response from utilities' staff, often in coordination with humanitarian agencies. They have typically included steps for rapid assessments of damage and needs, and consultation with affected populations. With highly skilled and well-prepared staff in the Gaza Strip and the West Bank, utilities have been able to provide quick responses to the impacts of conflicts on water access. Integrating water emergency plans within wider national and local response plans has also helped to ensure coordination with other sectors (eg with shelter and settlement response plans).

Building internal capacity over the long term: Long-term resilience with regard to human resources requires building internal capacity to ensure utilities remain as autonomous as possible during times of stress. To raise internal levels of expertise, organisations such as the Arab Countries Water Utilities Association (ACWUA) and the German development agency (GIZ) have provided long-term training to government agencies in charge of water across MENA countries. Such trainings have aimed to increase the technical capacities of local staff. In Iraq, ICRC has trained 127 technicians to operate and manage facilities independently (ICRC 2015a).

A strategic priority for utilities is to consider in detail the technical skills required. The nature of expertise required might differ from one context to another, for example from an urban to a rural context. A higher level of engineering expertise has often proven necessary to operate in urban areas including in large refugee camps, where engineering skills required are more similar to those in traditional urban contexts. To support this, organisations like ICRC have started to invest in the development of internal skill sets necessary for engagement with utilities, not only in water, but also electrical utilities and where relevant, wastewater too.

Very importantly, smart data management has been essential in informing rapid decision-making during emergencies, and has helped utilities to retain essential knowledge when affected by the emigration of staff or hindered by financial resources. In Lebanon, UNICEF has closely worked with the Ministry of Energy and Water and local utilities to address fundamental gaps in data availability and data monitoring (see Appendix 3).

5.1.3 Sustainable investment of financial resources

Balancing hardware and software investment: Experience of responding to conflicts in MENA shows that financial resources have been maximised where investment in infrastructure and physical assets ('hardware') has been coupled with investment in the management side of service provision ('software'). Where contingency stocks were already in place to respond quickly, more financial resources were available to focus on software activities, often providing space to build long-term resilience. However, with uncertainties related to periods of conflicts, it has been necessary for utilities to ensure financial resources remain available in an emergency. The key requirement has therefore been to ensure continuity of revenue collection during crises.

Some utilities already faced financial debt before the crisis, relying on external help from national governments and international funders. In such circumstances, resilience-building approaches have consisted of addressing pre-existing issues by restructuring their cost-recovery system so to become more financially autonomous. Reducing rates of NRW has been identified as a most efficient way of addressing this.

Upgrading meter-reading systems: As mentioned above, upgrading meter-reading systems provides multiple benefits to utilities by increasing their revenue and better managing water resources. Meter-reading systems enable utilities to have information on how much water is produced and how much water is consumed. This requires the use of the appropriate equipment to collect and monitor data in order to bill customers accurately. The right incentives can be put in place in a public utility within a broader framework of encouraging autonomy, accountability and customer orientation.

In Egypt, the Holding Company for Water and Wastewater (operating under the Ministry of Water and Wastewater Utilities) has replaced old meters in the water system of 19 cities. From 2008 to 2012, it substantially decreased NRW rates in cities like Cairo (by 7 per cent) and Giza (by 12 per cent) (Raslan 2013). In Taiz, Yemen, NRW rates were decreased from 45 per cent to 30 per cent following a set of actions including the improvement of water-meter readings, the installation of control valves, and in-depth data analysis of production rates (Veenstra 2013).

All households in Baghdad currently have meters. Payment of bills is currently shifting to online methods. This has led to a 7 per cent reduction in water consumption and an 11 per cent increase in revenue by the authority in charge (UNICEF Iraq Workshop, 15 March 2017).

Ensuring water tariffs are affordable: It is important to note that these are not solutions on their own. While utilities are often encouraged to introduce volumetric tariffs to recover costs reflecting the services delivered, it must be ensured that water tariffs remain affordable for the poor. Indeed, regulators are mandated with the task of guaranteeing that utilities deliver a sustainable service, but also that customer tariffs are affordable. Ensuring services are equitable so everyone is being served is a pre-requisite of resilient societies.

5.1.4 Maximised use of water resources

As described in the examples below, efficient water management can be achieved in multiple ways from a resource-management perspective. Water efficiency can refer to:

- The same amount of water being put into a system, with more water being available for consumption (eg repaired leaks).
- A decrease in input of water into the system, but resulting in the same amount of water being available for consumption (eg wastewater recycling).
- The use of 'non-conventional water resources', such as desalinated water, treated wastewater, rainwater and irrigation drainage water.
- Reduced water consumption per capita, achieved through demand-management programmes (eg awareness campaigns, regulations), where conservation practices bring about a reduction in stress on resources.

Reducing leakages and regulating pressure: Reducing leakages in water systems has been a way to reduce waste and optimise water production. Where utilities have reduced leakages, this makes more water available within the system. They are therefore able to either reduce the amount of extraction required from groundwater and/or supply more water to more customers. This can also remove or postpone the need for new resources to be developed.

In Jordan, the average NRW rate is of 60–65 per cent across the country. Up to 20–50 per cent of this loss is due to leakages (Interview 1, 9 October 2016; Workshop, 15 March 2017). The influx of refugees and associated increase in demand has led utilities to increase pressure in water systems, thereby causing further damage to pipes. Miyahuna utility has tackled both leakages issues and commercial losses to reduce NRW in the governorates it serves. By recently replacing about 30,000 water meters, it

BOX 9. DESALINATING WATER FOR THE PEOPLE OF GAZA

The armed conflicts between Palestine and Israel have affected water availability as water and wastewater treatment plants, wells and pipelines have been targeted during attacks (Lazarou 2016). In Gaza, damaged infrastructure has been left unrepaired due to the heavy restrictions on the import of spare parts and other necessary construction materials into Gaza (Gostoli 2016). Today, water losses from the municipal distribution system are significant and wastewater is left untreated and pollutes the only existing aquifer in Gaza (World Bank 2016). Decades of its overexploitation have also resulted in irreversible damage with saltwater intrusion. In 2015, less than 5 per cent of the water from the aquifer was deemed fit for human consumption (PASSIA 2015; EWASH 2015).

To address the acute need for an alternative source, the Palestinian Water Authority (PWA) has initiated the construction of desalination plants. In partnership with the European Union and UNICEF, it has built a low-volume plant to serve populations in the southern Gaza Strip. Already inaugurated in early 2017, it aims to serve 150,000 people with 12,000m^3 of water daily once it becomes fully operational (UNICEF 2017c). But this intervention only provides small relief to the strained aquifer. A central desalination plant with an annual capacity of 55 million m^3 is yet to be built (EIB 2016). The tendering process was planned to start in early 2017 (EIB 2016), but a finished plant may still be some years away (Al-Mughrabi 2017).

However, such projects do not come without additional challenges. Desalination is an expensive and energy-demanding process and electricity supply within Gaza is infamous for being unreliable. Furthermore, the construction of large infrastructure in a zone exposed to frequent conflicts and continued political oppression represents considerable implications affecting their management, including significant security concerns.

Additional sources: Interviews 17, 18 and 35 (13 and 27 October 2016).

increased billing by 40 per cent in some areas of Amman (Interview 1, 9 October 2016). In three pilot city districts of Iraq, a dual public-private approach supported by UNICEF for reduction of NRW has reduced water losses by 20 per cent.

Wastewater treatment: Egypt produces one the highest amounts of wastewater amongst MENA countries (about 3.7 billion m^3 a year). It treats about 2.9 billion m^3 of wastewater a year (78 per cent). The country reuses wastewater outside the Nile Delta for crops, industrial use and landscaping. Libya treats only 6.6 per cent of the 600 million cubic metres of wastewater generated per year, and re-uses it on fodder crops, ornamental trees and lawns (World Bank *et al*. 2011; cited in UNDP 2013).

Treating wastewater has also offered many opportunities for arid MENA countries. Many countries have recognised the need to reclaim more wastewater to meet the demand for irrigation and reduce groundwater abstraction for agriculture use. Wastewater treatment does not only prevent environmental pollution and further degradation of freshwater resources, but also provides opportunities for water re-use.

Water desalination: Desalinated water plays an absolutely crucial role in contexts where there is a deficit in drinking water. Desalination plants are very expensive and involve energy-intensive operations, but they have a cumulative capacity of about 24 million m^3 a day (UNDP 2013). In areas like Gaza, they represent a solution for providing freshwater to populations (Box 9).

5.2 Making aid sustainable

5.2.1 Coordinating humanitarian and development interventions

Cluster approach: In line with the aim to make humanitarian assistance sustainable, efforts have increased to coordinate responses between humanitarian and development actors and with local service providers. The humanitarian cluster approach which emerged in 2005 was developed in order to achieve common objectives in a coordinated way, by aligning planning and management of responses undertaken from different organisations. The global WASH cluster has also been set up as an opportunity to influence national WASH sectors to move towards SDG targets.

In Yemen, the WASH cluster was coordinated to support the local water and sanitation corporation (LWSC), the local utility operating in the urban areas of Aden. Particularly during 2015, the utility found itself at the edge of collapse and being incapable of covering salaries for its 2,000 staff employees. To ensure the continuity of the Aden LWSC's activities, the cluster distributed humanitarian roles amongst international organisations to meet the utility's essential needs. UNICEF took responsibility for fuel provision, ICRC for supplying spare parts and equipment to maintain infrastructure, while Aden LWSC put together an emergency team for which Oxfam provided employee daily incentives. The Aden LWSC team capacity was kept to a maximum of 100 individuals with key technical expertise, but also with management, financial and administrative skills (Questionnaire 4, 2 January 2017; Interview 69, 8 May 2017). Such coordination has sustained water provision to the Aden population of 800,000 people. Besides this, UNICEF has also initiated and supported the development of an emergency preparedness and response (EPR) unit within the offices of the rural water-supply authorities ('GARWASP'). During the 2011–2012 crisis, the EPR unit team conducted emergency interventions, including the restoration of water-supply services to 140,000 people (UNICEF, 2017f).

Cluster coordination provides a platform under which humanitarian agencies gather to support governments, although such support sometimes occurs separately from the cluster. While there have been many examples of good practice from this approach across countries, one strong weakness that has been identified is in the way that strategies have been developed in isolation from existing local systems. As argued by Luff (2014), humanitarian coordination mechanisms are more efficient when they put local government policies at the heart of programmes.

Strengthening the humanitarian/development interface: Many international agencies have increasingly recognised the need to analyse the long-term implications of immediate interventions at the onset of crises. However, such approaches have often been limited by the fact that interventions would either focus on humanitarian assistance or on development, due to the specific agendas under which donors and their implementing partners operate. In such circumstances, partnerships are crucial to ensure the humanitarian/development interface is strengthened. As argued by ICRC, there are multiple opportunities: development agencies can share experience with emergency teams at the onset of conflicts, while humanitarian actors should be assertive in engaging development actors in early recovery and should keep them informed of development (Interview 32, 9 November 2016).

The long-term involvement of organisations with multi-year programmes, some of which would be permanently implemented in the country of intervention, has also been extremely beneficial for such purposes. For example, ICRC has increasingly developed programmes which support local utilities' short- and long-term needs, thereby developing strong relationships with local actors (eg Gaza with CMWU and other municipal service providers, in coordination with the local government).

5.2.2 Developing long-term strategies

Planning for exit: Along with the 'do no harm' principle, international organisations have invested in projects that enable them to exit without limiting local actors' autonomy (Sphere Project 2017). These have included early investment in the upgrading of water, electricity and health infrastructure which can benefit both host communities and refugees. There has been a growing consensus amongst actors in the humanitarian and development sectors that ensuring permanent and sustainable access to water for vulnerable communities while reducing emergency-type supplies as early as possible is a priority.

This has enabled them to maximise opportunities to support rather than substitute for the provision of services, particularly in phasing out direct service provision, and in engaging as early as possible with longer-term development objectives. However, there have been barriers to investing in viable development initiatives that can be handed over by international organisations to local actors and enable organisations to exit. As explained above, connecting newcomers located in camps/settlements or in urban areas to the existing main network has been problematic in multiple ways as observed in Jordan and Lebanon. Yet this has been achieved in several areas in each of these countries where such strategies could be integrated into mid- to long-term urban plans (see Appendices 2 and 3).

Taking into account political contexts: While it must be acknowledged that lessons from such initiatives tend to have been context specific, it is important to highlight the different factors facilitating their implementation, and the benefits that have resulted from these. A range of political factors (including political will and political stability) have been particularly crucial, yet often limited in facilitating the process of serving newcomers through pre-existing networks. A dominant factor in the success of supplying newcomers has been where municipalities or local utilities responsible for water supply were devolved sufficient authority and flexibility in decision-making, as opposed to contexts where central governments have restricted or slowed down processes of local decisions, or retained decision-making powers.

Targeting all vulnerable populations: Recognition that addressing water access issues for refugees/IDPs can also benefit existing systems and access by host communities has greatly facilitated initiatives of network expansion. Using such an approach, many actors in Lebanon have managed to mobilise financial resources which could be invested to the benefit of both newcomers and host communities. Furthermore, this has aligned with the growing awareness that vulnerabilities of refugees and IDPs must be addressed in parallel to those of host communities. Such integrated approaches have greatly benefited water-supply systems, eased possible tensions between communities, and reinforced local providers' capacities to intervene in volatile areas.

5.2.3 Working with independent providers

Costs of emergency activities can be very expensive, particularly over prolonged periods. The critical need to work with private operators to make investment from international financial support efficient, sustainable and equitable has been increasingly recognised. A growing number of humanitarian organisations have collaborated with actors from the private sector (UN-Habitat 2011b; Brown *et al*. 2015). UNICEF and implementing NGO partners have reduced recurring operation costs by adopting fixed-price and long-term agreements with local companies. They have formed partnerships with local water truckers and other local companies which has enabled them to reduce activity costs.

Partnerships with large contractors and consultancies have been widespread, but limited attention has generally been paid to supporting the role played by small-scale providers. Given the key role played by formal and informal private actors at the local level in water supply, collaborating with them has presented a number of advantages. Working with private vendors and small-scale operators represents an opportunity for supporting livelihoods and the local economy. It can also provide an opportunity to develop a closer relationship with the private sector and to introduce monitoring of the quality of water provided by independent providers to communities.

5.3 Keeping communities engaged

5.3.1 Mobilising people

Our research has highlighted that the mobilisation of volunteers and the recruitment of individuals have on several occasions been crucial for water provision during conflicts. Although context dependent, and in no case a substitute for the role of actors with formal mandates and professional expertise, involving individuals from communities, civil society organisations or local associations can make service provision more efficient. Experiences of mobilisation of individuals from communities have proven to be necessary but also greatly beneficial to improve water-supply systems.

The creation of water committees in camps has improved communications between stakeholders. On the one hand, this has helped service providers to reach beneficiaries more easily and provide a faster response, whilst on the other hand, the creation of committees has opened a platform to people to make their needs heard by service providers, and for expressing their requirements and concerns.

As seen in Iraq with the creation of WASH service centres (WSC), such an approach has proven to result in positive outcomes where traditional methods of humanitarian

BOX 10. WASH SERVICE CENTRES IN IRAQ

As a consequence of the prolonged conflict, the number of IDPs has steadily increased in Iraq between 2014 and 2015. In 2016, 25 per cent of the population living in the Northern Kurdish region were either displaced Iraqis or Syrian refugees (ACAPS 2016). Humanitarian actors struggle to keep up with the increased demand for assistance in IDP camps and in urban areas.

To coordinate service provision better, UNICEF Iraq opened WASH service centres (WSC). These centres have been recruiting displaced Iraqis and staff from NGOs to serve displacement-affected areas. They have monitored WASH services and facilitated coordination among different stakeholders. Staff have been continuously trained in WASH, for example in water-quality monitoring in camps, rapid needs assessments, and for conducting hygiene-promotion activities.

Such an approach has proved efficient for WASH service provision. It has enabled rapid responses in conflict zones where the need for assistance has been fluctuating: 60,000 Iraqi IDPs in camps and host communities have benefitted from WASH service centres since 2015 and WSC has also helped tackle unemployment challenges among IDPs. There are now 16 WSCs in Iraq. The concept is about to be exported to both Syria and Yemen.

Additional sources: Interview 10, 11 October 2016; UNICEF (2017a).

assistance have failed (Box 10). Training of community representatives, for example for water treatment, has been presented as a way to delegate roles, and to ensure sustainability of practices. By providing an intermediary level between service providers and customers, these WSCs have also facilitated communication channels and coordination between IDPs, local authorities and humanitarian and development agencies.

5.3.2 Community engagement

A key characteristic of well-performing service providers is effective community engagement. Engaging with populations served is proven to provide several crucial benefits.

- Helping to identify and address communities' needs.
- Increasing accountability. Establishing relationships between utilities and customers is crucial to ensure transparency, build trust and improve performance. It is reflected in better responses to customers' demands.
- Enhancing community representation and participation, where people have the opportunity to provide input to influence decisions on how services are provided.
- Addressing tensions.

Stronger engagement of service providers (whether utilities, humanitarian or development actors) with communities being served has helped to raise the awareness of populations of multiple issues. As seen in Jordan during workshops conducted by a local NGO with the community of Al Naqab, matters discussed with community representatives included water storage and conservation challenges, as well as household treatment to prevent diarrhoeal diseases (Appendix 2).

Building better relationships between service providers and consumers eventually helps address common issues so that people can gain access to water, and utilities can increase their revenue. Strengthening local networks not only helps decisions about service provision to be made in a more inclusive way. It is also an opportunity for more efficient and sustainable results on the ground.

5.3.3 Addressing tensions

Countries affected by wars and economic and political crises are exposed to social conflicts amongst populations. While these conflicts can affect service provision, interventions themselves also run the risk of fuelling further tensions. In some locations of Darfur in western Sudan, UNICEF and partners have modified programmes initially aimed at assisting IDPs. This became necessary due to tensions between IDPs and low-income host communities and led UNICEF to design a programme that could equally serve both displaced and host populations with WASH services.

International and local organisations across MENA have developed conflict-management programmes or 'peace-building programmes' to address drivers of conflict by mitigating tensions and disputes arising in communities. Such programmes have enhanced social cohesion and enabled community mobilisation. With regard to water service provision, conflict-management programmes have prevented violence and helped address grievances. As seen in Lebanon (Appendix 3), conflict-management programmes have facilitated providers' interventions within communities and ensured a better transition towards better levels of services.

6

Moving towards resilience building: recommendations

Our study has identified and analysed a wide range of responses that have been made throughout the MENA region to ensure that populations impacted by various crises over recent years have access to at least an acceptable level of water service provision. Some responses have worked well and others less so.

The key lessons learnt and summarised below are aimed to be applicable not only to the traditional short-term emergency response of humanitarian organisations, but also the medium- to long-term more structural support to utilities that also helps to build resilience (both 'soft' and 'hard').

6.1 Building resilience of utilities through efficient resource management

6.1.1 Good contingency planning

Emergency plans and contingency stocks in place enable utilities to reduce risks of service disruptions during a crisis. Contingency planning helps utilities to respond quickly to emergency situations with safe failure. Contingency stocks help to maintain services with spare parts, while appropriate logistical and procurement capacities enable utilities to efficiently obtain specialist equipment. In circumstances where events are unpredictable in advance (eg in Syria), specific plans for particular events may not be possible. However, experience shows that it is good practice for utilities to undertake preparation of emergency plans, which could, if the need arises, be adapted for different situations. Making and updating inventories of resources and capacities at field and central levels help to prepare for local response and to build resilience to shocks.

6.1.2 Improving human resources and internal capacity

Utilities' resilience is stronger where human resources and internal capacity are sustained to a minimum during crises and enhanced over time. Training staff for specific responsibilities that may be assigned when a particular event occurs can be very fruitful. For example, pump operators or water-treatment technicians may be trained to set up and run emergency water systems. Training of staff in emergency assessment and programme implementation speeds up and improves the quality of response. Practical workshops, visits to established emergency programmes, and staff exchanges help to increase knowledge and build confidence. Utilities can create flexibility within the workforce by ensuring people are able to take on multiple or alternative roles. As such, they minimise the risks of dependency on particular individuals which would lead to a fragile system. The strengthening of human resources and internal capacities is also important for organisations that wish to increase engagement with utilities.

6.1.3 Reducing non-revenue water (NRW)

This increases utilities' financial viability and autonomy. Reducing NRW losses – both physical and commercial – within a utility can increase both the amount of water that it has to distribute to customers and increase a utilities'

revenue. Measures such as upgrading meter-reading systems, repairing leakages and improving utility-customer relations can all help to reduce NRW.

6.1.4 Efficient use of water and energy resources

This provides more sustainable solutions. More efficient water-management practices may include:

- More extensive treatment of wastewater and aquifer recharge (catchment-level initiatives)
- Reducing physical losses by reducing leaks (network level initiatives)
- Water conservation
- Rainfall harvesting, and
- Efficient use of greywater (household-level initiatives).

Setting tariffs to cover the costs of production could also provide incentives for citizens to make more efficient use of water. More efficient energy-use practices may include the reduced reliance on back-up generators, the installation of direct power lines, and the development of solar panels. Additionally, facilitating intersectoral dialogue between the water and wastewater sector with the energy sector is important.

6.1.5 Up-to-date data for decision-making

Ensuring data are up to date to help inform decision-making in relation to actual needs is essential. Service provision can considerably benefit from accurate, up-to-date and disaggregated data. This is particularly relevant in newly developed camps and in urban areas where diversity might increase complexity to address everyone's needs. Data include demographic data through surveys or rapid assessments in situations of emergency and data on water access, production and consumption. Data collection, monitoring and management enable utilities to better capture local needs and to identify gaps, and inform future decision-making and planning. This is particularly important in locations such as Lebanon where population movements have caused socio-environmental and economic situations to evolve rapidly.

6.2 Making humanitarian and development interventions sustainable

6.2.1 Understanding needs and gaps

Better understanding of the needs and capacity gaps of utilities by humanitarian and development agencies are required. There is a need for humanitarian and development actors to understand better local service providers' financial viability and business models in order to be able to engage effectively with them, and to support them appropriately when required. Humanitarian and development agencies here refer to donors as well as implementers. The process of coordinating (for example under the cluster approach), and particularly when led by local governments, has helped improve humanitarian and development actors' understanding of the needs of utilities. This also opens opportunities for stronger and well-targeted capacity building of utilities by supporting agencies. Coordination can also improve a utilities' ability to request strategic support from international agencies. Harmonising strategies from the onset of humanitarian interventions can also enhance their sustainability, and where relevant, facilitate handover emergency interventions to utilities and/or development actors.

6.2.2 Improving preparedness and response

Relief-type support which helps services to recover quickly can be complemented by continuous bolstering and adapting emergency preparedness and response capabilities. While necessary to save lives, relief-type interventions need to remain short-term options and not become a de facto solution. Moving away from relief-type interventions is facilitated with early consideration of long-term objectives from the onset of interventions. Early planning of interventions and coordination should enable the development of structural support so that relief-type coping mechanisms become unnecessary as quickly as possible. Front lines of conflicts often move back and forth during protracted conflicts which necessitate support along all three of the preparedness, recovery and stabilisation/development phases during crises. As such, dependency on activities that tend to be costly in resources (eg trucking of water at no costs to refugees/IDPs) will be minimised. Operating within decentralised political, administrative and economic structures, as well as working under flexible funding mechanisms tend to facilitate movements along the relief-to-development continuum.

6.2.3 Targeting both host and displaced populations

Development programmes that target both displaced and host populations simultaneously can provide more viable, equitable and sustainable outcomes. Humanitarian and development interventions should try to benefit the needs of both refugees/IDPs populations and host communities co-living in urban areas. This is particularly true in contexts where refugees/IDPs are settling in urban areas amongst host populations. Approaches should target the most vulnerable in a specific area of intervention regardless of where they come from. This approach can prevent the emergence of tensions between refugees/IDPs and host communities, and enhance social cohesion and strategic city development. This can also enable stronger coordination with local authorities, and make the investment of financial aid more sustainable.

6.3 Working more closely with the private sector

6.3.1 Partnerships provide multiple benefits

Partnerships with the private sector, and more particularly with independent providers (formal and informal) provide multiple benefits for utilities. Humanitarian and development agencies should work more closely with small-scale providers and construction companies, seek to understand their requirements, avoid duplicating service distribution systems, and support them where appropriate. Working with independent operators also provides them with multiple opportunities, including maximising the use of local knowledge, and serving hard-to-reach areas.

6.3.2 Improved regulation and monitoring

The development or enforcement of regulatory frameworks to monitor independent water provision activities is required. Improved regulation and monitoring of independent providers can help the local and national authorities to keep better track of activities at local level. It can also help them to understand more completely the services being provided and the extent to which they meet the needs of populations. It provides opportunities for ensuring water is extracted, transported and distributed according to the required standards, for example with regard to the quality of drinking water, and the prices at which water is sold.

6.4 Maintaining strong relationships with communities

6.4.1 Building relationships with communities

Closer engagement of utilities with communities is necessary to maintain relationships, improve accountability and trust. This can benefit utilities in multiple ways, enabling them to better understand and respond to the diversity of people's needs and requirements, increase mutual trust, and enhance accountability and transparency. While this helps to improve utilities' performance, interactions also inform decision-making and provide opportunities to make it more adapted to local demand and respond to needs more equitably.

6.4.2 Community mobilisation

Community mobilisation can render water services more efficient where social tensions affect service provision. The mobilisation of volunteers or the recruitment of individuals have on several occasions improved water services during conflicts. Although context dependent, involving individuals from communities, civil society organisations or associations can make service provision more efficient and better targeted. For example, by providing an intermediary level between service providers and people, committees can facilitate communication channels and coordination between stakeholders

Appendix 1. Methodology

The study was conducted over an eight-month period. Steps were grouped in three main phases as represented below.

Phase I: Desk-based research

Phase I of the research consisted of a literature review focusing on water service-provision systems under stress and resilient systems. A range of academic articles and books, international organisations' reports and grey literature on MENA, and water supply in contexts of conflicts (pre-, during and post-) enabled us to identify case studies to analyse. Syria, Iraq, Yemen and the State of Palestine were selected, as well as Jordan and Lebanon as the two country cases to be explored in depth. Literature on resilience and on water governance helped develop the conceptual framework.

Four main groups of actors involved in water service provision were identified during Phase I: UN agencies, international organisations and NGOs; national governments and regulators; local service providers (mainly utilities); and local NGOs, water committees and CSOs. Questionnaires were also prepared during this phase, with sets of questions identified for each of these four groups. These were designed to identify key lessons learnt by actors from the region.

Phase II: Field research

A training workshop with UNICEF and their partners was conducted separately by WSUP on urban WASH (9–13 October 2015). A first set of interviews was conducted with actors from the six countries, as well as actors intervening in Libya, Egypt, Sudan and Djibouti. The workshop itself enabled us to collect further information as participants shared knowledge and field experience across countries.

Fieldwork in Jordan and Lebanon consisted of in-depth research and validation of preliminary results. Areas visited in Jordan were Amman, Mafraq and Zarqa governorates including Zaatari camp. The researchers interviewed actors from the four groups involved in water provision in each of the areas visited. They also participated in a workshop as observers conducted in Al-Naqaab by Oxfam GB and Future Pioneers with a group of women from the local community. Places visited in Lebanon have included Beirut, Zahle, Tripoli and Saida. A total of 69 individuals were interviewed for the research. In parallel to the field visits, 80 questionnaires were sent to actors from the region. Answers to 19 questionnaires were collected. The authors chose to keep names and positions of respondents anonymous.

Phase III: Write-up and presentation of results

Information from the literature review, questionnaires and interviews was triangulated to identify lines of evidence where different sources could lead to converging conclusions. Findings were grouped thematically and analysed using the resilience conceptual framework developed for the study.

Results were presented for validation during a one-day workshop in Amman on 15th March 2017. Approximately 100 participants from the MENA region attended the workshop and discussed the results per country. Results were then compiled in this working paper and an accompanying briefing paper.[2]

[2] See: http://pubs.iied.org/pdfs/17425IIED.pdf

Appendix 2. Jordan case study

Introduction and key findings

The Hashemite Kingdom of Jordan, commonly known as 'Jordan', is located on the western bank of the Jordan River. An upper-middle-income country of an estimated 8 million inhabitants, Jordan has limited natural resources but has reached high economic development with trade, foreign direct investment and tourism. Its economy also depends heavily on expatriate worker remittances and grants. It imports nearly all of its energy (96 per cent, consuming about 20 per cent of its GDP), as well as large proportions of its water and grain (UNHCR 2013).

Similar to Lebanon, war in Syria has impacted Jordan through the high influx of Syrians seeking refuge in the country. Situated at the crossroads of the MENA region, Jordan has a long history of providing asylum to persecuted people, and demonstrated commitment in responding to the Syrian refugee crisis in 2011. According to the 2015 national census, 1.2 million Syrian refugees live in the country (Interview 24, 16 October 2016). While many Syrians in Jordan are currently spread amongst the three main refugee camps (including Zaatari, one of the largest camps in the world), the majority lives in urban areas in Amman, North and Central governorates. As the number of refugees has grown, public services have been increasingly strained and the government's position towards refugees has changed with time.

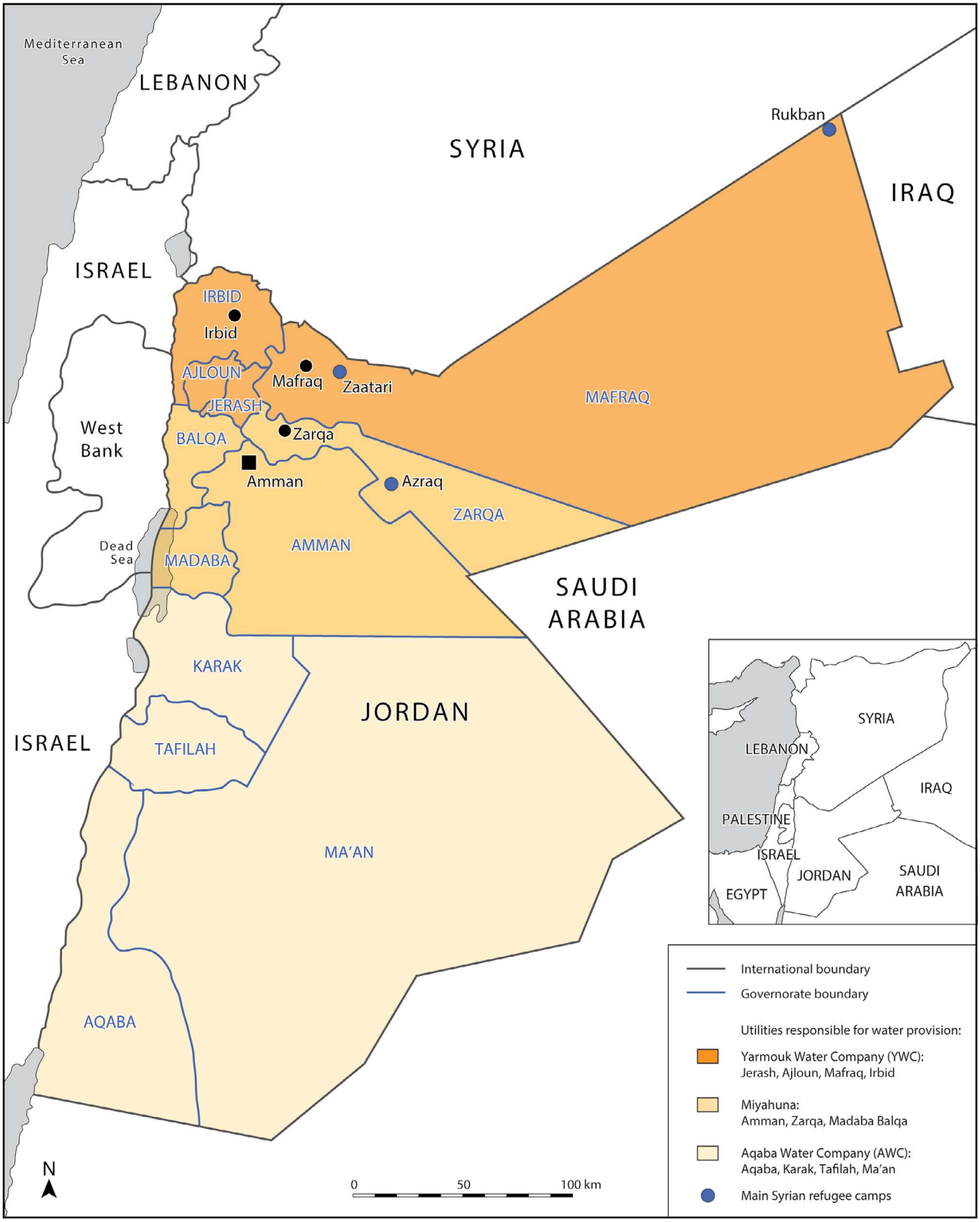
As with other MENA countries, Jordan's difficulties in supplying water to its populations is a long-existing problem. Current water issues in Jordan result from decades of stress applied to water resources, which the 'shock' of the refugee influx has exacerbated. Jordan is among the five most water-scarce countries in the world. Similar to Lebanon, Jordan has focused on increasing production as opposed to improving the efficiency of water-supply systems. The country has invested in large-scale infrastructure development to fill gaps in demand. However, this approach has not been sufficient to meet long-term needs.

The country is now facing major barriers for sustaining supply for the future. Poorly resilient, water utilities in the country have been torn by multiple challenges of resource management. Whilst water resources are depleting at alarming rates, financial debts continue to increase along with the population's frustration with the government failing to provide an acceptable level of water services. Both refugees and host communities are paying a high price for major problems in water supply. Nevertheless, the crisis has also shed light on embedded vulnerabilities, and provided opportunities for change towards sustainable and inclusive resilience building.

BOX 11. JORDAN CASE STUDY: KEY FINDINGS

- Water scarcity and financial constraints are predominantly reported as the direct causes of Jordan's water sector's important challenges throughout the Syrian refugee crisis. However, these challenges have importantly developed in pre-existing contexts of flawed water-management practices and weak legal frameworks. There are also internal barriers to the resilience building of utilities, where long-term planning is still limited.
- Government entities still focus on increasing production, which has remained insufficient to sustainably supply populations (eg Disi aquifer project), whereas strategic opportunities to manage demand and tackle inefficient water use at network level are yet to be developed more widely.
- Water service providers have benefitted from donors investing in more sustainable water-supply systems targeting both refugees (eg Zaatari camp) and host communities.
- Utilities' engagement with communities, often facilitated by NGOs, has been identified as a key factor to improve accountability and increase trust between parties. This is necessary to maintain relationships that enhance the viability of service providers.

Map 2. Map of Jordan showing governorate borders, water utilities and main Syrian refugee camps



Setting the context of the 'refugee crisis'

Pre-existing challenges in meeting water demand

Jordan is located in an arid climatic region and gets little water from rivers and streams. Groundwater is the main source of water but aquifer levels are dropping precipitously, resulting in higher salinity and reducing the amount of drinkable water. More than 200 public and private boreholes dried out in 2015 (Interview 24, 16 October 2016). Whilst many argue this is caused by rainfall rates having dramatically decreased over the past years, others point out this is mainly due to overexploitation by the agricultural sector. The United States Geological Survey (cited in Mercy Corps, 2014) estimated that at this rate, 40 per cent of Jordan's groundwater basins would be depleted by 2030, and completed exhausted by 2060.

The government has been developing major infrastructure projects to reduce stress on current water resources and closing the water demand-supply gap. These include the large-capital Red Sea-Dead Sea project, as well as the Disi aquifer project which has only succeeded in supplying populations over a short period of time (Box 12). The majority of water used by the country is still used for irrigation although this has been largely reduced over the past two decades (previously 80 per cent, currently about 60 per cent) (Anonymous 2017a). While re-use of treated wastewater for irrigation is widely applied in Jordan, long-term efficiency strategies in water resource management remain insufficient.

The country used to provide a high level of supply to its population and for all sectors until independence from the United Kingdom in 1946. Higher consumption trends associated with the country's economic development have incrementally added stress on water resources. Jordan has also one of the fastest growing population rates in the Middle East. Without the recent influx of Syrian refugees, population growth rates were estimated as likely to reach 10.6 million and 17 million in 2030 and 2050 respectively (Farishta 2014). Furthermore, past migration from Palestine (nearly 2 million Palestinians live in the country) and from Iraq has added stress on resources. Rates of supply per capita have continuously decreased at a substantial rate.

Jordan's water sector: institutions and utilities

At national level, the Ministry of Water and Irrigation (MWI) is responsible for the overall strategic direction and planning for water and sanitation in the country. As a regulatory body, it develops laws, by-laws and policies. It sets international and national private-sector partnerships and supervises the implementation of programmes. MWI operates in coordination with the Water Authority of Jordan (WAJ) and the Jordan Valley Authority. In charge of the operational management side of the water sector, WAJ is financially and administratively autonomous. WAJ controls the construction and quality of service-provision projects, and supervises water utilities and companies through the Programme Management Unit (PMU). The Jordan Valley Authority is responsible for providing bulk water in the Jordan Valley.

There are three water utilities in Jordan responsible for water provision in the entire country (see Figure 8). Miyahuna is a state utility, fully owned by WAJ. It is in charge of water distribution and wastewater in Amman, Zarqa, Madaba and Balqa. With 640,000 customers, it operates through commercial entities. Yarmouk Water Company (YWC), previously supported by the private French company Veolia to enhance its service

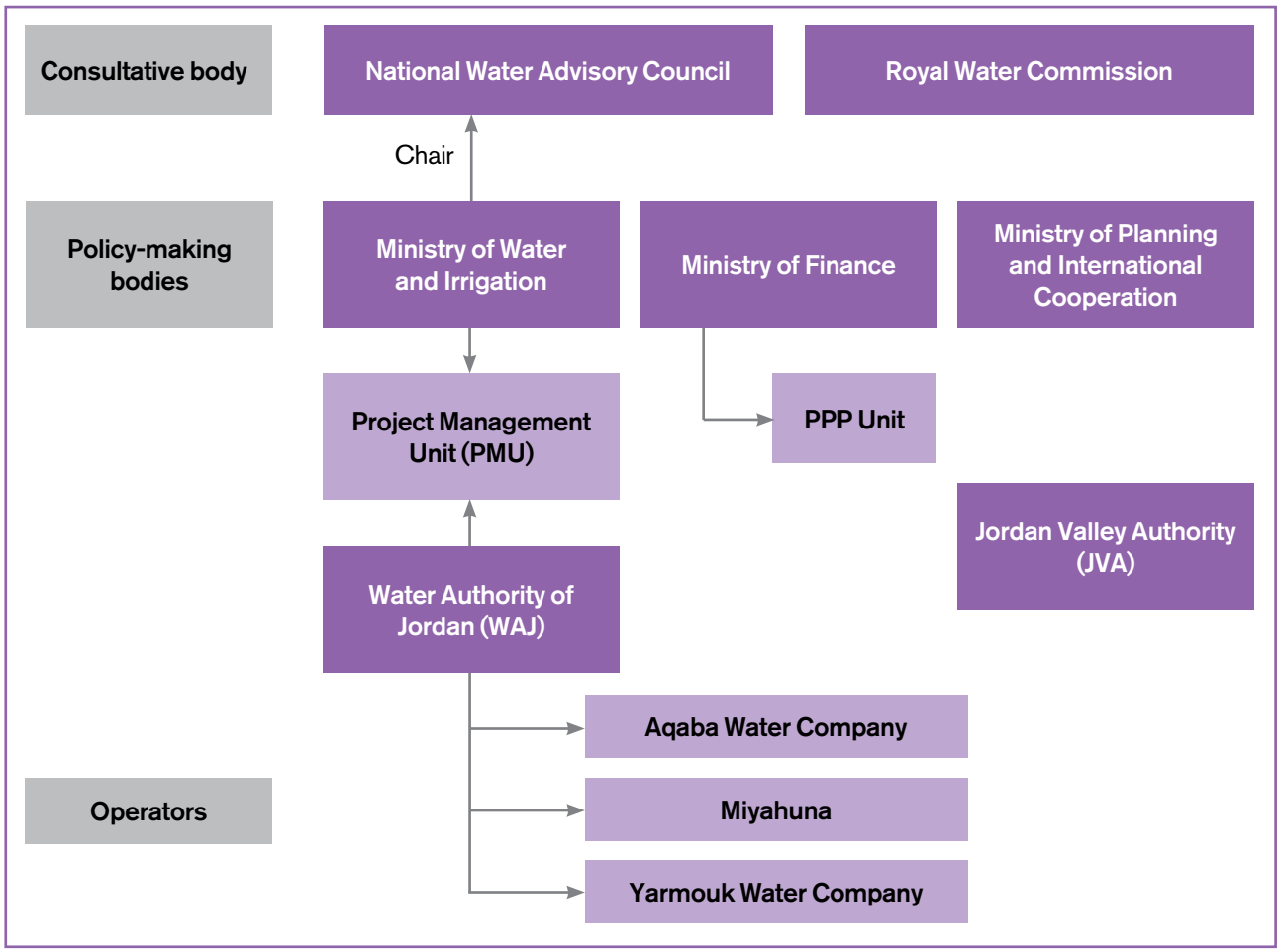
BOX 12: THE DISI AQUIFER PROJECT: A SHORT-TERM SOLUTION FOR A LONG-TERM PROBLEM

Faced with increased pressure on its water sector, the government negotiated a project of extracting water from a large aquifer in South Jordan to supply Amman and other cities in the northern part of the country. The Disi aquifer project aimed to relieve the stress on resources and fill the gap in domestic water needs until 2022. The project started developing in the 1990s, long before the refugee crisis, and without anticipating the Syria conflicts and their impacts.

The Disi project cost US$ 1 billion and aimed to pump 100mcm of water per year for at least 50 years (Ellingson and Abadesco undated; Interview 24, 16 Otober 2016). It was inaugurated in 2013 by King Abdullah of Jordan. Less than three years following the inauguration, water resources were already depleted (Miyahuna, interview, 9 October 2016).

The project has been controversial for many reasons. Amongst other critics, de Gooijer *et al.* (2009) reported the lack of data sharing and transparency on estimated pumping rates, hiding the project's short lifespan. The aquifer contains fossil water, a non-renewable resource (Mercy Corps 2014). While water supplied from the Disi project has helped to mitigate pressure on resources during the refugee crisis, it has also highlighted the unsustainability of such initiatives in covering the long-term needs of populations.

Figure 8. Main institutions in the water sector in Jordan



Source: OECD (2014).

performance, became state-owned in 2010. Like Miyahuna, it is fully owned and managed by WAJ. YWC covers Jerash, Ajloun, Mafraq and Irbid governorates. It serves around 350,000 customers (Yarmouk Water Company 2017). Aqaba Water Company is also operating under WAJ. Supplying water to approximately 130,000 customers, it operates in Aqaba, Karak, Tafileh and Ma'an governorates (MWI 2016). Together, the three utilities serve between 1.12 and 1.2 million people: a small percentage of the total population.

Jordan's National Water Strategy 2016–2025 recognises the sector is characterised by overlapping responsibilities and administrative gaps (MWI 2016). Most decision-making for the water sector remains at the national level, giving little room for manoeuvre for the three utilities. Changes made in the by-law of 2014 aimed at addressing these by strengthening the leadership of MWI in strategic planning, water allocation and data management. These have in fact accentuated centralisation and weakened service provision at the local level.

A growing role for the private sector

The private sector has an important role in the water sector, from financing to operating. The country has adopted a strong private-sector participation approach, with the involvement of both small- and large-scale companies. Large-scale companies are largely involved through management contracts and concessions such as build-operate-transfer (BOT) projects, including the Disi aquifer project. The country relies heavily on expertise from the private sector, including that of international actors. However, many suggest a stronger involvement of the private sector to address water-supply issues which the government cannot address (OECD 2014).

Highly overlooked, informal operators and providers also play a role in the water sector in Jordan. Despite high connection rates in the country (97 per cent of the population live in zones connected to the network), water does not flow at reliable frequency in pipes (Interview 24, 16 October 2016). Therefore, private tanker water providers are often found as alternative small-scale providers in both rural and urban areas.

Influx of Syrian refugees: impacts and responses

Beginning of the crisis: movements and settlements

The Jordan government adopted an open-border policy and humanitarian stance towards refugees at the start of the Syrian war. Although Jordan is not a signatory of the UN's 1951 Geneva Convention on Refugees, it demonstrated an early progressive stance. Syrian refugees entered Jordan at high daily arrival rates from 2012 until 2014. Humanitarian agencies were meeting refugees at official crossing points and sending them to refugee camps. When it became clear the influx was accelerating in July 2012, UNHCR and the government opened Zaatari refugee camp, one of the largest in the world. Later on, Azraq camp was built to host about 50,000 people (Interview 30, 24 October 2016). WASH services in camps have been provided by humanitarian agencies, led by UNICEF.

Humanitarian support provided to camps has been more substantial than for refugees living outside who represent the majority (more than 80 per cent of the total refugees are in urban areas). Syrians have mostly sought integration within host communities in central and northern governorates. Together, Amman, Irbid, Mafraq and Zarqa have hosted more than 85 per cent of the refugees registered outside the camps (UNHCR 2017). According to UNICEF, most refugees live in rented accommodation (84.6 per cent in 2013), but a few have also lived in informal tented settlements (ITS) or in sub-standard accommodation (eg garages, chicken houses).

Higher water demand

As of February 2017, UNHCR reported more than 655,000 Syrians being registered in Jordan (UNHCR 2017). The government estimates that this figure is largely underestimated and that 1.4 million Syrians could actually be residing in the country (JRPSC 2016). Since many refugees in Jordan are not registered and a large number settled in the country prior to 2011, figures remain uncertain.

The continued influx of refugees for nearly six years has had a significant impact on demand for public services from existing systems in Jordan. The arrival of refugees is estimated as having doubled or even quadrupled the demand for water in some parts of Jordan. YWC, the water utility in charge of the north governorates, is responsible for the majority of the refugee-affected areas, and has faced the biggest challenges in keeping up with the demand. Without counting the camps, the number of people to serve in Mafraq would have increased from 60,000 in 2012 to 250,000 in 2016 (Interview 31, 24 October 2016). Miyahuna has seen the number of people to serve in the capital Amman growing from 2 million to 3.6 million (Interview 1, 9 October 2016).

Utilities keeping up with strained systems

The level of water services provided by utilities has decreased at a steady rate since the influx of refugees. Jordanians require an average minimum of 100 litres of water per capita per day. Utilities were previously able to meet such needs to the Jordanian population by overexploiting groundwater, but daily water supply has now dropped to as low as 30 litres per capita through the network in some areas (Interview 24, 16 October 2016). In several cities in the northern part of the country, service hours have decreased to eight hours of supply per week (Interviews 1 and 27, 9 and 20 October 2016; Questionnaire 18, 7 February 2017). In other parts of the country, the frequency of water supplied through the network has gone down to as low as once every four weeks in summer.

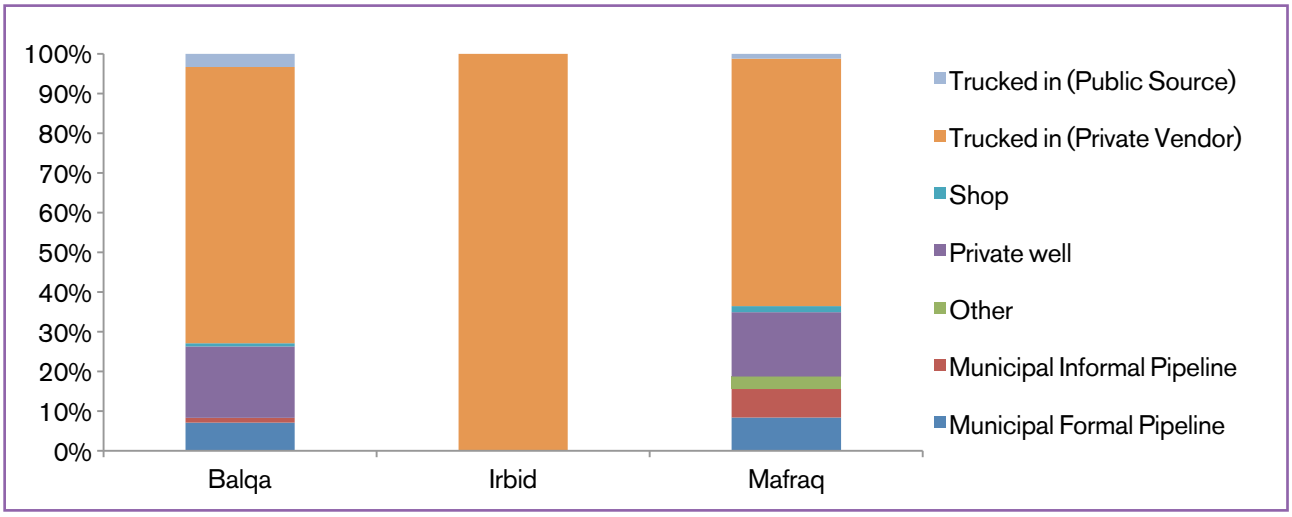
Increased pressure on the old and undersized infrastructure to satisfy higher demand has stretched the system to a maximum, causing outbursts and pipeline breaks in many parts of the network. Representatives from Miyahuna explain that outbursts in the system have required more water to be inputted into the system to maintain the pressure, causing more loss of resources. Due to the accumulation of impacts, response time to repair damaged infrastructure has increased, causing decreases in the level of services.

YWC and Miyahuna have had to decrease the frequency of supply in the system, leading to further issues such as water theft. Utilities report that water cuts have sometimes led to illegal connections and the manipulation of valves, which have strained distribution systems by increasing NRW rates (Mercy Corps 2014; Interviews 31, 1 and 23; 24, 9 and 16 October 2016). In Mafraq, increases in both leakages and illegal connections have led NRW rates to reach 70 per cent. Added to this, the country has experienced a critical economic crisis, hindering the financial sustainability of the water sector. YWC faces a growing fiscal debt, and rising operational and capital costs are putting more pressure on utilities' financial situation.

Change of direction of humanitarian and development programming

A large mobilisation of the humanitarian sector occurred in Jordan (about 60 international NGOs and UN agencies), and financial aid coming to Jordan reached hundreds of millions of dollars. ECHO states that it has funded €657 million to Jordan since the start of the crisis (ECHO 2017). Arab donor countries have also largely mobilised funding for Jordan. Nevertheless, response has eroded over the past few years despite the continuity of the crisis. The latest plan prepared by the government states US$8 billion are needed for the period 2016–2018, including nearly US$750 million for WASH. However, only part of these

Figure 9. Water source variation in informal tented settlements (ITS) in Jordan governorates



Source: REACH (2013).

funds has been received (Interview 27, 20 October 2016). In relation to decreased funding, humanitarian actors, and particularly UN agencies and international NGOs, have had to re-orientate their programmes as the crisis has evolved. While humanitarian assistance was largely focused on filling water-supply gaps for refugees – and particularly in camps – during the first phases of the crisis, programmes then started to target host communities in parallel to refugees.

The government's position with regard to the crisis has changed incrementally as the crisis has continued. Over the course of the conflict in Syria, Jordan has become increasingly wary of the permanence of refugee populations. Nevertheless, it has continued leveraging international aid through various plans. Humanitarian assistance has continued being supervised by government authorities which have increasingly restricted protection space for refugees. Jordan started displacing refugees to camps, sending some back to Syria and halting border crossings, and even restricting services available to Syrians, including medical care. This 'refoulement' approach has profoundly affected Syrians' coping mechanisms, who have faced growing barriers to basic subsistence (Francis 2015; Achilli 2015).

Reliance on the private sector

The private sector has also played an important role in responding to the crisis. In camps, humanitarian actors established partnerships with local contractors for water supply, where access to the formal network was limited. Water generally came from private wells, transported and delivered to tanks by private truckers in camps, up until the development of new delivery systems.

Utilities have also worked with private operators to fill the gap in water supply in urban and rural areas. Authorised and licensed private truckers have transported water to public water points, such as mosques and schools (Interview 24, 16 October 2016). Monitoring, including for water quality, has been strong with regard to these private operators. Informal service providers (truck owners and private vendors) have also largely supplied water to populations in urban areas, but water quality and tariffs have been harder to control. This has led many operators to sell water at much higher rates than those of utilities, thereby posing inequality issues, and particularly to low-income households.

Communities' coping mechanisms

Populations have had to develop strategies when faced with lack of access to water. Refugees living in rented accommodation are usually connected to the water-supply system or pay landlords for water bills. During times when there is a deficit of water through the main network, both host communities and refugees generally purchase water from private truckers, particularly during summer when water resources are lower. Tank owners sometimes mix water coming from the network with water from private vendors. People also purchase bottled water for drinking (Wildman 2013; Interview 24, 16 October 2016).

REACH (2013) reports that refugees in ITS would be the most vulnerable to lack of access to water. Usually living in ITS because they are unable to afford appropriate shelter, refugees living in tents have little income and are therefore less able to afford water at high prices. Yet private water vendors are the primary source of drinking, washing and cooking water for a majority of ITS in Jordan (Figure 9). In Balqa, 70.5 per cent of respondents to a survey reported borrowing water or money from relatives, friends or neighbours when faced with such constraints.

Unpacking challenges faced by service providers

In a number of MENA countries, highly centralised governance systems and politics have constrained the scope for responding to the crises. In Jordan, the Syrian refugee influx has illuminated a crisis of water governance at several levels. This has been mirrored in the struggle by utilities to maintain services, partly due to high operational costs, low recovery rates, and growing dependency on central authorities and external financial support. Responses to the refugee crisis have for the majority not broken patterns of cumulative impacts, but rather reproduced vulnerabilities as services continue to decline. Barriers limiting the scope of responses by utilities must be scrutinised in order to identify opportunities for change.

Gap between support required by utilities and external assistance

The government entities interviewed for our research have reported a gap between the help required for their operations, and the actual support provided by humanitarian and development organisations. YWC explains that many international NGOs have offered assistance, but retreated after a short period of interventions without having made a significant contribution to the system. Where time and financial resources are limited, YWC argues infrastructure repair or the provision of spare parts represent fast and more efficient strategies of support (Interview 31, 24 October 2016). Miyahuna complains about the lack of understanding of the local context by many NGOs intervening in the country and calls for more culturally sensitive stakeholder engagement. Cultural understanding should come at the forefront of strategic interventions, particularly when engaging with communities (Interview 1, 9 October 2016).

PMU describes the need for hardware initiatives to update the water network, now undersized due to higher pressure on the system. It argues strategic interventions are those focusing on the installation of more efficient pumps and the control of leakages (Interview 27, 20 October 2016). Similarly, utilities have argued that helpful support has been where hard measures were prioritised (at least 70 per cent of whole programme), along with – but to a lesser extent – some software support such as training. However, they consider 'soft' measures will only be appropriate if well adapted to the context and long lasting. Meeting such demand has been challenging for several NGOs with different agendas, which must also meet donors' expectations. A number of NGOs explain they have had to balance 'hardware' and 'software' initiatives in order to pursue their interventions, despite their expertise in structural support. Although not rare in the humanitarian and development sectors, such issues have prevented the smooth movement from relief to development phases in Jordan.

Weak management systems

There is general agreement that the water sector needs restructuring at multiple levels. Issues to address by utilities include leakages and commercial losses, metering systems and tariffs. Utilities' poor cost-recovery systems are in large part caused by issues with current tariff and metering systems. Utilities do not have a strong metering system to enable them to accurately calculate how much water is produced and how much water is consumed. This has led to unbilled consumption, leading to important commercial losses. As another form of commercial loss, illegal connections have also highly impacted utilities' cost-recovery systems. The number of illegal connections has increased for multiple reasons including utilities' lower capacity to serve new customers as the crisis has impacted on levels of service provision. Poor relationships between utilities and customers have also led to the non-payment of bills.

Different tariffs are set for industrial, agricultural and domestic consumptions. Tariffs are progressive, meaning higher consumption is more expensive. It aims to facilitate payment by low-income customers by subsidising the minimum-needed consumption at a fixed price. This structure supposedly guarantees recovery of such subsidies from wealthier customers. Despite such pricing structures, tariffs are currently considered as too low to enable sufficient cost-recovery by utilities. The MWI eventually subsidises water costs to minimise impacts on their financial resources. While preserving pro-poor tariffs is crucial for several reasons ranging from equity to social cohesion, the tariff system must improve to reflect actual consumption (Interview 24, 16 October 2016).

It is worth noting that important political challenges must be taken into account. Government authorities are reluctant to change tariffs or reinforce metering systems due to a fear of people's reprisals (Interview 1, 9 October 2016). Nevertheless, tariffs need to be modified and metering systems reinforced to minimise utilities' financial burden. This should start with non-domestic users, and particularly the agricultural and industrial sectors. It must be accompanied by parallel actions including stronger engagement of utilities with customers to smooth the process. Where the public is aware of and consulted about changes through in-depth engagement, there is better scope to discuss affordability and quality of service provision. Some platforms already exist but remain dispersed and overlooked. While accountability to the public in Jordan's water sector has been weak, the capacity of the government in communicating with stakeholders will be critical to the success of reforms (OECD 2014).

Complex involvement of the private sector

While Jordan has much experience of private-sector participation, the involvement of private operators in

the water sector has also raised important questions. As Jordan is facing an economic crisis threatening the sustainability of the water sector, it has increasingly relied on international grants and investment through the development of large-scale projects. For these, priority has been increasingly given to the involvement of large companies to meet upfront costs and to transfer technical knowledge which the government is currently lacking (Interview 27, 20 October 2016).

If private-sector participation is to increase – and particularly that of large companies – different challenges and risks must be taken into account. As identified by OECD (2014), conditions need to be put in place with regard to the regulatory framework, administrative capacity, financial sustainability and strategic planning of projects. Experiences of public-private partnerships (PPPs) have highlighted the risks of jeopardising the financial viability of projects, and raised concerns about its affordability for users. Contract management challenges also include the negotiation of realistic targets and liability of the different partners in service performance.

Large-scale actors from the private sector tend to be given higher priority in comparison to small-scale actors, whose role is unclear. As recognition of their support during the crisis, the government has offered cheaper rates to private operators who purchase water and sell it on to populations. UNICEF reports that some private vendors have used this opportunity to collect higher fees and increase their financial benefits (Interview 24, 16 October 2016). In this regard, tariffs and revenue collection by small-scale operators have been poorly monitored. Nevertheless, authorities have retained control of the quality of water delivered by private trucks, which has proven to be successful by the absence of disease outbreaks since the start of the crisis.

Reliance on depleting resources

The sector has been challenged by inefficient water-resource management for some time. Analysts have warned Jordan about shrinking renewable resources and quickly growing populations, which require careful management. The recent refugee crisis has reinforced this trend. According to the University of Jordan freshwater was to deplete as early as 2060, even before the refugee crisis (Mercy Corps 2014). Since the crisis began, studies on water availability in Jordan indicate that depletion is likely to happen much earlier (Farishta 2014).

Long before the crisis, groundwater depletion was a major concern for Jordan's water resource availability since water extraction rates were already exceeding replenishing rates. In 2007, the National Water Strategy stated that 'groundwater extraction for agriculture is beyond acceptable limits resulting in a groundwater deficit of 151mcm' (Ministry of Water and Irrigation 2009). Declining groundwater levels have also increased risks of saltwater intrusion into aquifers, affected the quality of water and reduced amounts of available freshwater. WAJ has taken a number of initiatives to address these issues, including in-depth hydrological studies, the installation of meters on wells and the adoption of by-laws to better control over-abstraction and reduce pollution (El-Naqa and Al-Shayeb 2009). However, increased reliance on groundwater resources has proven that these initiatives were not sufficient and should be taken in parallel with other measures.

A big challenge for utilities is to address leakages in their systems. While ageing water networks is one cause of this issue, poor maintenance and mismanagement are also major causes for water losses. Jordan loses about 120 million cubic litres of water per year due to leakages (Anonymous 2017b). In Mafraq, YWC reports pipes are too small to stand higher water input, thus higher pressure is applied but requires considerable amounts of electrical power. The water sector is currently consuming about 15 per cent of Jordan's power due to inefficient pumping (GIZ 2016). Billions of litres of water extracted from wells never reach household taps, but actually spill out of broken pipes. Jordan's NRW is currently estimated between 50 and 60 per cent (Interviews 23 and 24, 16 October 2016; Interview 35, 27 October 2016). Poor sewerage systems expose the network to additional risks, including contamination during flooding periods, and thereby limiting amounts of freshwater.

Social fragmentation

Tensions amongst groups – and particularly the most affected – tend to emerge during times of instability where competition over resources increases. Water has been a direct cause of grievance and tensions between vulnerable groups in Jordan. Firstly, Jordanians have decades of experience in water rationing, but Syrians come from a water-rich country where conservation practices are generally less common. The perception that Syrians have been misusing water has increased social fragmentation between hosts and refugees. Syrian refugees are highly concentrated in the country's most vulnerable communities, where the Jordanian population's resentment towards refugees has generally grown (Francis 2015).

Another social issue commonly observed is where refugees are being exploited. UNICEF reports cases where Syrians pay landlords for water consumption who then do not transfer payments received to utilities. Higher rent prices set by landlords have also been commonly observed, as well as lower wages for more demanding labour by employers (Mercy Corps 2014). Furthermore, resentment of government authorities has led to further social fragmentation. Jordanians' frustration with the government has grown alongside the length of the crisis. The poor level of service provision has meant populations must rely on alternative sources of water. This has affected revenue collection where customers refuse to pay bills to utilities, an additional issue that has affected utilities' cost-recovery capacities.

Successes and way forward

Moving towards efficient resource management

As argued above, Jordan's water challenges go beyond physical water scarcity. The multi-layered water crisis requires an integrated response with smart investment using the different resources available in order to build short- and longer-term resilience to future risks. Utilities need to move towards autonomous and sustainable financial management. As donor funding is an important share of capital funding in Jordan's water sector, its use must be strategic. At the same time, there is scope to strengthen cost reduction, and enhance operational and service efficiency. As the current tariff structure does not meet the growing costs of the sector, there is wide agreement on the need for a reform. Analysing the impact of existing tariff and subsidy structures will help build stronger structures and address financial problems faced by utilities.

Strategic investment will include addressing NRW. In 2014, Mercy Corps estimated that addressing the amount of water lost through leakages in the network could satisfy the needs of 2.6 million people in the country (Interview 31, 24 October 2016; Mercy Corps 2014). Supported by international donors, Miyahuna argues for prioritising the reduction of water losses by renovating its network. GIZ has also provided support to WAJ for maximising energy consumption for efficient pumping through pilot projects in different parts of the country.

Sustainable and more equitable humanitarian interventions

Experience has proven that humanitarian responses have been more successful when keeping exiting strategies in focus so to avoid dependency on external and unsustainable support. In MENA, the length of conflicts has repeatedly locked humanitarian and local actors in vicious cycles. As seen in the Bekaa Valley of Lebanon, international organisations have faced challenges in moving away from water-trucking operations due to the range of barriers preventing them from developing viable solutions to serve refugees.

In Jordan too, humanitarian activities aimed at servicing refugees with more sustainable supply systems have faced constraints. Initiatives to expand existing water networks have required the government's commitment. However, several constraints have emerged for utilities: the need to mobilise new resources (water, finance and infrastructure); the risk of further tensions emerging between hosts and refugees; and the political implication of legitimising refugees' permanent/long-term settlement in the country.

However, connecting refugees to municipal networks – both in urban areas and in camps – can also represent significant short- and long-term benefits to the range of actors involved. To humanitarian actors, this represents the opportunity to lighten a financial and human resource burden. It also enables them to plan for longer-term strategies which can also benefit utilities. To utilities, this not only represents an equitable approach, it also enables more control over the mechanisms of water provision, as well as its quality.

In Zaatari camp, advocacy strategies have enabled international agencies to move towards more sustainable investment in their programmes. UNICEF and its implementing partners started by drilling and using internal water sources to build a self-sustained network in the camp, and thereby enabling the frequent and higher supply of water to refugees. While Zaatari camp has to be considered as an isolated success example, it is important to highlight the lessons learnt from this case, as well as identify the range of enabling factors (Box 13).

Community engagement

Actors involved in water supply found multiple ways of addressing social fragmentation so as to benefit service provision. Efficient engagement of stakeholders has been identified as one of the key mechanisms benefiting planning and water-management processes. This approach has also enabled stakeholders to enter in contact with each other to better understand mutual challenges, and provided opportunities to discuss sustainable solutions that can be implemented collectively. Through community engagement, service providers have been able to communicate with customers on the way they are affected by decisions, or to consult them on the implementation of future decisions. As such, utilities' accountability and people's trust have both increased. Community engagement is also being used as a means to gather useful data and ideas, and even enhance the public-sector image. It is increasingly recognised as a success factor controlling the sustainability of any development project.

A number of humanitarian and development NGOs working in Jordan have worked on enabling utilities' engagement with communities. Local NGO Future Pioneers has been running projects in several urban areas to facilitate community engagement for water provision in partnership with Oxfam GB and the government of Canada (Box 14). Such initiatives have created an environment that incentivises the transformation of the Jordanian water sector.

Conclusion

Many challenges face the actors involved in water supply in Jordan, contributing to unsustainable and inequitable service provision. Without these challenges being addressed, we argue that the refugee crisis will continue to impact service supply in the country and increase local vulnerabilities. Therefore, future initiatives taken by utilities

or those supporting them must take into account such challenges in order to move towards resilience building.

Despite these challenges, there are multiple opportunities for water utilities, and particularly Miyahuna and Yarmouk Water Company, to break patterns of cumulative impacts on service-provision systems. Moving away from the systematic development of new water sources, a stronger focus on strategic management of existing resources will enable more sustainable responses to the current water crisis faced by the sector.

While supported by other government entities such as WAJ and PMU, the different utilities can build resilience to further increases in population in gaining fiscal, administrative and political autonomy. Stronger donor commitment supporting international and local organisations will help the ministry's response in building resilience in host communities.

Continuous engagement with local actors, including partnerships with small-scale providers and building relationships with customers, has proven to provide space for more targeted and efficient initiatives, as well as strengthening social cohesion.

Water tanks were previously used to supply water to households in Zaatari camp before the development of a self-sustained network © Loan Diep

BOX 13: ACHIEVING WATER FOR ALL IN ZAATARI CAMP

During the early days of the Zaatari refugee camp in July 2012, supply was ensured through communal water points built to meet the immediate needs of the rapidly growing refugee population which reached a peak of 130,000 in 2013. Communal blocks for washing and collecting water quickly appeared to be an inappropriate solution, partly because of their cultural unsuitability.

A system of water-trucking operations in the camp was then created but several issues quickly emerged. For example, monitoring issues led to unequal distribution of water amongst households. To resolve this, a customised mobile and web-based technology was created to digitalise, aggregate and analyse information on amounts of water supplied by trucks in each block. When interviewed, French NGO Acted explained that this helped ensure daily access to a minimum of 35 litres per person throughout the entire camp.

Although the achievements were considerable, the system remained economically unsustainable. Health risks due to water contamination also persisted in a number of ways. In order to move towards a stabilisation phase with less expensive practices, UNICEF and implementing partners successfully negotiated with Yarmouk Water Company to design and build the infrastructure required to supply the camp sustainably. As part of Phase I, three boreholes were built by Mercy Corps within the camp and connected to eight district reservoirs. Ongoing Phase II of the project involves connecting these reservoirs to households. Once the building of the infrastructure is completed, Zaatari will have its own water system.

Several lessons can be identified from this evolution. Firstly, the successful method developed by Acted for efficient and equitable water trucking provides an example of good practice to be replicated in similar contexts. Secondly, advocacy from humanitarian actors to the government resulted in a multi-beneficial agreement. While the water network will relieve the humanitarian actors operating in the camp, the utility will also financially benefit from the connection over the long term and gain better control of the quality of water supplied. Ultimately, this represents a considerable improvement for the 79,000 refugees currently living in the camp.

Additional sources: Interviews 30 and 33, 26 October 2016.

BOX 14. CREATING AN ENVIRONMENT FOR COMMUNITY ENGAGEMENT IN AL-NAQAB

Home to 60,000 Jordanians and Syrians, Al-Naqab is a small but densely populated city located near Zarqa, and where taps only run once a week. There are high levels of poverty and therefore reliance on small vendors can be expensive or even unsafe for a large part of the population, including refugees. People's frustration has grown as a result of the poor level of services, leading to a decline of trust in public utilities.

A local NGO Future Pioneers, in partnership with Oxfam GB, organised a series of workshops mobilising local communities of Al-Naqab. In parallel to the objective of raising awareness of water-management challenges, these sessions have mobilised people within the communities and created a platform for engagement between families, but also between the population and the local utility. Ruby Assad, a community developer with Future Pioneers and leader of the event, explained that the workshop has the ultimate objective of bringing members of the community together – including Jordanians and Syrians – through representatives who can identify and communicate the range of needs and requirements to entities in charge of water provision.

In several instances, these workshops have gathered women together, several of whom have been elected as 'water ambassadors'. The workshops have involved discussions of conservation practices at the household level with participants, which the ambassadors then discuss with the rest of the community through their networks. The workshop has demonstrated the significant knowledge held by women on water-management challenges at household level, but also at city and country level.

Beyond this, ambassadors have been selected to represent their community during interactions with the utility, which has opened opportunities for stronger community participation in water management. Dana Nasereddin is a senior officer with Oxfam GB in Jordan and in charge of addressing the water needs of hosting communities. She describes the way mobilising community members has increased community representation:

Elected women ambassadors have endorsed advocacy roles and started engaging with the utility. With these communication channels, the project aims to raise people's voices in water governance systems.

Also conducted in Balqa, the Addressing Water Needs of Jordan Hosting Communities (AWANE) Project 2015–2018 is expected to target approximately 40,000 men, women, girls and boys in the two governorates. Targeted utilities and government bodies include the Ministry of Water and Irrigation (MWI), the Water Authority of Jordan (WAJ) in Balqa, and Miyahuna in Zarqa.

Additional sources: Interviews 28 and 29, 23 October 2016.

Appendix 3. Lebanon case study

Introduction and key findings

Lebanon is a small country (a quarter of the size of Switzerland), but it is the fifth most densely populated country in the world: 90 per cent of its estimated population of 5.9 million live in urban areas (Government of Lebanon and UN 2015; MoE *et al.* 2014). It is considered as an upper-middle-income country with a GDP of US$ 47 billion in 2015 (World Bank 2017; GVC 2016).

The total water resources in Lebanon are estimated at 2,400–2,700mcm/year, with an estimated net exploitable volume of 2,000mcm/year in 2001 (El-Fadel *et al.* 2001). However, the government of Lebanon recently reported that available exploited public resources can only provide 900mcm/year (Government of Lebanon and UN 2015). Despite the discrepancy, this suggests that Lebanon is a relatively water-rich country, particularly in comparison to other countries of the MENA region such as Jordan, Libya and Yemen. Given the geology and topography of the country, much of the country's freshwater is stored in mountain snow caps and in aquifers. Groundwater (500mcm/year) is therefore used as an important source of water across Lebanon. It accounts for 50 per cent of irrigation water and 80 per cent of potable water (GVC 2016; Nassif 2015).

The amount of renewable freshwater resources per capita was estimated as 926m^3 per year before the refugee crisis (MoE *et al.* 2014). More recent figures are largely disputed but would approximate 855m^3 per year (GVC 2016). Largely under the 1,000m^3 per year reference threshold considered as 'high water scarcity' (Box 1), this means that Lebanon has reached a critical state. Water scarcity is largely caused by 'scarcity in access' to water services due to institutional challenges in ensuring reliable supply to users and/or to the inability of the population to afford connection/costs of water. At the national level, the rate of household connections to the public water-supply system was estimated at 79 per cent in 2014, with discrepancies at regional level (MoE *et al.* 2014). In the Beirut and Mount Lebanon governorates, water is supplied for less than three hours daily in summer.

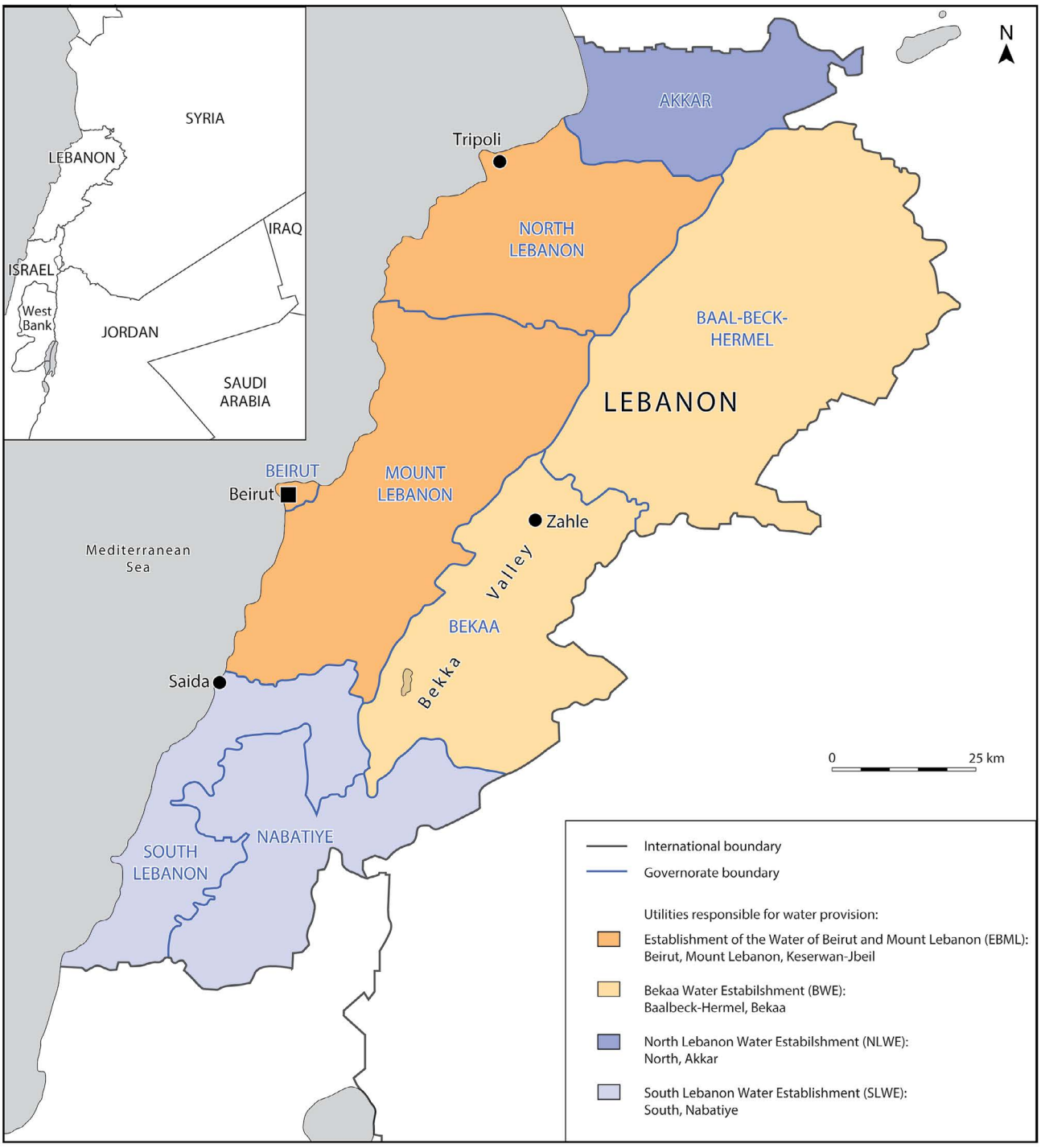
Distribution and access have been undermined by long-standing institutional and management challenges. Lebanon has experienced unprecedented political and social instability in recent years, including 15 years of civil war, the 2006 conflict with Israel, and the absence of a head of state for three years until the end of 2016. These have eroded the capacity of public institutions to deliver basic services and challenged state-citizen relationships (Abbas *et al.* 2015). Water is delivered by four regional public water establishments, but limited investments and capacity to recover costs has meant that they have struggled to meet the population's needs. The supply is irregular and infrequent and water quality is inadequate, particularly in Bekaa and North Lebanon where pressure on systems has been the highest.

Similar to Jordan, the arrival of between one and two million Syrian refugees since 2011 has put further pressure on the system. The pre-existing institutional and management challenges facing the water sector, as well as the extent of the refugee influx to Lebanon, has meant that the Lebanese water sector has adopted a very different response to the Jordanian sector. Over 3.3 million people are considered to be in need of

BOX 15. KEY FINDINGS: LEBANON CASE STUDY

- Lebanon's water sector suffers from decades of socio-political instabilities, to which the Syrian refugee crisis has added more complexity, including social conflicts.
- A high number of UN agencies and international organisations have intervened in Lebanon to support the sector, but discoordination amongst them and with local actors, as well as political blocks in responding to refugees' needs have resulted in fragmented strategies.
- The absence of up-to-date and disseminated data at national level has been a source of social discord and a fundamental problem in informing strategic management in the sector.
- The activities of small-scale water service providers in Lebanon, many of them informal, account for a large part of the water supplied to people in Lebanon. However, their exclusion from formal systems has increased risks, including that of poor-quality water.

Map 3. Map of Lebanon showing governorate borders and water utilities



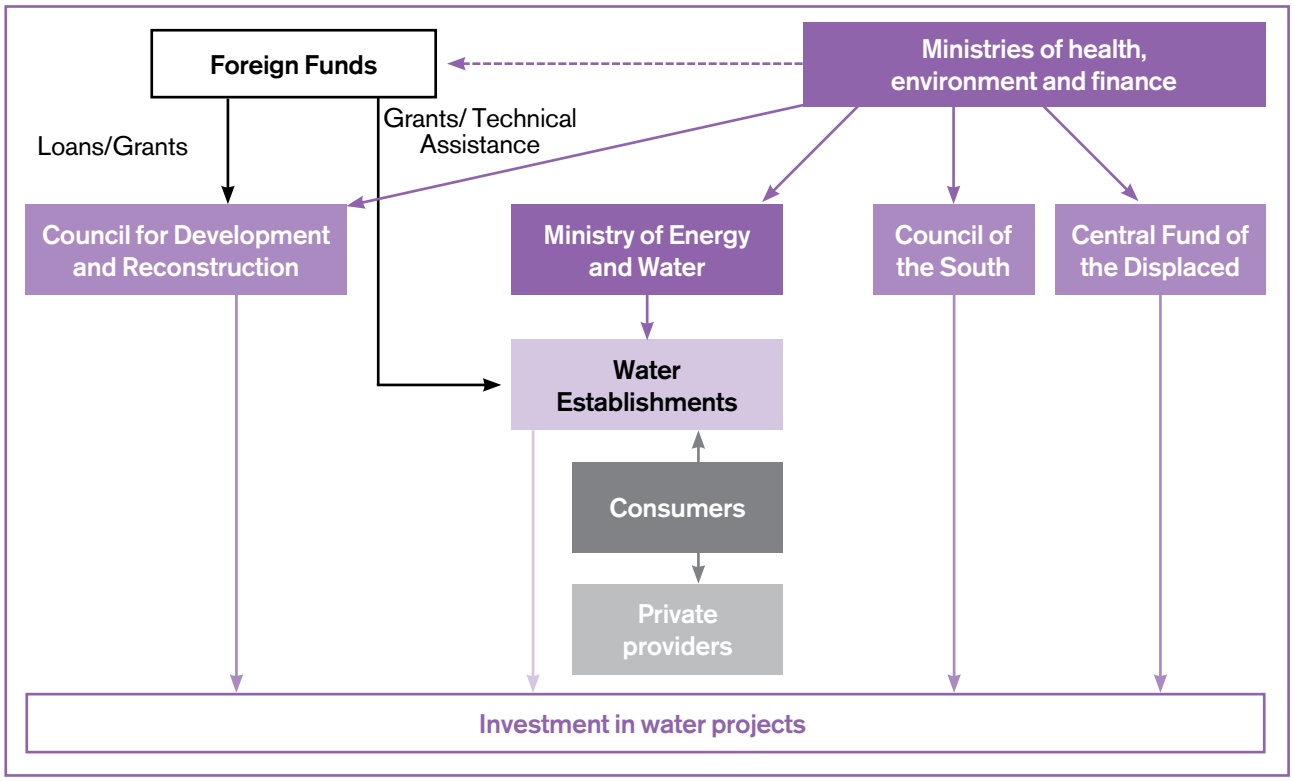
humanitarian intervention in Lebanon. This includes all Syrian and Palestinian refugees, and 1.5 million vulnerable Lebanese citizens (Government of Lebanon and UN 2015). The widespread involvement of humanitarian and development actors in Lebanon has incrementally modified the dynamics of the service-provision framework, which has resulted in government reliance on external support. After social stability funding, the water sector receives the second-largest sum of humanitarian financial assistance. In the latest crisis response plan, the government stated that its requirements are as high as US$ 280 million to meet the needs of over 1.9 million people by 2020 (Government of Lebanon and UN 2017).

Setting the context: pre-existing vulnerabilities

A complex water provision system

The water sector consists of a mosaic of state and non-state actors, often with competing and overlapping roles and responsibilities (Figure 10). At national level, the Ministry of Energy and Water (MoEW) has the overarching responsibility of developing national plans, managing water resources, implementing large-scale infrastructure, and monitoring water quality. It closely works with the

Figure 10. Lebanese water sector



Source: adapted from Fanack Water (2015)[3]

Council for Development and Reconstruction (CDR) which mobilises international funding for the rehabilitation and construction of large water-supply and treatment projects. The Ministry of Health is in charge of water quality. At local level, the four regional public authorities (water establishments of Beirut and Mount Lebanon, North Lebanon, South Lebanon and Bekaa Valley) are responsible for water service delivery and maintenance. The four WEs have had the mandate to provide all water services in the country since the introduction of Law 221 in 2000, which released municipalities from this duty. However, many municipalities have continued to supply and maintain services.

Actors from the private sector also play a significant role in the water sector of Lebanon. Private companies support the sector through service contracts linked to the development, operation and maintenance of infrastructure, including pumping stations and wastewater treatment plants. The government has established long-term relationships with a number of specific companies that are regularly contracted for conducting assessments. Besides this, citizens heavily rely on small-scale operators and vendors who often operate in the country to fill service gaps, or use local boreholes to supplement supply. A high proportion of these actors operate informally. The MoEW estimates there are at least 55,000–60,000 unlicensed wells in the country (Government of Lebanon and UN 2017).

An incomplete process of sector restructuration

In 2000, the government of Lebanon recognised the need to undertake a more strategic water resource-management approach, culminating in the introduction of new water sector legislation, Law 221 with subsequent amendments. Since then, a national water sector strategy was released in 2010, with a water code still to be ratified and master plan at national and regional levels to be developed. An important feature of the new legislation was the divestment of responsibility for water service provision to four water establishments which operate at a regional level, and planning and policy responsibility remaining with MoEW at the national level.

However, due to capacity and institutional constraints (including implementation of key regulatory tools such as the master plan) WEs have not been able to apply key measures to improve water-supply reliability or to improve their financial viability. This together with the current Syrian crisis has exacerbated the water-scarcity situation within Lebanon and the need for effective intra-sectoral management particularly at the national level.

Law 221/2000 (followed by a number of by-laws in the 2000s) was introduced to create and transfer authority to WEs. The law was adopted to restructure the sector at a time of fragmentation and inefficiency, where 21 water

[3] In the original Fanack Water publication, the only government ministry shown was the Ministry of Finance. We have added here the Ministry of Health and Ministry of Environment.

authorities and 209 local committees were responsible for water supply. By transferring authority to newly created entities at regional level, Law 221 aimed to centralise management practices at a higher administrative level to improve resource management and coordination, while decentralising national decision-making powers and increasing financial autonomy at the local level. Parallel reforms under Law 221 placed WEs at the centre of water services provision as they became responsible for carrying out studies, operations and maintenance (O&M), implementation and renewal of projects for drinking and irrigation water, and wastewater. With such responsibilities and powers, WEs were expected to operate with financial and administrative autonomy (El Amine 2016).

However, the intended improvements proposed with the introduction of the law have shown weaknesses in practice. MoEW has failed to transfer sufficient autonomy and resources to WEs. Local interventions for improved water distribution and infrastructure management remain tied to decisions made at national level. CDR also reports that it requires the approval of the ministry for the implementation of each project. Lack of transfer of resources from the ministry to the water establishments following the promulgation of Law 221/2000 and the subsequent by-laws has restricted utilities' internal capacities. Constrained by limited economic resources in a complex institutional framework, the financial empowerment of water establishments has therefore been limited despite the needs for investment at local level (Box 16). Average yearly national expenditure in the water sector has been estimated at 0.4 per cent of national GDP, while costs of inadequate public water supply have been estimated at 1.3 per cent of GDP every year (GVC 2016). Furthermore, Law 221/2000 led to the duplication of roles and responsibilities. Conflicting roles have prevented efficient coordination at several of these institutional levels, for example between MoEW and CDR, and between WEs and municipalities.

Implications for water services

The water sector has been characterised by poor service delivery for decades (GVC 2016). Insufficient human and financial resources have undermined the capacity of WEs to deliver and maintain water services according to Law 221/200 and thus to overcome the infrastructural and governance challenges that existed before the law was created. Today, poor metering systems across the water network limit the collection of reliable data on amounts of water produced by utilities, and consumed at household level. In fact, only 10 per cent of the connections in Lebanon are currently metered (El Amine 2016). This has impeded effective revenue collection. Water tariffs are fixed and although they vary from one region to another, they are considered as very low (around the equivalent of US$118–150 a year) (El Amine 2016; GVC 2016).

Ageing infrastructure and informal connections lead to significant water losses, or non-revenue water for WEs. As a result of general dissatisfaction with service provision, many customers do not pay for water services, making it difficult for WEs to recover costs and further invest in the

BOX 16. INVOLVING THE PRIVATE SECTOR TO IMPROVE UTILITIES' PERFORMANCE: THE CASE OF TRIPOLI

Until now, private-sector participation in the water sector in Lebanon has been limited to service contracts for the conduct of specific tasks or the operation and maintenance of pumping stations and small wastewater treatment plants. Contracts tend to be awarded to local private companies and aim at tackling the lack of human resources and capacities within water establishments. The duration of contracts is often limited to one year, reflecting more the annual programming budget cycle than the operating needs of the plants.

One of the exceptions to concessions and lease for private-sector participation was in the urban area of Tripoli where 400,000 inhabitants lived in 2003. A service and management contract for drinking services was awarded to the company Ondeo Liban for four years. This €4.6 million contract was financed by the French Development Agency. The contract included two components: the construction and improvement of infrastructure with a budget of €11 million, and institutional support to the water utility in charge.

The institutional support component had objectives to improve the technical, commercial and financial performance of NLWE, to establish information and management systems, and improve communication. Evaluation of this performance has been the subject of controversy. Positive outcomes include reductions in water losses, the continuous supply of good-quality drinking water and the training of staff. However, many targets were not reached. Although billing rates went from 34 to 55 per cent, the progress made was against a target of 75 per cent. The debt recovery rate went from 29.7 to 33.8 per cent, against a target of 90 per cent.

Despite some positive outcomes of the partnership, the parties were unable to reach an agreement to extend the duration of the management contract, which ended in 2007. The difficulty of operating in an uncertain institutional environment was identified by the private operator as the key issue that contributed to the failure of the contract re-negotiation.

Sources: Interview 68, 28 November 2016; GWP-MED and OECD (2010).

sector. Nevertheless, service provision varies considerably from WE to WE, often reflecting population size. Despite the clear institutional definition of roles, local politics and informal social networks strongly influence services provided at local level.

Only the Beirut and Mount Lebanon WE is financially autonomous. With a collection rate of 80 per cent, it is by far the best-performing utility in Lebanon. In South Lebanon, the WE has a 65 per cent collection rate (Interview 60, 20 November 2016). The majority of municipalities have handed over water provision responsibilities to the WE, or work in conjunction with it to deliver water services. The situation is very different in the Bekaa Valley and North Lebanon. The water establishments in charge – Bekaa Valley Water Establishment (BVWE) and North Lebanon Water Establishment (NLWE) – have subscription rates of only 37 per cent and 58 per cent respectively (GVC 2016; Interview 52, 17 November 2016). Over 100 out of 200 municipalities continue to provide water services in parts of the region that BVWE has yet to consolidate. A recent survey conducted in North Bekaa estimated 75 per cent of people connected to the public network are dissatisfied with the services provided (GVC 2016).

The Syria refugee crisis: impacts and responses

An additional 1.5 million people who require water services

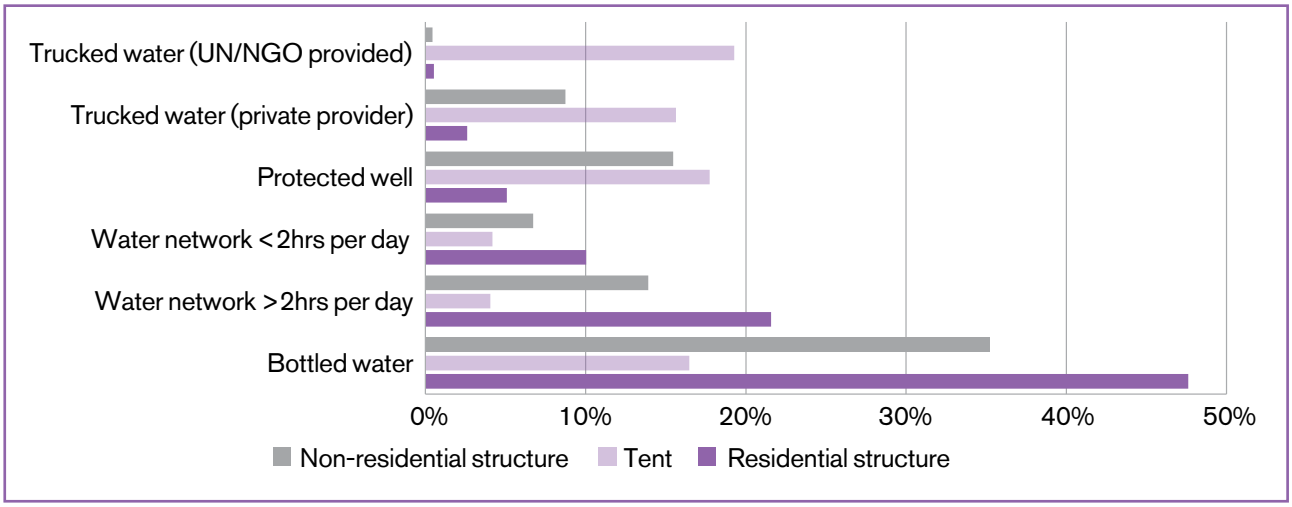
The war in Syria has led to the displacement of about 4 million people outside its borders, most of whom are dispersed between Jordan, Lebanon, Turkey and Egypt. An estimated 1.5 million have sought refuge in Lebanon (approximately 1 million are registered with UNHCR), half of whom are women and children. This means that one in five people living in Lebanon is a Syrian refugee. An estimated 35,000 Lebanese have also returned from Syria since 2010.

Closest to Syria's borders, the Bekaa Valley and North Lebanon are the regions hosting the highest number of refugees. Refugee influxes took more time to reach South Lebanon and Beirut/Mount Lebanon. Until the start of the Syrian war, many Syrians moved freely between Lebanon and Syria for seasonal work. The Bekaa Valley has long provided job opportunities such as fruit picking for Syrians before the conflicts started. As the conflict intensified, many Syrians have remained in Bekaa to escape the conflicts. According to UNHCR, about 360,000 Syrians were living in Bekaa at the end of 2016.

Currently, 17 per cent of Syrians live in informal tented settlements (ITS) (UNHCR 2016). A total of 2,244 informal settlements (more than four tents each) have been counted across the country, the highest numbers being located in Baalbek, Zahle and Akkar (UNICEF 2017b). In these areas, informal encampments have emerged as groupings of simple plastic tents constructed directly on the ground – often on privately rented land – without water, electricity or sanitation. Other refugees live in sub-standard buildings and residential buildings, 40 per cent of which are in poor condition.

According to a recent survey, only 18 per cent of Syrians have access to the water network with more than two hours of water per day, and 9 per cent have access to the water network but with less than two hours per day. The rest rely on bottled water, on wells and trucked water. As shown in Figure 11, sources of access to water are highly dependent on whether the household lives in a residential structure or a non-residential structure or a tent. The majority of Syrians living in residential structures rely on

Figure 11. Distribution of Syrian refugees' households by main source of drinking water and shelter type in Lebanon



Source: UNHCR *et al.* (2016)

bottled water, whereas the majority of Syrians living in tents depend on trucked water from either UN agencies/NGOs or from the private sector (UNHCR *et al*. 2016).

The refugee crisis is the most recent in a series of events that has put significant strain on public services in Lebanon. The country's response to the influx of Syrians from 2011 must be understood in the context of a continuum of socio-political crises that have persisted for many years. While it could be argued the country has the required resources to accommodate refugees, it does not have the governance structure to absorb an influx of this scale without further impact on its existing service-delivery systems. Increasing demand as a result of influxes of refugees has placed more pressure on water services. Without well-managed extraction of water resources as well as a strong framework to manage water demand and distribution, stresses on resources and distribution networks have been exacerbated.

Government and humanitarian agencies' responses

Given the limited capacity of the Lebanese government to respond to a crisis of this extent, authorities have been cautious in their responses to refugee needs. The existing sector and plans were unable to be adapted to an emergency response, meaning that there was no scope to mount a systematic response during the first years of the crisis. Furthermore, Lebanese authorities refused to allow the establishment of formal refugee camps as they feared history would repeat itself following its experience with Palestine refugees since 1948.

As a result, numerous international agencies intervened in response to the refugee crisis in Lebanon. A total of 144 organisations are part of the Inter-Agency Coordination Group of Lebanon. Focus has initially been on humanitarian response and short-term provision, as the state has been unwilling for humanitarian agencies to develop long-term solutions that might lead to formalisation of informal settlements. UN agencies initially led the WASH cluster's response to the Syrian refugee crisis in the country. As the crisis lengthened, the Lebanese government eventually became involved in the response. From 2014, it led the development of the Lebanon crisis response plan (LCRP) jointly with international organisation support. Today, most organisations conduct both humanitarian and stabilisation activities in parallel.

International funding plays a significant role by supporting the sector through capital investment in projects. The scale of the Syrian refugee crisis and underlying challenges faced by the national sector means that at the time of writing, one of UNICEF's biggest WASH programmes is in Lebanon. Donor contributions implemented by agencies under the various LCRPs have led to a wide range of achievements to support health, shelter, food security, transport, education and livelihoods etc. Much of the WASH budget has been spent on water trucking, the main water-provision system for refugees since the beginning of the crisis. In ITS, water trucks have delivered 35 litres per person per day to camps since 2013. Refugees have often supplemented their water with alternative sources in the camp, often groundwater or a water source provided by landlords.

The government adopted a policy at the end of 2014 to reduce the number of Syrian refugees in Lebanon, but stated its readiness to work with the international community to manage the crisis (3RP 2014). This has resulted in a complex situation where the Lebanese government has provided only limited support to refugees, with the aim of preventing long-term settlement of Syrian refugees in the country. For example, the government requested housing and basic service provision delivered to Syrian refugees by humanitarian agencies to remain temporary to avoid granting permanent residency. Furthermore, the state has required humanitarian and development interventions to focus more on improving the infrastructure to support WEs.

Both stipulations have guided water interventions delivered by humanitarian agencies to date. International agencies have had to develop programmes with two components: firstly, providing water and sanitation services for refugees in ITS as part of a humanitarian response, and secondly, implementing stabilisation activities that can benefit host communities and deliver to refugees living in host communities. This two-pronged approach to serve water to people has prevented a coordinated strategy to make supply systems sustainable.

Unpacking challenges faced by service providers

The arrival of Syrian refugees in Lebanon would have led to an estimated increase in demand of 8 to 12 per cent at national level (MoE *et al*. 2014). Many formal service providers in charge have used the Syrian refugee influx as a scapegoat for issues in the water sector, arguing this increase constitutes the direct cause of the current water crisis in Lebanon. However, poor levels of service in Lebanon need to be understood as a result of different challenges, mainly governance and management related. Increased demand from refugees has added more pressure on the sector, but cannot be blamed as the only cause of decreased water supply in the country, nor for the declining capacities of service providers. In fact, as described below, a whole range of factors have resulted in a complex network of problems, which account for the current water crisis.

Water service provision in Lebanon takes place in a complex myriad of challenges, most of which involve socio-political conflicts which the current institutional framework is not able to address. Conflicts of role and overlapping responsibilities have created parallel small formal and informal systems and resulted in a

fragmented sector which suffers from the absence of a common vision. This range of interlinked issues put WEs in a complex position where their internal capacities continue diminishing and where they increasingly rely on external support to continue operating. This makes them vulnerable to further impacts in a regional context of intensifying crises. Declining levels of services mean that customers – and citizens in a broader sense – lack trust in public entities which are less and less accountable for the services they are mandated to provide.

Declining potable water resources per capita

Higher demand for water resources has led service providers – formal and informal – to accelerate the rate of groundwater extraction. This has increased the gap in groundwater balance of 200mcm/per year already identified in the national water strategy before the start of the refugee crisis (GVC 2016). In 2012, Lebanon was using two thirds of its available water resources: a very high rate of water withdrawals in comparison to other regions which would typically have rates of 10–30 per cent (MoE *et al.* 2014). Besides over-extraction, the country's resources are under pressure as a result of the lack of wastewater treatment and limited conservation practices. These management flaws reduce opportunities for serving a growing population with potable water.

Wastewater management is a high-priority issue in the country. In 2007, the estimated proportion of household connections to wastewater networks was 66 per cent, but less than 8 per cent of wastewater generated at national level was being treated before release into the environment (Bassil 2010). These figures have largely decreased since more untreated wastewater is being produced, and treatment systems have seen little improvement. Coastal waters receive an estimated 162mcm/year (about 276,000m^3/day) of untreated wastewater from at least 53 sewage outfalls along Lebanon's coastline (MoE *et al.* 2014). This corresponds to 65 per cent of the total sewage load in the country.

Wastewater collection is legally under the jurisdiction of the WEs (although many municipalities have resisted handover of responsibility following the enactment of Law 221/2000). The O&M of wastewater treatment plants has also been gradually transferred from MoEW to WEs. However, transfer of responsibilities remains unclear in many cases. As contaminated water flows across the country, it contaminates aquifers, thereby polluting more freshwater resources. Besides this, it represents a missed opportunity to use treated wastewater as a source of water for example for irrigation, thus allowing higher amounts of freshwater resources to be distributed for drinking purposes.

Insufficient administrative autonomy

WEs are not sufficiently empowered to act and therefore lack administrative and financial autonomy. Poor revenue collection prevents them from fulfilling O&M responsibilities, affecting their cost-recovery capacities and limiting scope for strategic planning. Identified as a primary weakness, WEs are largely understaffed and/or struggle with a lack of internal technical capacity, particularly on collecting, analysing and handling data. In 2010, the Ministry of Energy and Water was already reporting that WEs were relying on contractor-provided staff (50 per cent), mainly workers performing O&M (Bassil 2010). However, El Amine (2016) reports that needs are also at managerial level. The unattractiveness of working for public entities has been reported as a cause of shortage in staff. This is related to the lack of trust in public entities and low public-sector salaries. In times of crisis, however, it is difficult to envisage an increase in staff salaries in the sector due to budget shortages, and broader impacts on payrolls (Interview 66, 23 November 2016).

As part of its stabilisation programmes, one of UNICEF's interventions has been to recruit individuals who would be based in WE offices and closely work with existing staff to temporarily take on various functions to fill the gaps. These range from finance and administration tasks to data management. While these initiatives have helped fill gaps in human resources on a temporary basis, WEs point out their need for in-depth trainings for their staff (for example on NRW), and long-term capacity-building programmes (Interviews 51 and 60, 17 and 20 November 2016).

Lack of cost-recovery capacity

Poor financial revenue has posed major challenges for WEs. BVWE and NLWE in particular have operated with yearly financial deficits. With WEs' diminishing capacities to provide reliable services, the number of connections and revenue-collection rates have incrementally decreased and rendered cost-recovery extremely difficult for utilities. To minimise damage, the central government or international agencies have increasingly covered WEs' energy costs or staff salaries. Here too, these initiatives have helped temporarily, but run the risk of increasing WEs' dependency on external support.

The current incapacity of WEs to operate autonomously and cover their costs independently has been widely recognised. Water tariffs are flat and considered insufficient. The WEs do not have the power or capacity to define tariffs actually based on real costs of services as these are often unknown. The absence of reliable water-metering systems and out-of-date customer databases are some of the gaps preventing accurate calculations of water produced and consumed, thereby limiting options for volumetric charges. Besides this, there are important risks of social discontent if tariffs were to increase.

However, experts have identified the poor understanding of customers' willingness to pay as a barrier to increasing tariffs (Ayoub and Kertous 2015). In close relation to the general mistrust of the Lebanese population of public

authorities, it is widely recognised that few would be willing to pay more for water services even if they improved. Citizens currently rely on a mixture of public and private supplies (water trucking, private wells, bottled water) and their average household expenditure for water services is around US$45/month. In reality, this is three times the actual tariff of the public water service (GVC, 2016).

Old infrastructure causing leaks in the system and an irregular electricity supply are other causes of revenue losses. In total, the national average for NRW including leaks and illegal connections has been estimated between 40 and 60 per cent. However, apart from Beirut/Mount Lebanon governorates, leakages remain poorly addressed.

Difficult move from humanitarian interventions towards development phases

Significant funding has been provided by international donors but implementing agencies have faced political blocks in this investment. Government authorities have had concerns about developing infrastructure for newcomers or making settlements permanent, and therefore prevented international agencies from conducting stabilisation and development programmes targeting refugees. As a result, the humanitarian interventions responding to refugees' water needs have persisted as emergency-type of activities for the past six years.

In the specific context of refugee camps, the long-term nature of the crisis and reluctance of the national government to provide any permanent critical infrastructure for refugees has made the humanitarian interventions costlier and more labour- and time-intensive for humanitarian agencies. In all regions of Lebanon apart from a part of the south, UNICEF and implementing partners have been providing water through trucking to refugees living in ITS since the beginning of the crisis. Faced with funding restrictions, and due to political barriers to extend piped water to settlements, humanitarian and development agencies have faced constraints in taking radical decisions. They have recently outlined plans to increase the cost efficiency of water services by separating domestic and drinking water provision. If alternative sources of domestic water are available and provide at least 25 litres/person/day, 10 litres/person/day of drinking water through trucking will be delivered in a separate tank.

As the Syrian war continues, refugees are likely to remain in Lebanon for several more years. Preventing investment of international funding in more sustainable solutions, where for example the water distribution network is upgraded and extended, represents a missed opportunity to benefit both refugees and host populations over the long term. This puts international agencies in a difficult position where the handover of the existing distribution system to WEs is hardly conceivable, and where refugees' conditions of access to basic services are decreasing.

Absence of data preventing decision-making

The absence of both demographic and technical data for the water sector represents a crucial barrier to any form of planning or evidence building with regard to current issues. Data are either related to very specific geographic areas or to very specific problems (therefore preventing overview and comparisons), or based on estimations (therefore leaving room for uncertainty or even to manipulation of information). The latest population census conducted at national level was carried out in 1932. Latest MDG data for Lebanon from 2009 showed a 97.7 per cent access to improved water services by the national population, although the reality was clearly different. While household coverage with the public water network is indeed high in the country, it does not reflect the quality and level of the services provided.

Water quality is a major challenge in Lebanon, but little information has been collected to raise awareness on the scope of the problem. Recent JMP data collection has revealed domestic water supply being far below drinking water standards. Particularly in informal settlements and camps, people drink water that does not meet quality standards. Data and service-delivery tracking systems are still insufficient to precisely determine at what stage of the distribution chain contamination takes place, although water delivered by NGOs is strictly monitored. Besides this, a large proportion of water supplied to the population comes from providers operating informally and whose services are not monitored, as discussed in more detail below.

While these issues represent only a few examples of the overall data-management issue in the sector, they highlight the significant risks associated with poor knowledge of the current water-supply situation, and the need to take action based on informed decisions.

Small-scale private service provision

Small-scale private enterprises or individuals provide supplementary water in parts of the country where service provision is inadequate. Therefore, private providers and operators fill an important gap in water supply that neither local authorities nor humanitarian/development agencies currently fill. Nevertheless, there are also many other implications in the rise of this sector independently from formal actors, sometimes outside regulations.

In 2014, there was an estimated 21,000 licensed private wells, but also 59,124 unlicensed private wells in the country (MoEW and UNPD 2014). Given the unregulated nature of the informal water sector, there are particularly problematic implications with regard to water resource management and quality monitoring. Some well owners abstract groundwater at high rates outside regulation standards, resulting in a burden on resources against which authorities have no control. The operations of a

large number of private tanker-truckers occur without going through monitoring processes. This increases risks to the population relying on water that is contaminated. Furthermore, private vendors typically sell water at much higher prices than public rates. This may create significant equity issues for low-income populations, generally those who also do not have access to acceptable levels of water services from public providers.

A clearer and strengthened regulatory framework relative to the activities of the private sector is required. The Lebanese parliament is in the process of discussing the participation of private companies in the water sector. Until this law is adopted by the parliament, the role of the private sector is limited to service contracts. These refer to specific tasks such as the operation and maintenance of pumping stations and small wastewater treatment plants. Contracts are normally awarded to small local private companies and aim to tackle the lack of human resources and capacities within WEs. Contract durations are often limited in time (generally one year), reflecting the influence of annual programming budget cycles as opposed to long-term local needs. The awarding process and the supervision of these contracts are advantageously flexible for the administration. However, the use of these contracts is circumstantial and is not included in a comprehensive outsourcing approach seeking to make a better/more targeted use of these contracts.

Social tensions

Lebanon is a socially fragmented country, where clan systems at local level define power relations and access to resources. In such a communitarian society, the arrival of Syrians has added complexity and increased tensions amongst civil society, but also between people and the state. On this issue, the International Crisis Group (2015: ii) reports:

Social and sectarian tensions are rising, as the quality of public services declines dramatically for ordinary Lebanese, and opportunities for jobs and personal fulfilment are available for a decreasing few. Instead of exhorting its politicians to represent their interests via established institutions, a weary population has lowered its expectations, circumventing the state apparatus and resorting to survival strategies. These further invigorate informal networks, relationships based on patronage and corruption and rules of the game that ensure the political class remains entrenched, unaccountable and detrimental to what is left of the state.

Syrian refugees have been largely employed in the labour market (agriculture, construction and small businesses), often accepting low wages and thereby competing with the Lebanese. While many refugees receive aid in parallel (an option that is closed to Lebanese), a majority of Lebanese believe that Syrians are taking their jobs and pushing down wages (Thorleifsson 2014). Tensions amongst communities have often led to competition over access to water, including between Lebanese and Syrians. Such tensions have affected water provision by creating informal governance structures, where particular groups would have the monopoly over water resources or infrastructure.

Operating in climates of conflict is problematic for service providers who face barriers to conducting operations. In some areas, local politics prevent WEs and/or municipalities from functioning properly, thereby fuelling tensions between people and government authorities. Currently it is commonplace to hear that customers are willing to sabotage the water system, make illegal connections or steal water and that they do not feel obliged to pay bills.

Examples of strategies building service providers' resilience

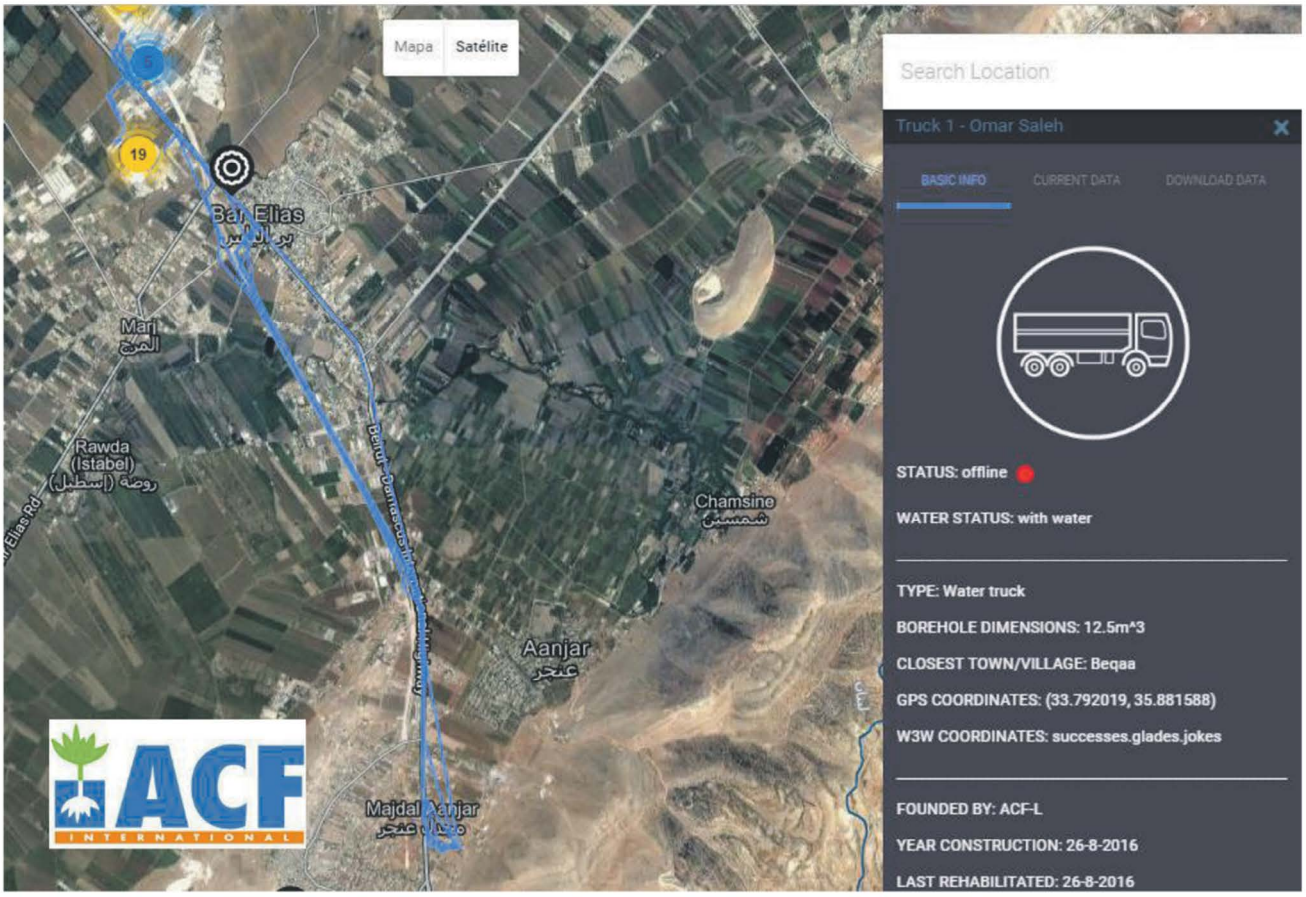
Many international agencies have supported WEs in each region to extend and upgrade infrastructure but also to capacity-build institutions around the management and administration of services. Several development organisations have considered the refugee crisis and associated added demand on public services as an opportunity to solve pre-existing issues for the Lebanese too. For the water sector, this has triggered a leap in new technology, updating metering systems and leakage control. Soft interventions coupled with hardware benefitting local utilities have in many instances enabled the elaboration of integrated approaches towards resilience building.

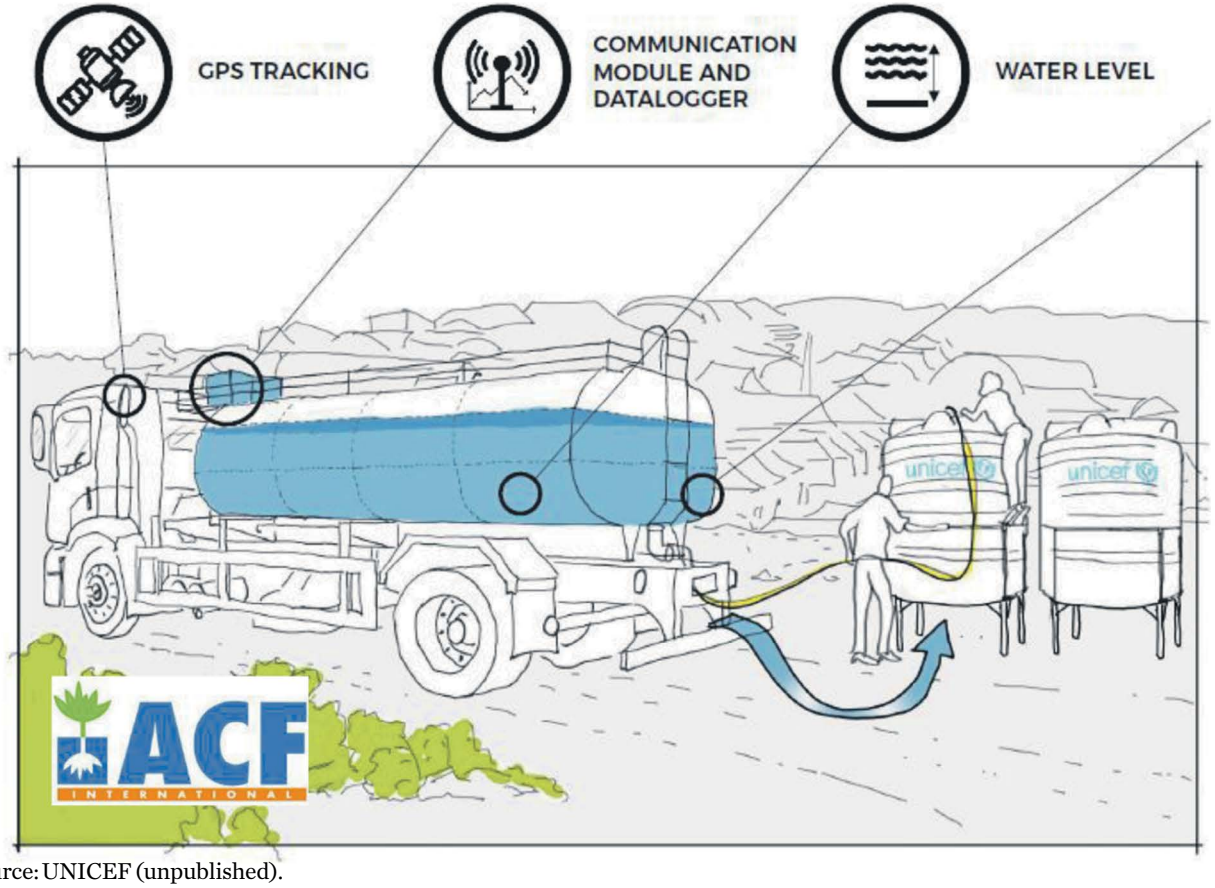
Developing more sustainable water-supply systems

In line with the objective of moving towards more sustainable and less costly interventions, humanitarian and development agencies have attempted to develop new or upgrade existing water-supply systems that can serve newcomers through municipal networks. Due to political barriers and local conflicts as mentioned above, such objectives have been difficult to implement in certain municipalities and for many refugee camps.

However, this has been achieved in several cases, and particularly in South Lebanon, where the national government and the WE in charge have reached agreement with international agencies. Some ITS located near water pipelines belonging to the South Lebanon WE have been connected to the existing network to provide household access. Factors facilitating this initiative include the fact that some settlements pre-date the refugee crisis and their proximity to the pipeline. While these are specific to a particular context, it is important to note that the initiative results from strategic advocacy work and negotiations. This can significantly benefit the

Figure 12. Smart water supply and wastewater desludging using GPS-tracking methods in informal settlements





Source: UNICEF (unpublished).

WE in the extended provision of water services to these ITS over the medium to long term.

Developing sustainable solutions to serve refugees living outside of camps has required different approaches from international agencies. In sub-standard buildings where many refugees live, Solidarités International has combined WASH work with shelter-upgrading activities. Through close negotiations with landlords, the NGO has rehabilitated household piped networks in exchange for decreases in rent for tenants.

Not only do these decisions enable moving towards more sustainable and equitable service provision, they also directly benefit service providers who may find multiple socio-political and economic benefits in serving new customers, while being supported by international organisations. As the amount and length of support (including financial support) provided by UN agencies and NGOs might be blurry, early negotiations on handover to local actors to enable exit strategies for external organisations are crucial to the success of such initiatives.

More efficient and traceable interventions in partnership with the private sector

To overcome issues of poor efficiency and control over water-supply activities in informal settlements, Action Against Hunger and World Vision have initiated and developed a smart monitoring system to track water supply and wastewater-desludging activities carried out by private truckers. The GPS-tracking method has been used to monitor the volumes of water transported from pumping stations and delivered to settlements. It has also been used to monitor volumes of wastewater being collected and disposed to wastewater treatment plans (Figure 12).

The system has contributed to the improvement of equal distribution of drinking water, and ensuring efficiency of water-trucking activities. It has also prevented the disposal of untreated wastewater to the natural environment. The objective of this initiative is to serve 125,000 Syrians living in informal settlements.

Increasing utilities' cost-recovery

Addressing cost-recovery weaknesses in the sector has required structural and integrated approaches which several development organisations have undertaken to support WEs in Lebanon. As a strategic advance that could support stabilisation and development efforts and longer-term strategies, many have advocated for action research on how to enhance the cost-recovery capacities of WEs by moving towards payment methods reflecting real consumption (Ayoub and Kertous 2015). This also recognises the opportunities emerging from the crisis to take action benefitting both refugees and host communities.

The EU-funded Madad consortium (International Committee for the Development of People or CISP, GVC, Concern Worldwide, ACWUA) has developed a strategic programme tackling WE weaknesses from several key angles. This has included analysing people's willingness to pay, promoting volumetric tariffs to replace flat tariffs, and enhancing communication with citizens to support incremental changes made in the sector (Box 17). These complementary activities have opened up opportunities to improve utilities' performance as a whole. Together with enhanced community engagement, they have been key to communicating changes in the sector to citizens, based on decisions that aim to adapt to local demand and respond to needs more equitably.

Data collection for strategic planning

Strong data management is characterised by regular data collection, update, dissemination and use for strategic and efficient planning. Data are essential to empower stakeholders in decision-making for resilient management, and are a critical tool for advocacy. The country's most fundamental needs in this regard start from country-level data to provide an overview of the current situation and enable targeting actions according to where the most immediate needs are, in accordance with resource availability.

To tackle Lebanon's dire need of improved water resource management, UNICEF has recently coordinated hydrogeology research projects and feasibility studies for groundwater recharge across the country. To achieve this, UNICEF has worked with local technical experts to enhance knowledge on hydrogeological conditions in eight *cazas* (districts) and to identify four viable sites for the development of artificial aquifer recharge projects. Recognising the need to better control groundwater extraction in Lebanon, these studies have aimed at supporting the MoEW on data management. While informing long-term planning around water resources, they are intended to be used to guide investments in the water sector.

UNICEF has been working with the national government to collect accurate data on access to water and sanitation services using some of the new criteria that have been introduced as part of SDG6 'Ensure availability and sustainable management of water and sanitation for all'. It has focused on SDG 6.1 and 6.2, on safely managed drinking water services and safely managed sanitation services. Indicator for SDG 6.1 is assessed entirely from recent JMP and baseline surveys done by UNICEF in 2017 while SDG 6.2 is being assessed using the recent baseline survey undertaken in January 2016, and supplemented by an audit of wastewater treatment plants UNICEF is currently undertaking. The JMP survey has included water-quality tests throughout the entire country, and together with baseline household survey, provides information on coverage, availability and safety for drinking-water supply.

Ownership of data by the national government has

BOX 17. INTEGRATED APPROACH FOR BETTER COST-RECOVERY IN NORTH BEKAA

The Italian NGO the Civil Volunteer Group (GVC) has devised an interesting approach for enhancing cost recovery: tariff changes will be accompanied with a communication strategy. GVC has considered the introduction of water meters and the application of volumetric tariffs as necessary steps to improve water services in Lebanon. Besides creating a basis for cost recovery, the communication strategy aims to increase the accountability of water establishments and build trust between parties. These same measures have been identified as necessary to reduce unpaid bills, of which rates are high in the country (40 per cent in some areas of Bekaa and North Lebanon according to El Amine (2016). More fundamentally, the approach aligns with the aim to shift from a current sectorial approach focused on production, towards a demand-management approach (also mentioned in the 2012 National Water Strategy).

Installation of water meters has been hindered in the past by different local political interests and citizen opposition to them. Aware of the sensitivity of the issue, GVC has intended to create new forms of dialogue between citizens and water authorities to break the cycle of growing mutual frustration between service providers and customers. EU-funded research conducted by the organisation with stakeholders of the sector has indicated that appropriate sensitisation of customers can facilitate the installation of water meters. Surveys undertaken as part of the research also concluded that customers (90 per cent of people surveyed) would be ready to pay higher water tariffs and to install domestic meters in exchange for more reliable services. The same research has demonstrated the importance of involving municipalities as intermediary stakeholders in dialogue between citizens and regional WEs.

Building on the findings of the research, the project has started to be implemented in two municipalities in North Bekaa. The improvement of infrastructure has been coupled with social activities to facilitate dialogue and collaboration between the WE in charge, the municipalities and citizens. The project was developed with the purpose of increasing ownership and knowledge of management challenges and opportunities, while promoting a culture of acceptance of water meters. Subscription rates of 82 per cent were achieved in the two project areas, thereby reflecting milestone progress in a region with a 36 per cent average (GVC 2016).

Source: co-authored with GVC.

provided a more accurate understanding of conditions of water access. This has been a crucial requirement to help the ministry and its partners develop programmes according to local needs, and for which investment can be done more strategically. In line with the attempt to address fragmented approaches at the local level, data informing a national framework enables a revision of local strategies in a holistic way. In this sense, smart data management and dissemination will benefit the sector at multiple strategic levels, including at WE level.

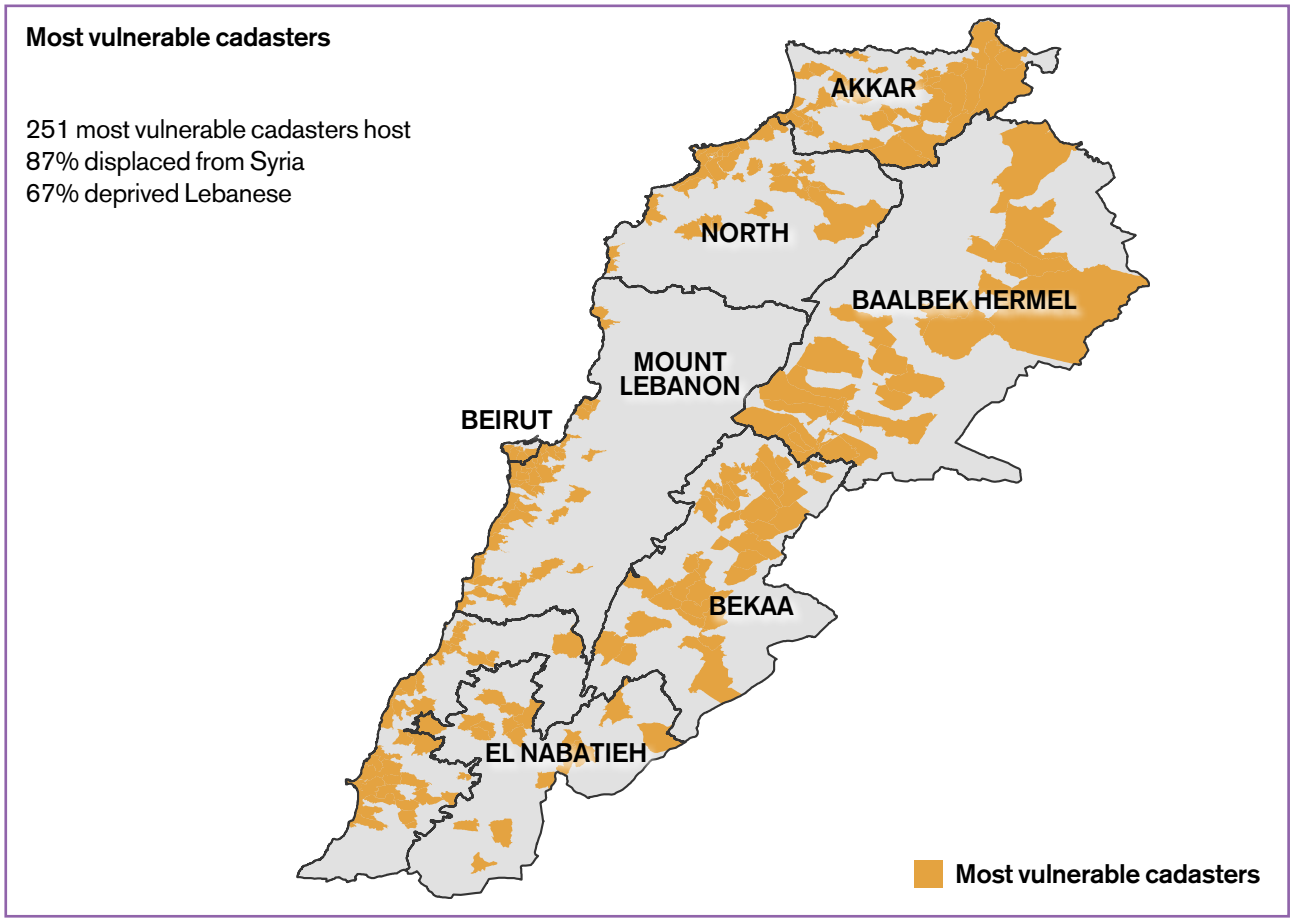
Targeting vulnerable areas

When arriving in a new city or country, refugees tend to settle in already-vulnerable areas. According to LCRP 2017–2020, poor urban neighbourhoods in Lebanon host 21 per cent of displaced Syrians. As a result, the most vulnerable communities in Lebanon have lived together in specific geographic pockets of poverty. While Syrian refugees have different needs from Palestine refugees who also have different needs from Lebanese, many have recognised the importance of developing interventions that co-benefit these communities simultaneously, as opposed to targeting parts of the population separately (Dahi 2014).

Based on this approach, partners of the Inter-Agency Coordination Group have developed a map of the most vulnerable localities in Lebanon (Figure 13). These refer to 251 cadastres with the highest needs of humanitarian assistance based on different indicators. Socio-economic indicators include host/displaced persons ratio, and household income level. While humanitarian and development assistance will also occur outside this list of 251, Government of Lebanon and UN (2017) state that over 1.9 million people in these localities are being targeted for access to 'sufficient, safe water for drinking and domestic use with reduced health and environment impacts from unsafe wastewater management' by 2020. Members of the Inter-Agency Coordination Group point out the need to break down indicators further in order to deepen understanding of local needs, but recognise the value of this tool as a starting point for better prioritisation of interventions in the country.

The method is relevant to guide action in an integrated way which benefits people at the local level, regardless of whether they are refugees or host communities. Similar to Jordan, this approach has enabled humanitarian and development agencies working in WASH to focus on providing drinking water to all members of these communities, thereby also addressing tensions created over resources. While this does not directly contribute to the resilience building of service providers, it consists of strengthening inclusivity in decision-making, including in the energy and water sector. By focusing on vulnerable host and displaced populations, this approach reduces social inequalities.

Figure 13. Most vulnerable localities in Lebanon as identified by the Inter-Agency Coordination Lebanon



Source: Government of Lebanon and UN (2017)

BOX 18. ADDRESSING TENSIONS TO ENHANCE DIALOGUE: LOST'S PEACE-BUILDING APPROACH

Only 40 per cent of the population in Bekaa is subscribed with the water utility in charge, and only 37 per cent of those pay their fees: the rest of the population relying on private vendors. In Baalbeck-Hermel, water supply has suffered from socio-political clashes for many years. Clan conflicts, influxes of refugees, and community division have enhanced the difficulty of reaching populations with water services. Local NGO LOST (Lebanese Organisation for Studies and Training) operates through 10 centres across Baalbeck-Hermel governorate. It uses a conflict-resolution approach to bring local communities together and, in parallel, achieve goals for education, WASH and livelihoods.

Through intra-community conflict-resolution activities, LOST has put its efforts into fostering a culture of peace and trust through various projects bringing different stakeholders together. Starting with educational youth programmes, LOST has incrementally built a network of trained volunteer leaders. It has aimed to strengthen social bonds through activities such as theatre performances. Such mobilisation has provided a platform for people to share and exchange knowledge, but also engage with local authorities, including municipalities. In WASH, LOST has endorsed the role of intermediary between communities, municipalities and WEs with support from international funders.

Much progress has been achieved in water service provision since the start of programmes aiming at improving water service conditions. LOST has worked in partnership with Lebanese and refugee communities and municipalities on developing local infrastructure. For example, through a partnership with UNICEF, UNHCR, Medair and the municipality of Yammouneh, LOST has helped achieve the connection of three refugee informal settlements to the existing water and sewage systems. This bottom-up approach to stabilisation based on a conflict-resolution approach is recognised as one way of improving relations between host and refugee communities, and to improve weak state-citizen relations.

Enhancing social cohesion

Social tensions negatively affect water service provision. There has been an increasing recognition of the multiple benefits resulting from peace-building activities. Several local NGOs in Lebanon have developed programmes through which communities have been able to interact and share. Peace-building programmes have generally consisted of bringing communities together around a common interest (Box 18).

Such an approach presents several advantages that can directly enhance social cohesion and thereby benefit service provision. Firstly, it prevents conflict and violence, which risk leading to further instabilities. Secondly, exchanging and bonding enhance feelings of belonging where individuals are keener to contribute to wider societal interests. Thirdly, it contributes to the creation of an environment where communities may be more likely to engage with external actors. In the water sector, this means people are more likely to establish relationships and accept dialogue with utilities, and eventually trust providers whom they would pay for services.

Conclusion and way forward

A different form of resilience

Lebanon is a case in point of how vulnerabilities have grown with time and require resilience building which addresses embedded and long-standing issues. Water service delivery in the country has been in decline for years because of a network of problems having accumulating over time. Similar to Jordan, these have been exacerbated by added pressure on existing systems due to the influx of refugees. However, due to the fact there is no strong national framework in Lebanon the resilience of service providers has varied in different ways compared to other MENA countries. The provision of water services is somewhat chaotic and unstructured and cannot be regarded as being either sustainable or equitable. However, due to its informality and flexibility it does have a certain resilience and has at least been able to respond to populations' needs at a minimal level.

The need for clearer institutional roles

The national response to the refugee crisis has been defined by Lebanon's previous experiences of hosting refugees. Consequently, the immediate response to the influx of Syrians was not to provide shelter or basic service provision that could be defined as permanent, so as not to grant the refugees any permanent status in the country. During the refugee crisis, the jurisdiction of national and local government and basic service providers has not always been clearly defined. Their roles have, to some extent, been shaped by the presence of humanitarian agencies with significant budgets and programmes. More clarity around the roles and decision-making powers of national government, local government and public institutions is necessary. Better coordination between these institutions could facilitate more effective investments and water programme development by humanitarian and development agencies in the sector.

Completing the decentralisation process

Despite the implementation of Law 221/2000 and the development of decentralised WEs that operate and maintain water services at the regional level, many of the most significant decisions are centralised and made at the national level. The Ministry of Energy and Water retains key decision-making powers and shapes investments in the sector. Providing more autonomy and decision-making powers to WEs enabling them to respond to local challenges could create space for more responsive solutions to current and future issues. The national policy framework could be more effective if it was able to support local decisions made around investments and infrastructural development in the sector, specifically by completing the process of decentralisation of powers to WEs to be able to deliver and maintain service delivery. Two crucial requirements for such a framework to be strategic and for better accountability in the sector are transparency in decision-making and stronger data management.

Enhancing utilities' internal capacities

The current capacities of WEs are inhibited by weaknesses in the national framework affecting management of internal resources. Lack of internal expertise and staffing in general has affected the level of services provided to the Lebanese, and hindered scope for response to higher demands associated with the refugee influx. Utilities' management in relation to cost recovery and service delivery will only improve when internal human resources are maximised. Internal agencies have so far played a role in this respect, but long-term and stable interventions are necessary in order to provide sustainable outcomes.

Involving small-scale private sector actors

Given that the small-scale private sector plays a central role in water service provision in the country, understanding mechanisms to better involve its activities in formal provision systems is essential. Small-scale operators and vendors tend to have knowledge of local needs and requirements that are overlooked by large-scale operators, particularly in hard-to-reach areas. Working more closely to them will therefore benefit the level of service provided, while minimising the duplication of service systems. Furthermore, it is of crucial importance to better monitor activities occurring in the shadow of regulations, particularly with regard to water quality and prices.

Building state-citizen trust

Citizens have limited trust in the state. This has directly affected utilities' subscription rates and revenue collection from customers. Furthermore, it has exacerbated difficult institutional coordination efforts, as many have continued relying on municipalities for service provision despite Law 221 being enacted 17 years ago. In this regard, WEs must develop approaches to engage with citizens and maintain relationships in order to develop a culture of mutual trust. While outcomes will only emerge over the long term, they will lead to considerable improvements in the water sector and participate in building its resilience.

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Protracted conflicts in the Middle East and North Africa (MENA) region have left tens of millions of people in need of humanitarian and development assistance to have access to water. But the capacity of local water service providers (state-owned and private) to maintain adequate levels of services has decreased as conflicts and population movements across the region have continued, mainly towards urban areas. Other actors including United Nations agencies, international organisations, local NGOs and independent – often informal – water providers have played an important role in filling gaps in supply. This study analyses all these actors' responses to continuing the supply of water during conflicts, focusing on factors of resilience building that particularly concern local service providers.

IIED is a policy and action research organisation. We promote sustainable development to improve livelihoods and protect the environments on which these livelihoods are built. We specialise in linking local priorities to global challenges. IIED is based in London and works in Africa, Asia, Latin America, the Middle East and the Pacific, with some of the world's most vulnerable people. We work with them to strengthen their voice in the decision-making arenas that affect them — from village councils to international conventions.

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