



# Balancing water stress and human crises under a changing climate

Integrating international policy agendas in the Bekaa Valley, Lebanon

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Issue paper

December 2016

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**Water; Urban**

*Keywords:*

climate change, drylands, Middle East, water and sanitation, watersheds

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## Produced by IIED's Climate Change, Human Settlements and Natural Resources Groups

Working in collaboration with partner organisations and individuals in developing countries, the Climate Change Group has been leading the field on adaptation to climate change issues.

The Human Settlements Group works to reduce poverty and improve health and housing conditions in the urban centres of Africa, Asia and Latin America. It seeks to combine this with promoting good governance and more ecologically sustainable patterns of urban development and rural-urban linkages.

The aim of the Natural Resources Group is to build partnerships, capacity and wise decision-making for fair and sustainable use of natural resources. Our priority in pursuing this purpose is on local control and management of natural resources and other ecosystems.

## Acknowledgements

We wish to thank everyone who provided input into this report at a co-ordination meeting organised by the Bekaa Water Establishment; at a subsequent reflection meeting for interested researchers and other actors at the Advancing Research Enabling Communities Center in the Bekaa; and during internal review meetings among IIED staff. We would like to thank the Litani Authority for providing data from their river gauges for our research. Additional thanks are due to Farah Ahmad who prepared an outstanding report on the reflection workshop and to Mark Foss for his structural editing of this paper, its accompanying Working Paper and preceding 'Reflect & Act' publication on 'Balancing Water Stress'. Also to Hassan Machlab (ICARDA) and Ihab Jomaa (LARI) for review comments.

Published by IIED, December 2016.

King-Okumu, C, Jaafar, H and Archer, D (2016) Balancing water stress and human crises under a changing climate: Integrating international policy agendas in the Bekaa Valley, Lebanon. IIED, London.

Product code: 10175IIED

ISBN: 978-1-78431-423-1

Photo caption: Houses and tents in the municipality of Qab Elias in the Bekaa Valley, May 2016

Photo credit: Caroline King-Okumu

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Three major international agendas concern building resilience to climate change, achieving sustainable development in marginal dryland environments and responding to humanitarian crises. These agendas often compete with each other for support and attention. When crises become acute, sustainable development and the climate change agenda may suffer reversals that will leave populations ever more vulnerable. However, the agendas can also complement each other. This paper reflects on recent experiences in Lebanon's Bekaa Valley, where an international humanitarian effort has created both challenges and opportunities for balancing water stress over both the short- and long-term horizons.

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# Summary

In Lebanon's Bekaa Valley, an international humanitarian effort has created both challenges and opportunities for balancing water stress over the short- and long-term. An analysis and discussion confirm that lack of a long-term environmental response is increasing water scarcity, pollution, variability and vulnerability to climate change. The intractability of these collective local resource management challenges is due to institutional difficulties rather than lack of know-how or innovative technologies. A different approach is needed – one that can de-escalate and reorient both local and global drivers of this institutionalised failure. Such an approach should include increased international support to local and regional environmental solutions for sustainable development. However, it will have to cost less, achieve more local buy-in and bring more benefits – both to the region and to the international community – than the current pattern of crises and creation of refugees.

## Multifaceted challenges

Since 2013, a humanitarian crisis caused by the displacement of people from Syria, and the accompanying crisis responses, have multiplied the population and its demands for water in the Bekaa Valley of Lebanon. This, in turn, has amplified environmental challenges and sidelined any consideration of possible solutions to them. This paper explores the intersection between three international agendas for building resilience to climate change, achieving sustainable development and responding to the humanitarian crisis in the context of the Bekaa. It draws on discussions held by the International Institute for Environment and Development (IIED) co-investigators with a range of international, national and local actors who are engaged in activities in the water sector.

Three principal questions concern:

1. Whether the current crisis and lack of long-term environmental response are increasing water scarcity, pollution, variability and vulnerability to climate change
2. How immediate water and sanitation needs of an expanded population could be met without increasing water stress, and
3. What institutional support is in place (/needed), including at the local level in the Bekaa.

A scoping team that participated in three IIED missions to Lebanon in April, May and October 2016 formulated and explored these questions. IIED subsequently commissioned an in-depth study and a comprehensive review of available literature. These were discussed at a co-ordination meeting organised by the Bekaa Water Establishment (BWE) and at a subsequent reflection meeting for interested researchers and other actors at the Advancing Research Enabling Communities Center in the Bekaa. This discussion was supported through a series of internal review meetings among IIED staff in Edinburgh, London and a range of dryland locations on different sides of the Sahara.

This analysis and discussion confirm that lack of a long-term environmental response is increasing water scarcity, pollution, variability and vulnerability to climate change. But the displaced people are not the largest consumers of water in the Bekaa. Their needs could be accommodated harmoniously through careful integration with the spatial and temporal demands and return flows from the other water users. Furthermore, some international responses may be helping to generate data and build capacity. Nevertheless, rebalancing of water demands and availability require a level of local information, planning and co-ordination that is still not available. This will require a dedicated programme of collaborative action (Box 1).

## BOX 1: TAKING ACTION

A credible long-term strategy and process to overcome water stress is urgently needed for the Bekaa Valley. This should be based on open and effectively managed databases to continuously share, update and review the best available information. Such a system should help overcome the climate of mistrust and denial of responsibility that prevail among the various different actors, public and private. This is a necessary part of adaptation planning and crisis prevention.

We have identified three promising and complementary entry points for a new strategic approach to rebalance water stress in the Bekaa. These could be implemented simultaneously.

First, a pilot climate mitigation and adaptation planning process could strengthen local institutions and capacities. Such a process to be launched at the local level would take a minimum of 3–5 years to establish at an estimated cost of £2 million. This should be led by the national government and ecological research institutions in Lebanon, include civil society and focus on changing attitudes to the formal and informal systems for collective resource stewardship. A range of examples from the United States, Europe, Africa and drylands in other regions are available in the published literature on common pool resource management.

Second, pilot investments across sectors and scales in selected municipalities or *cazas* could enhance water resource conditions and economic development. A system for investment, monitoring and assessment to implement and track the impacts of climate mitigation and adaptation on resource conditions and development indicators would take at least 5–10 years to put in place at an estimated minimum cost of £5–10 million. Such a system could be designed to build capacities and system coherence at the municipal and/or *caza* levels. This initiative should work through the national systems, including the Bekaa Water Establishment (BWE) and Lebanese Agricultural Research Institute (LARI) in the Bekaa Valley.

Third, international and national innovation and information management initiatives led by the Ministry of Energy and Water could be boosted and accelerated through pilot initiatives at regional and local levels over a minimum of 1–3 years and at a cost of £0.5–1 million per year. This could be done either alongside or before the other two through an initiative focused around Sustainable Development Goal (SDG) 6.4. Such an initiative should include both Lebanese and international universities, LARI and BWE in the Bekaa. It should also encourage practitioners in the Bekaa to enroll in and/or complete study courses that could help their work on relevant topics for stewardship of water and achievement of environmentally sustainable development.

## An integrated agenda

There is a strong case for increased international support to long-term engagement with the Lebanese government and research institutions in the Bekaa Valley. This should focus on building long-term resilience to climate change, responding to the immediate humanitarian crisis, and achieving and sustaining development. Continued discussion among various stakeholders at national, local and international levels should refine pilot actions proposed for the Bekaa, and analyse costs and benefits.

Further challenges to integrate crisis response agendas with long-term resilience building can be observed across a range of different dryland contexts beyond the Bekaa Valley. The proposed experience and learning process for the Bekaa should therefore be of significant interest to the international and regional community, as well as to national and local actors.

# Introduction

Long-term (and short-term) environmental challenges under dry and variable climates relate to water scarcity, climate variability, water quality concerns and depletion of groundwater tables. The international community needs a different approach to de-escalate and reorient a pattern of crisis, short-term intervention and escalating conflicts in the Middle East and North Africa. Such an approach should encourage more collegial and neighbourly international support to local and regional environmental solutions for sustainable development over the longer term. This has to cost less, achieve more local buy-in and bring more benefits – both to the region and to the international community – than the current pattern of destruction, displacement and short-term responses.



## The Bekaa Valley

This study focuses only on the upper parts of the two basins located in the Bekaa Valley in Lebanon (Figure 1). This valley is a fertile land corridor separating the Mount Lebanon and Anti-Lebanon Ranges. It is drained to the north by the Assi River and to the South by the Litani River. The Assi River is also known as the Orontes, with lower reaches extending through Syria and Turkey (Comair *et al.*, 2013). The area of the upper Orontes in the Bekaa is approximately 209,000 ha. The Upper Litani Basin in the Bekaa is 153,000 ha, while the entire basin covers an area of 2,174 km<sup>2</sup>.

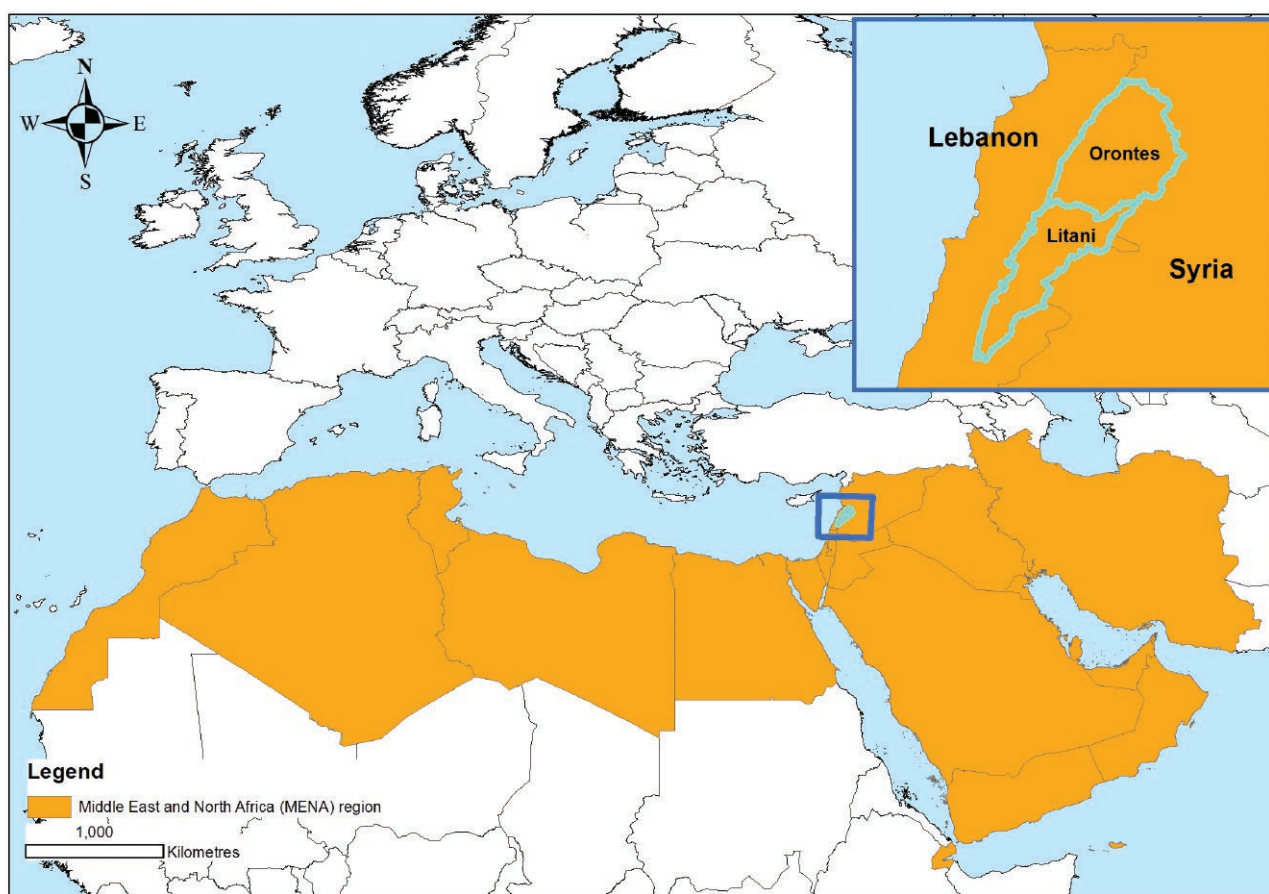
Long-term (and short-term) environmental challenges in Lebanon's Bekaa Valley relate to water scarcity, climate variability, water quality concerns and depletion of groundwater tables (MoE, 2011). The intractability of

these collective local resource management challenges is due to institutional difficulties rather than lack of know-how or innovative technologies.

The ongoing humanitarian situation in Lebanon, Syria and Palestine has amplified these challenges. Specifically, it has multiplied the population in the Bekaa and its demands for water. And it has increased quality threats due to temporary sanitation and waste management measures (IBRD, 2013; VASyR, 2016).

Crisis responses, including more wells, faster extraction of water, and increased informal or expanded settlements with make-shift service arrangements, are aggravating environmental pressures. Such pressures will make it more difficult to adapt to climate change and further threaten the resilience of communities.

Figure 1: Location of the Upper Orontes and Upper Litani basins in the Bekaa Valley



Credit: Hadi Jaafar, 2017.

## A growing refugee population

Administratively, the Bekaa Valley includes two separate governorates: Bekaa and Baalbek/Hermel, which occupies the northernmost part of the valley, reaching to the border with Syria.

As of August 2016, the total population in Bekaa governorate comprised 563,515: 228,142 refugees from either Syria or Palestine and only 275,373 Lebanese (IAMP, 2016). The total population of 407,183 in Baalbek/Hermel included 263,450 Lebanese, while the remaining 35% were refugees. However, the refugee population is not evenly distributed. Instead it is concentrated in some areas.

There is a need to review and update the population estimates. Other categories of 'stateless' people may also be present (Chatty, 2010; Shoufi, 2015). As of 2009, based on electoral records, 50,000 Bedouin were guesstimated to be living in the Bekaa without identity cards or direct legal access to state services (Chatty *et al.*, 2013).

The Bekaa governorate includes three administrative districts (Zahle, West Bekaa and Rachaya), composed of over 85 municipalities. The Baalbek/ Hermel governorate includes the administrative districts of Baalbeck and Hermel, containing 74 municipalities. In 2013, West Bekaa had the highest ratio of refugees to local population in the whole of Lebanon, followed by Zahle (IBRD, 2013).

The Bekaa Valley and North had the highest proportion of influx of refugees from 2013 onward (UNHCR, 2013). Consequently, the influx almost doubled the number of people requiring domestic water supplies and further exacerbated the challenges in the water sector (IBRD, 2013).

## Access to water

The World Bank (IBRD, 2013) assessed expenditures required from local authorities on operations and maintenance, as well as capital investments to restore pre-crisis levels of water services. It identified the Bekaa as having the largest shortfall of services and needs for additional investment. The BWE provides water services in this region.

For the annual Vulnerability Assessments for Syrian Refugees in Lebanon (VASyR, 2015, 2016), international nongovernmental organisations (NGOs)

such as World Vision collect data. A regional analysis of the data presented in 2015 showed that refugees in Baalbek-Hermel had the lowest rate of access to improved water sources (42%) compared to all other surveyed governorates. In Baalbek-Hermel, 58% of refugee households relied on unimproved sources of drinking water. The main unimproved source was tap water, which was available for less than two hours per day. The main improved source was protected wells (30%).

In Bekaa, 51% of households had access to improved sources of drinking water. The main improved source was tap water for more than two hours per day (available to only 33% of households). The main unimproved sources were bottled water and water not provided by NGOs. By 2016, reliance on bottled water had increased across Lebanon (VASyR, 2016). The proportion of refugee households in the Bekaa without access to a bathroom was 29% – the highest of all surveyed governorates (VASyR, 2015). In Baalbek-Hermel, 13% of refugee households reportedly did not have access to a bathroom. This level of analysis was not repeated in 2016.

The Lebanese Crisis Response Plan (LCRP) includes targets for water, sanitation, hygiene and other vital services by the energy and water sector for some 2 million people, including displaced Syrians, Lebanese and Palestinian Refugees from Syria (PRS) (RoL, 2015b and RoL, 2017). The target for safe and equitable access to a sufficient quantity of water for drinking, cooking and personal and domestic hygiene at public health facilities is tracked at the national level (e.g. in Interagency, 2016, LCRP, 2016, RoL, 2017).

Reporting on implementation of the LCRP is expected to be broken down among the following categories: Syrian, Lebanese, PRS and Palestinian Refugees from Lebanon (PRL) (Table 1). The LCRP results framework identifies numbers of people in permanent settlements in need and targeted for equitable access to a sufficient quantity of safe water for drinking, cooking, and personal and domestic hygiene at permanent locations in 2016. These include total numbers, and those in the governorates of Bekaa and Baalbeck Hermel.

The BWE has a jurisdiction of 4,261 km<sup>2</sup>, including estimated 525,066 Lebanese residents.<sup>1</sup> By 2013, a master-plan had been formulated to improve BWE's service delivery (BWE, 2013, 2015a, 2015b). However,

<sup>1</sup> Indicated at: <http://bwe.gov.lb/about.php>

Table 1: Numbers of people in need and targets for equitable access to a sufficient quantity of safe water for drinking, cooking, and personal and domestic hygiene at permanent locations\*

	NATIONAL		BEKAA		BAALBECK	
	IN NEED	TARGET	IN NEED	TARGET	IN NEED	TARGET
Syr	255,000	251,491	53,451	52,613	22,555	22,201
Leb	705,000	704,175	149,664	147,316	63,153	62,162
PRS	42,000	40,239	8,552	8,418	3,609	3,552
PRL	20,000	10,060	2,138	2,105	902	888
<b>TOTAL</b>	<b>1,022,000</b>	<b>1,005,965</b>	<b>213,806</b>	<b>210,451</b>	<b>90,218</b>	<b>88,803</b>

Source: Energy and Water Sector Results Framework for the Lebanese Crisis Response Plan 2016.

\* based on best available population estimates and does not include needs at informal tented settlements.

the plan was subject to a number of practical limitations. In particular, it could not have foreseen how the regional crisis exacerbated water stress. Nor could it take a long-term view, including consideration of the effects of climate change and other environmental challenges.

Since 2013, the number of international partners trying to improve water and sanitation in the Bekaa has grown rapidly (see: <https://data.unhcr.org/syrianrefugees/country.php?id=122>). These initiatives have primarily targeted the displaced Syrian population, but also increasingly include interventions for the Lebanese host communities. The BWE co-ordinates all of these additional initiatives in the Bekaa water sector. The expanded community of national, local and international actors active in the Bekaa has made no further attempts at strategic planning.

## An evolving context

Long-term (and short-term) environmental challenges in Lebanon's Bekaa Valley relate to water scarcity, climate variability, water quality concerns and depletion of groundwater tables (MoE, 2011). The intractability of these collective local resource management challenges is due to institutional difficulties rather than lack of know-how or innovative technologies.

The ongoing humanitarian situation in Lebanon, Syria and Palestine has amplified these challenges. Specifically, it has multiplied the population in the Bekaa and its demands for water. And it has increased quality threats due to temporary sanitation and waste management measures (IBRD, 2013).

Crisis responses, including more wells, faster extraction of water, and increased informal or expanded settlements with make-shift service arrangements, are aggravating environmental pressures. Such pressures will make it more difficult to adapt to climate change and further threaten the resilience of communities.

The deepening of pressures in the Bekaa due to ongoing conflict in the surrounding region has stimulated discussion of the nature and principles of resilience-building in the Lebanese context (Bekdache, 2015; UNDP/MercyCorps, 2015; Verme *et al.*, 2016). It has also reshaped attention on how the population, government and international humanitarian and development communities can nurture resilience through long-term planning (ECODIT, 2015; RoL, 2014, 2015a).

For many years in Lebanon, crisis response planning (e.g. RoL, 2014) has dominated natural resource decision making. Since the civil war period, it has not been possible to apply normal systems and laws, particularly in certain areas. Lebanese society and its international partners are facing challenges to integrate humanitarian assistance with national plans to steward the available water resources (ECODIT, 2015), while mitigating and adapting to climate change (RoL, 2015a). The latest wave of international humanitarian interventions is the largest yet. It may create additional openings for more inclusive and sustainable strategies for local water resource management.

## The research agenda

For nine months between April-December 2016, IIED explored the need, opportunity and level of stakeholder interest for an international policy action-research agenda in the Bekaa Valley. Such an agenda would build resilience in drylands to avert water stress over the long- and short term under the changing climate in the Bekaa and the surrounding region.

Previous researchers had suggested that the failure to address these shared challenges had contributed to forced and uni-directional migrations from areas with reduced access to water, energy and economic resources across the region (Kelley *et al.*, 2017). Further investigation of how these questions are playing out in the Bekaa is therefore of critical significance and interest to international, regional, national and local policymakers.

This initiative on dryland resilience-building draws on previous experiences gained by the investigation team members. These experiences revolve around the water-food-energy-climate nexus (Jaafar *et al.*, 2015; King and Jaafar, 2015). They are also informed by a regional initiative on water and agricultural livelihoods established at the International Center for Agricultural Research in the Dry Areas (ICARDA) before and during the emergence of the crisis in Syria (King *et al.*, 2013).

Further, it takes inspiration from a growing body of work at IIED on institution building in a range of challenging dryland contexts. These have included areas of sub-Saharan Africa, such as parts of Mali and the Horn of Africa (see [www.iied.org/drylands-pastoralism](http://www.iied.org/drylands-pastoralism)). It also draws on and contributes to a programme of work within the IIED Human Settlements group on effective response to urban humanitarian crises.

Collectively, this body of experience suggests that water availability is central to three aspects of resilience in the dryland context: living standards, livelihoods and local resource management institutions. It also reflects an understanding that:

- dryland water resource availability is often subject to considerable variation and extremes (i.e. both droughts and floods), as well as longer-term changes due to climatic, anthropogenic and institutional factors (Krätli and Jode, 2015)
- in addition to economic assessment (e.g. Trærup and Stephan, 2014), strategies to enhance water availability require integrated consideration of effects on the climate-water-energy-environment nexus (Hoff, 2011; King and Jaafar, 2015)
- inclusive, well-resourced and well-informed local and national institutions hold the keys to success (Mayers *et al.*, 2009; Toulmin *et al.*, 2015).

This paper is based on discussions by IIED co-investigators with a range of international, national and local actors engaged in water sector activities in the Bekaa. It also reflects a series of analytical studies commissioned by IIED to pursue issues in greater detail (Jaafar, 2017; Machayeki, forthcoming). The IIED team formulated and explored these questions through two scoping missions to Lebanon in April and May 2016.

They were explored further during a co-ordination meeting organised by the Bekaa Water Establishment (BWE) on 25 October 2016 and a subsequent reflection meeting for interested researchers and other actors on 26 October at the Advancing Research Enabling Communities Center (AREC) in the Bekaa which included the Lebanese Agricultural Research Institute (LARI) and others. This discussion was supported through a series of internal review meetings among IIED staff in Edinburgh, London and a range of dryland locations.

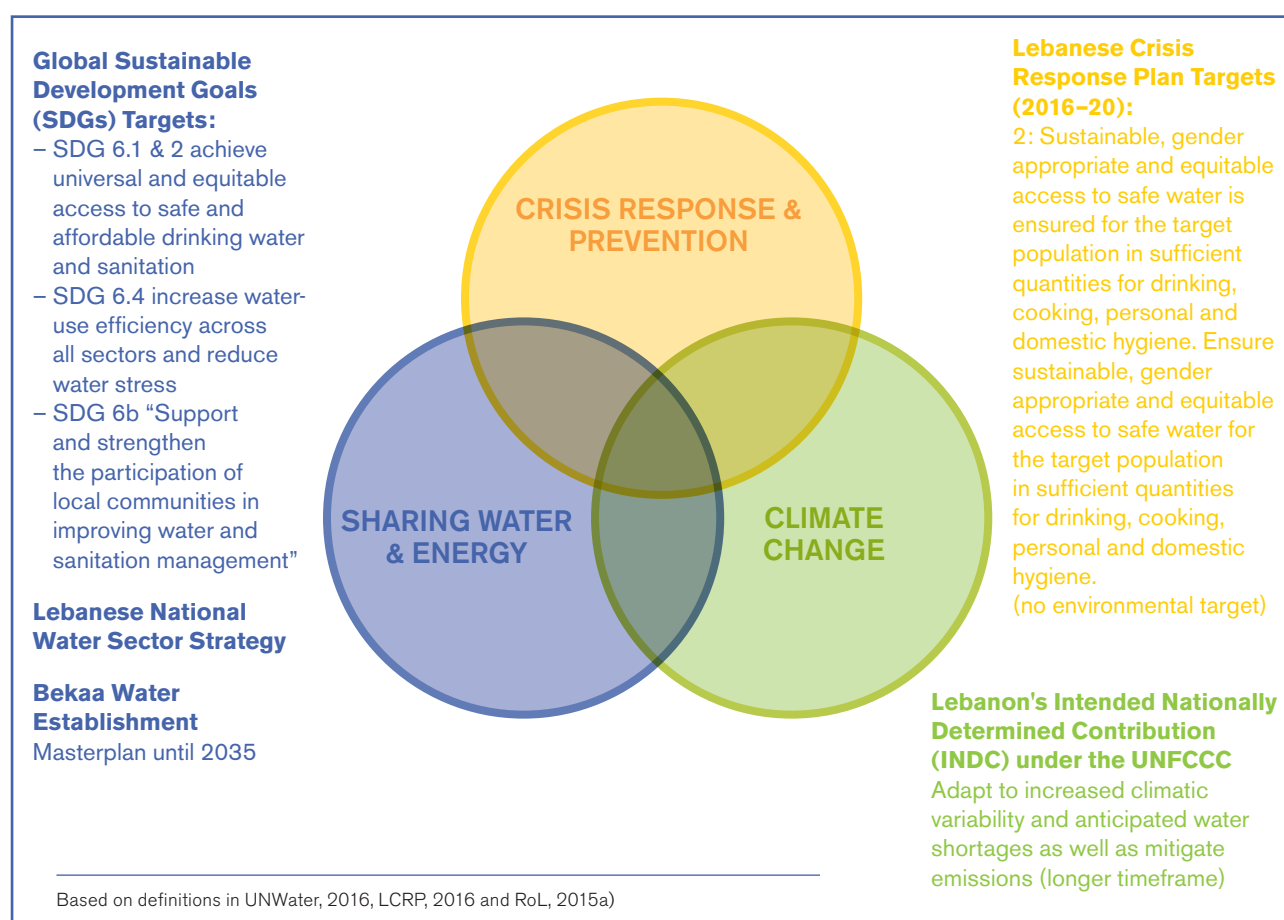
## The need for a new approach

The paper reflects a view that the intractability of the environmental challenges in the Bekaa and its surrounding region is due to an unfortunate socio-ecological dynamic. The interaction of capital flight, brain drain, environmental degradation and creation of disasters and refugees has become accepted as an inevitable unidirectional pattern and part of daily life across Western Asia and North Africa. This bad to worse dynamic has not been helped by the ongoing peace process.

The international community needs a different approach to de-escalate and reorient the situation. Such an approach should consist of more collegial and neighbourly international support to local and regional environmental solutions for sustainable development over the longer term. This has to cost less, achieve more local buy-in and bring more benefits – both to the region and to the international community – than the current pattern of destruction, displacement and short-term responses.

Conclusions are intended to feed into strategic discussions in Lebanon concerning water service provision, resource management and adaptation to climate change (building on ECODIT, 2015; IRC, 2015; RoL, 2014, 2015a). They should also feed into the international- and regional-level discussions regarding national and sub-national adaptation planning and investments to achieve the SDG targets in the context of water scarcity and climate change, even in conflict-affected and fragile environments (Figure 2).

Figure 2: Intersecting international, national and local policy agendas in water-stressed and fragile dryland environments



## Three questions

This issue paper explores some of the questions around three international planning agendas (see Figure 2) in the context of Lebanon, and in particular the Bekaa. It refers directly to four targets of the global Sustainable Development Goals (SDGs) in this context.

Three principal questions:

**i. Is the current crisis and lack of long-term environmental response increasing water scarcity, pollution, variability and vulnerability to climate change?**

This question relates to SDG target 6.4 (to ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water stress). It also has implications for national water management planning and databases. The answers could inform national and sub-national agendas for adaptation to climate change.

**ii. Is there scope for better informed and improved planning to reduce future water stress?**

The LCRP and master planning for service delivery by the BWE and international partners focus on targets for water and sanitation. These are relevant to the SDG targets 6.1 and 6.2 concerning universal and equitable access to safe and affordable drinking water and sanitation. However, the question also has implications for water management and development planning across a range of sectors, including in urban and agricultural areas.

**iii. What institutional support is in place at the local level in the Bekaa?**

The cross-cutting SDG target 6b (to support and strengthen the participation of local communities in improving water and sanitation management) relates directly to institutional questions and debates around decentralised governance in Lebanon. Institutional support and participation will also be central to the rest of the SDG agenda and to the domestication of the Lebanese Intended Nationally Determined Contribution (INDC) to mitigation and adaptation to climate change.

# Issues for Discussion

This section explores three critical questions:

- i) Is the current crisis and lack of long-term environmental strategy increasing water scarcity, pollution, variability and vulnerability to climate change?
- ii) Is there scope for better informed and improved planning to reduce future water stress?
- iii) What institutional support is in place or is needed at the local level in the Bekaa?



## Anatomy of a crisis

### i) Is the current crisis and lack of long-term environmental strategy increasing water scarcity, pollution, variability and vulnerability to climate change?

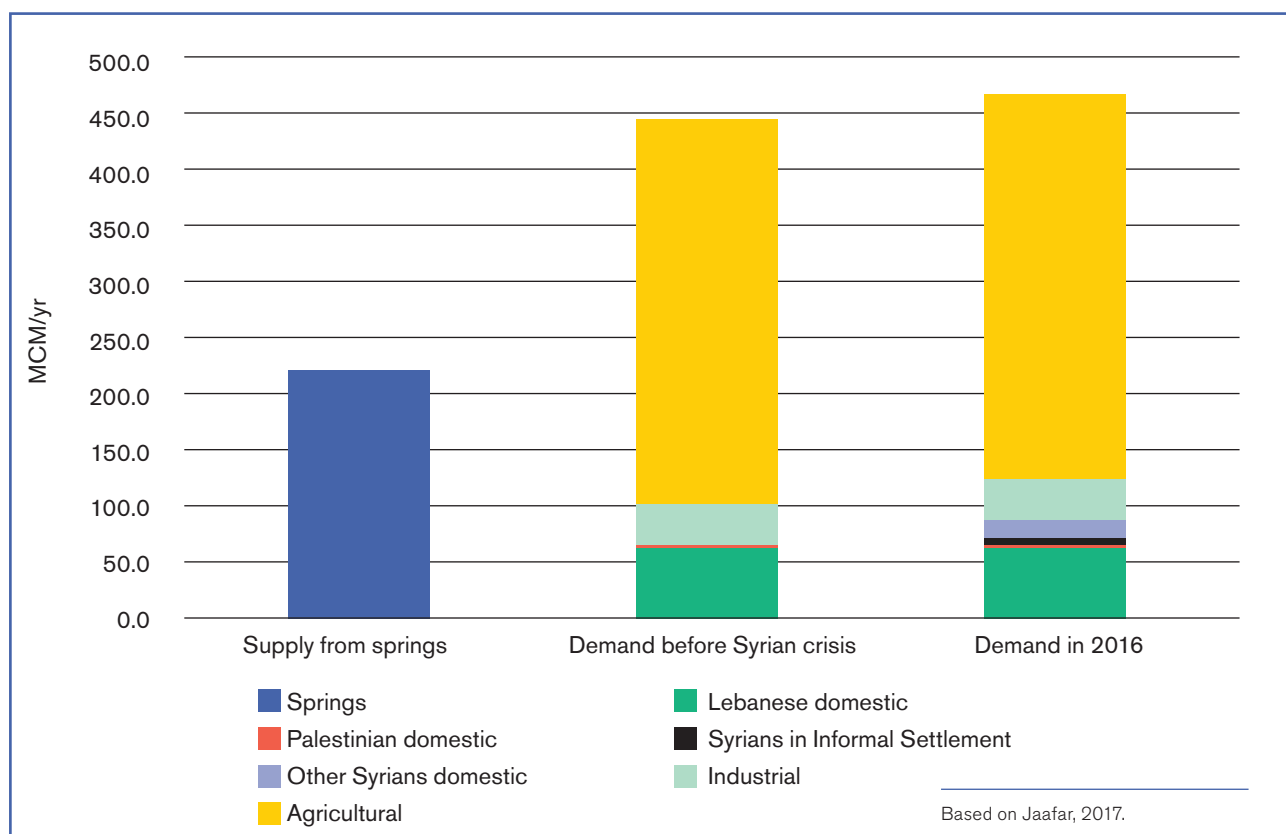
#### Understanding water stress

In the Bekaa, water stress tends to be blamed on agricultural water use, and also more recently, on the increased population following the arrival of refugees from Syria (MoE, 2014). Few formal studies have been published concerning climatic effects on the flows of water through the Assi (Orontes) or Litani Rivers (Ramadan *et al.*, 2012, 2013; Shaban *et al.*, 2014). This is partly due to gaps in the available time-series climate information, particularly during the war periods. However, LARI collects weather data at locations across the Bekaa and shares them with farmers. From 2008–2014 this was done via text messaging. Since early 2015 information is now transferred via smart-phone application LARI LEB.

The river systems in the Bekaa are fed by water from springs and surface runoff. Where surface water is not available to meet human needs, groundwater is increasingly used (Jomaa *et al.*, 2015). Between April 2013 and April 2014, water table levels in North Bekaa appear to have fallen by around 2m (MoEW/UNDP, 2014). Many individual resource users say they have observed falling water tables at their wells over longer periods to greater depths. The Litani River Authority (LRA) in the Litani River basin reported a decrease in water volume in three out of four sources in 2012–13 compared to the year before (MoE, 2014). This suggests significant use of groundwater, causing withdrawals to exceed annual recharge. This, in turn, reduces water reserves in the aquifer systems.

The South and North Bekaa Neogene-Quaternary Basins show deficiencies in their budgets of up to 45.7MCM and 34.2MCM respectively (MoEW/UNDP, 2014). A drop of about 20m is observed in the Litani area in the Southern Bekaa Neogene-Quaternary Basin (Basin 11a) (UNESCWA, 2015). These observations appear in line with imbalances between estimated volumes of available supply of water from streams and estimated demand volumes (Figure 3).

Figure 3: Estimated water demand and supply of water from springs in Bekaa Valley before and after arrival of displaced people (MCM/yr)



## Information gaps

The BWE Master-planning reports (BWE, 2013, 2015a, 2015b) acknowledge the need to consider water availability estimates for its planned increases in water service delivery in the Bekaa. The Master-plan also highlights difficulties with estimates of water availability from the springs and river systems due to reliance on limited and fragmented recordings of water flows (BWE, 2015a: p4). It concludes that efforts to gather more information are needed, and should appear in a future report.

A series of water balance studies have been conducted for the Ministry of Energy and Water (MoEW) (Fayad *et al.*, 2014). However, they could not be published in detail or enriched through scientific peer review. According to all available studies to date, agricultural uses account for the largest proportion of water extractions and use in the Bekaa (Figure 3).

Estimated volumes of water used in industry and bottled for water vending are poorly understood and may well be underestimated. In addition, the amount of water used in institutions such as schools, offices, hospitals, medical facilities and places of worship is never accurately quantified or considered in the available water balance studies. It is also unclear how much urbanisation in areas such as the Bekaa is accelerating institutional demand for water.

Precise measurement of agricultural and domestic water uses is also difficult, but can be attempted using demand estimates (used in Figure 3 and Table 2). At present, the water establishment cannot assess the actual volumes of water that it extracts and supplies

for domestic and other uses. However, together with international partners, the BWE is working to install water metering devices (BWE, 2016).

## Demand exceeds supply

According to a recent assessment of water demand for the Lebanese and Syrian populations in the Bekaa, total domestic demand for water is less than the total supply from naturally flowing springs (Figure 3). However, because spring water is shared with agricultural users, water for drinking is often sourced from wells.

The additional domestic demand to meet the needs of displaced Syrians in the Bekaa is relatively small compared to the overall demand (Figure 3). Nevertheless, the amount of disruption caused to the balance of supply, demand and water quality through configuration of emergency water supply and sanitation systems is not clear from this assessment.

Domestic and agricultural demands are not perfectly aligned to available supplies in terms of their spatial distribution and seasonal peaks and lows. Instead, both types of demand are concentrated in particular places at certain times of the year. This can create local hotspots of increased competition and scarcity, particularly during the summer and in drought periods (OXFAM *et al.*, 2014).

At other times of the year, excess rainfall can cause flooding in the Bekaa. The arrival of displaced people has led to sudden changes in population. Further, the new residents are unevenly distributed, clustering in particular municipalities. These trends may have worsened the imbalances between supply and demand.

Table 2: Water demand in the Bekaa Valley in 2016\* (MCM/yr) (based on Jaafar and King-Okumu, 2017)

Supply area <sup>i</sup>	DOMESTIC						INDUS-TRIAL <sup>iv</sup>	AGRI-CULTURAL <sup>v</sup>
	Lebanese <sup>ii</sup>	Palestinians <sup>iii</sup>	Syrians in IS <sup>iii</sup>	Syrians not in IS <sup>iii</sup>	Total Syrians	Subtotal domestic		
West Bekaa	8.9	0.3	1.3	2.8	4.1	13.3	5.3	97.0
Zahle	23.9	0.5	3.4	7.5	10.9	35.4	14.2	109.0
Baalbek	27.4	0.3	2.5	4.3	6.9	34.6	13.8	132.0
El Hermel	5.5	0.0	0.0	0.3	0.4	5.8	2.3	5.0
Grand total	65.7	1.2	7.3	15.0	22.3	89.1	35.7	343.0

<sup>i</sup> Rachaya was excluded from this study.

<sup>ii</sup> Based on BWE (2013) population estimates and consumption rate: 180l/c/day.

<sup>iii</sup> Based on IAMP population estimates and consumption rates of 160l/c/day (except for Syrians in Assi Basin, who use only 120l/c/day for reasons explained in the study).

<sup>iv</sup> 40% of total domestic demand.

<sup>v</sup> See methods described by Jaafar and King-Okumu (2017).

## Growing threats to water quality

In addition to concerns regarding the volumes of water required to meet expanding needs in the Bekaa, and its distribution in space and time, there are many anecdotal reports of growing water quality threats. Displaced people living in informal tented settlements – and the international NGOs hosting them – have been unable to create permanent systems for treatment and/or disposal of sewage and wastewater. The existing wastewater treatment plants that serve the Lebanese population are acknowledged to be limited and subject to management challenges.

Local authorities are expected to monitor water quality to ensure safe supply for drinking, cooking and personal and domestic hygiene (LCRP, 2016). LARI operates the available facilities in the Bekaa for analysis of water quality. It completed a study on ambient water quality in the ground and surface waters of the Bekaa in July 2016. LARI reported and continues to report results and concerns to officials and responsible ministries. UNICEF (the UN Children's Fund) commissioned a national household water quality survey in 2016 that is expected to be published in January 2017.

Overall, the Bekaa faces some significant environmental challenges. These include water scarcity, pollution, variability and vulnerability to climate change. A lack of effective information and monitoring systems does not help local planners and practitioners to assess, plan and minimise these problems. It is almost impossible to assess the real impacts of the displaced population or local resource use in causing or exacerbating water stress. And it is all too easy for people to blame others, while contributing to the problem themselves.

## Towards better planning

### ii) Is there scope for better informed and improved planning to reduce future water stress?

#### Averting water stress

It is difficult for international partners to adjust their humanitarian interventions (including Water, Sanitation and Hygiene [WASH], job creation and other activities) to avoid increasing water stress. It is also difficult for the Lebanese government to pinpoint the sectors, locations and management approaches or technologies that could help avert further water stress in the Bekaa. This would require innovations to be underpinned by information and analysis.

The Ministry of Energy and Water (MoEW) has observed the need for enhanced water information management in the water sector, and operates an information centre for this purpose (MoEW, 2016). However, a range of practical, institutional and capacity-

related challenges remain for water availability and uses across all sectors to be fully understood and balanced effectively.

The Food and Agriculture Organization of the United Nations (FAO, 2016) proposes to enable MoEW to manage information from Lebanese public institutions. But without further attention the downward connections to private resource users at the local level are likely to remain as a bottleneck.

In the meantime, the relief effort is generating more information on household-level water access (e.g. Oxfam *et al.*, IAMP; VASyR, 2015, 2016) and water resource conditions (UNICEF, 2016). It may be possible to channel this information upward to improve strategic planning across sectors. But without a mechanism for this to happen, NGO staff privately express scepticism regarding the credibility of the national planning system, and concern over the possible use of their information by unscrupulous people for unintended purposes.

#### Better planning needed

Furthermore, the potential for local institutions, such as municipalities and chambers of commerce, to support better informed, more inclusive and more environmentally sustainable local economic development planning has not been explored. The LCRP is the main national planning framework, gives limited consideration to water use in urban, industrial or institutional uses (other than the needs of health facilities).

A target to “reduce irrigation water consumption to lower stresses on water resources, by improving irrigation efficiency of existing and planned irrigation schemes.” (target expressed in m<sup>3</sup> of water saved/ additional available water for domestic use) was suggested (LCRP, 2016).

This reflects the view that excessive irrigation water causes water stress in the Bekaa, and assumes that better irrigation efficiency will alleviate the problem. But the indicator is not sensitive to the location, timing and integration of irrigation efficiencies with other use patterns. Nor does it specify whose agricultural water uses would be reduced.

Due to the lack of information and bottom-up engagement of resource users, Lebanese authorities may struggle to track the SDG 6.4 indicators on freshwater availability and withdrawals effectively. In contrast, the LCRP suggested target for irrigation efficiency can be tracked and achieved most easily through a massive expansion of drip-irrigated farming across the Bekaa. This might not necessarily improve the overall water balance. Further, if successful, it would likely increase threats to water quality associated with increased use of agrochemicals.

There is no written plan for adaptation to water stress and climate change in Lebanon or at the sub-national level for the Bekaa. However, BWE, LARI and other actors have already collected a growing list of relevant low-cost interventions that could be effectively piloted, promoted and monitored alongside the ongoing humanitarian WASH programmes (Box 2). LARI is already implementing some of them in the Bekaa.

The National Water Sector Strategy (NWSS) (MoEW, 2011) forecasts a dip in domestic water demand from household-level water conservation to be introduced by 2020 (plumbing retrofits, high-efficiency toilets, showerheads and clothes washers, dual flush toilets, complete retrofit of large commercial and industrial consumers, public awareness campaigns, etc.) and due to more conscientious use of water by consumers after meters are installed.

### The right solutions for the right problems

Effective targeting of the right solutions to the right problems is important. This could help to avoid reducing water uses that are not competing with any others, and which may be having a positive effect on the water cycle. For example, agricultural and domestic demands can be difficult to reconcile at certain times of the year in some locations and cropping systems. These

cases may justify investing in drip irrigation systems to prevent farmers from 'wasting' water. But in other cases, practices that involve environmental uses or 'wasting' of water may be enabling low-income households to maintain low-input crop production strategies, enhance groundwater recharge and conserve tree cover (King and Jaafar, 2015).

Not all agricultural water uses result in the removal of water from the system. Water is often removed in the form of food and drink products containing liquid or through the evapotranspiration process that enables agricultural production. However, in traditional irrigation systems, the 'wasting' of a large proportion of applied water means this water returns to the system, recharges to the aquifers and can then be used again. In these cases, the return flows of water can represent an additional water source, rather than a loss. But this will depend on the surface and subsurface conditions, as well as a range of other factors. All of these are invisible in top-down systems for planning and target tracking.

Where they are managed and treated effectively, domestic and industrial wastewaters can also be recovered and reused. As the urbanisation process continues across the Bekaa, the NWSS could consider further efficiencies. Opportunities for wastewater

## BOX 2: WATER-SAVING TECHNOLOGIES AND APPROACHES

- a. Household-level water harvesting using rooftop reservoirs and cisterns
- b. Settlement-level water harvesting using urban drainage planning and design
- c. Catchment and micro-catchment level water harvesting using earthworks and vegetation integrated to landscaping
- d. Reuse of lightly treated greywater for small-scale irrigation and groundwater recharge at household level
- e. Reuse of treated wastewater from treatment plants at settlement level for irrigation and groundwater recharge in surrounding areas
- f. Additional systems to boost artificial groundwater recharge to replenish springs and water levels in wells
- g. Fitting wells with low-intensity solar-powered pumping systems (less than 200hp) that will reduce recurrent fuel costs for water users
- h. Fitting piped distribution systems with meters, reducing illegal connections and improving operations and maintenance efficiencies
- i. Awareness campaigns for water conservation to encourage consumers to further reduce unnecessary water losses
- j. Vocational training of plumbers and builders to fix and further reduce household water losses and improve greywater systems
- k. Training of technicians at municipalities and BWE to fix and further reduce system-level water losses
- l. Training of database managers, GIS technicians and students in Lebanese research institutes and universities to access, analyse and share available information.
- m. Using agrometeo and smart phone communication to increase water use efficiency (as LARI is already doing).

These were identified at a workshop discussion, 26 September 2016, AREC.

reuse, for example, could be built into the configuration of water uses and cycling among homes, institutions, industrial facilities, drainage systems, gardens and food and crop production, etc. Since the configurations of water uses and resource conditions are different throughout the Bekaa (Figure 4), solutions that could save water in one area might not apply in others.

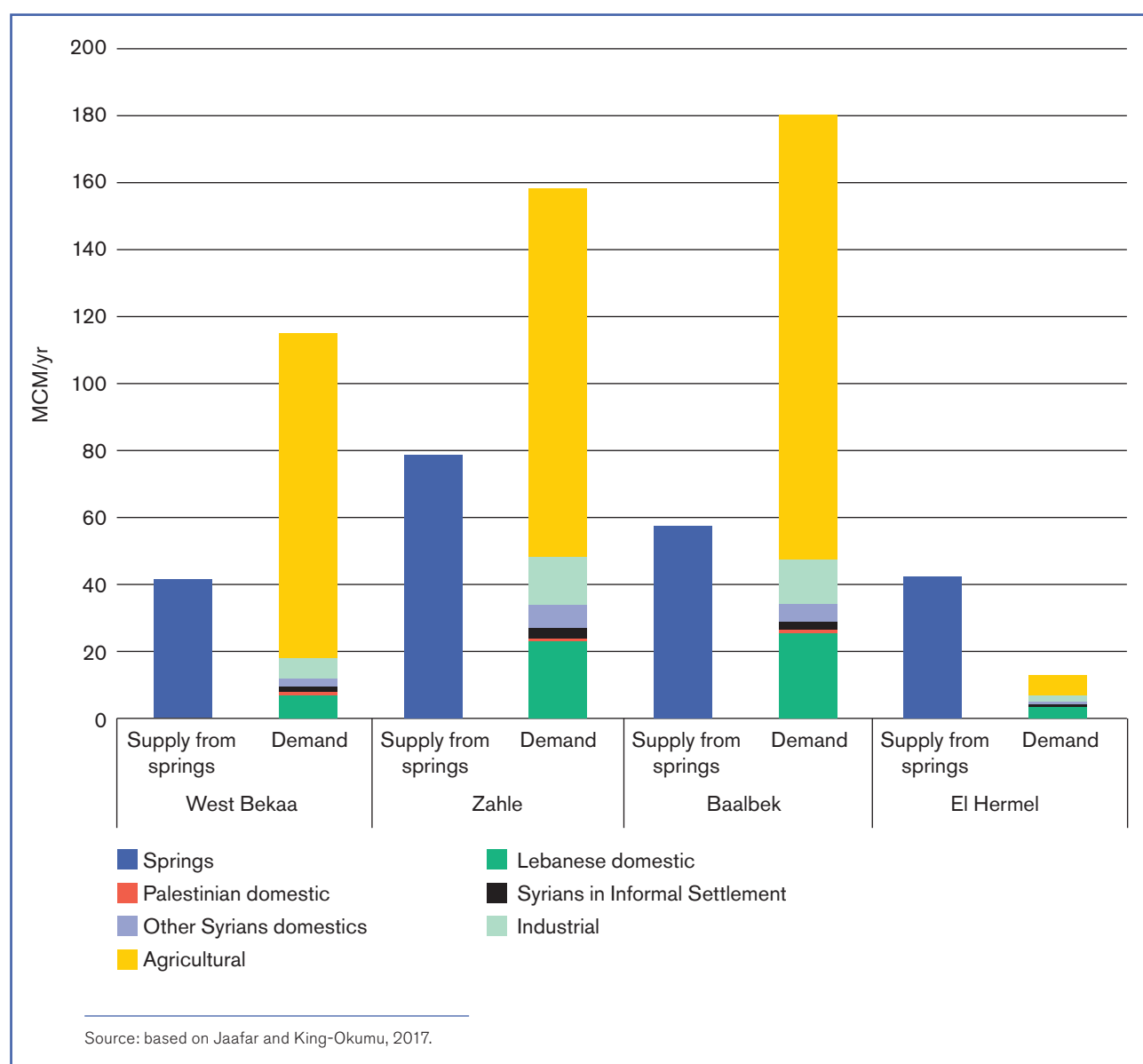
### Costs, benefits and trade-offs

Our analyses to date of water demand to the supply from springs in four service areas of the Bekaa (Figures 3 and 4) show a shortfall. We have not determined what proportion of this shortfall is sourced from other surface runoff, reuse or groundwater. We can confirm, however, that the balance is slightly different in

each service area. We do not have sufficient information to assess further potential to optimise use of renewable water sources and minimise the use of non-renewable groundwater. But since the application of all proposed solutions in Box 2 is limited, the untapped potential to reduce future water stress could be worth looking into.

Analysis at the supply system level (Figure 4) is more enlightening than that of the two basins combined (Figure 3). However, an even more localised scale of analysis (e.g. at the level of individual municipalities) could shed more light on where each solution could make the most difference. Such an analysis could be part of local adaptation and economic development planning.

Figure 4: Water supply from springs and demand in four service areas in the Bekaa (2016)



In light of available resources and solutions, one could ask questions that go beyond whether the basic needs of the population can be met. These questions concern the configurations of uses, technologies and associated costs and trade-offs for meeting these needs. They must address issues such as increased water pumping and treatment (either at the expense of the government, international partners and/or the water users), emissions to the environment, depletion of aquifers or other costs to the regional and national economy.

Unless it is possible to reach a perfect balance among water demands and availability, these costs could include possible trade-offs. These might affect productivity in agricultural or other economic activities requiring access to water (e.g. water bottling; or service and hospitality industries for which offices, restaurants, hotels and other facilities require reliable water supplies for employees, customers or the public).

A considerable body of work is available in Lebanon to guide analysis of the costs of environmental degradation versus the benefits of avoiding it (Box 3). These costs and benefits should be weighed against any potential losses of economic productivity that could be associated with reconfiguring current water use.

### BOX 3: ANALYSIS OF COSTS AND BENEFITS AND TRADE-OFFS

The Lebanon State of Environment report (MoE, 2001) assessed the cost of the pre-crisis health impacts of poor water availability across Lebanon at US\$7.3 million per year, and excess bottled water consumption at about US\$7.5 million per year. Both the health problems and the annual consumption of bottled water are believed to have increased since that time.

At the national level, the opportunity costs of inadequate public water supply provision were estimated at 1.3 per cent of GDP (gross domestic product) (IBRD, 2009; Sarraf *et al.*, 2004). The cost of environmental degradation had further been estimated at 1.1 per cent of GDP (IBRD, 2011). There are fears the burden of environmental degradation has multiplied since the population increase in 2013 (Arif and Doumani, 2013). These costs are anticipated to worsen with ongoing climatic changes (MoE/UNDP/GEF, 2015).

## Establishing a planning framework

### iii) What institutional support is in place or is needed at the local level in the Bekaa?

#### Engaging local communities

Given the scope for a planning framework described in the previous section, the next question concerns how to establish such a framework. Reaching the ground through local participation is widely recognised to be critical to the success of all three of the international agendas for humanitarian response, sustainable development and climate change (see Figure 2). But how does this play out in practice in a conflict-affected and crisis-driven context such as the Bekaa?

In the present crisis, the importance of local level co-ordination in the Bekaa and across Lebanon has already been widely observed (Boustani *et al.*, 2016). International humanitarian support by Oxfam, UNICEF, Mercy Corps and others has been targeted to help municipalities respond to the basic needs of displaced people.

The municipalities have no legal role in providing water and sanitation services to the populations in Lebanon. But in practice, they are continuously obliged to deal with these challenges as they arise and affect their constituents. As a result, municipalities respond to pressures to solve water and sanitation problems however they can. Other important levels of local government include the unions of municipalities, through which some international programmes have boosted support to municipalities.

A strategic environmental assessment (SEA) of the National Water Sector Strategy (MoEW, 2011) reviewed the unforeseen challenges from rapid population growth due to arrival of the refugees (ECODIT, 2015). The SEA focused on 12 key issues, starting with climate change adaptation. A list of policy responses to address them (some of which are already embedded in the NWSS), considered three stakeholder groups: MoEW, Ministry of Environment (MoE) and 'other'. The role of the municipalities was briefly considered under 'other'. More recently, increasing attention has been devoted to identify stakeholders and analyse their respective roles in the water sector.

MoEW affirms it is keen to engage stakeholders and promote participation in the sector. However, it has not yet defined its process for achieving these goals. BWE would like to convene a meeting with people elected to represent local resource users in each of the municipalities, as well as members of the international community involved in the water sector in the Bekaa, to enable discussion of our research findings.

### Building municipal capacities

A range of profiling initiatives focus on assessment of water needs and other environmental planning at the municipal and *caza* levels. These include REACH, United Nations Office for the Coordination of Humanitarian Affairs (OCHA) and UNICEF profiles, municipal profiles under development by UN-Habitat and also Maps of Risks and Resources (MRR) in *cazas*, villages and localities by the Lebanese Ministry of Social Affairs.

Some municipalities have also secured international co-operation and support for local planning. LARI researchers are already working with agricultural water user associations in the Bekaa. They have developed several proposals to support the MoEW and municipalities in building their capacities (e.g. LARI, unpublished).

Decentralisation in Lebanon has been described as a fragmented and incomplete work in progress under development since the end of the civil war in 1989 (Harb and Atallah, 2015). Many expect a formal process of legislative decentralisation, despite taking time, to eventually enable the Lebanese people to overcome problems of elite capture, conflict and violence that have held back development (LeBorgne and Jacobs, 2016).

The central government in Lebanon has faced a range of challenges, including a vacant presidency over the past two years. It has still managed to decentralise some decisions and to hold municipal elections. However, the effects of the ongoing decentralization process have been limited by its informality and short-term planning horizons.

Current practices, experiences and expectations for how local communities can cope with water and sanitation challenges were established during the war period and its aftermath. This was a time when many national institutions were not functioning (BWE, 2016). The law has since changed, and significant investments have increased the BWE's capacities.

However, attitudes and expectations at the local level have not yet altered. Municipalities continue to play a significant role in the day to day management of water problems. Where the BWE can deliver services, there are high levels of illegal connection.

Non-payment of fees limits the ability of the BWE to operate, improve its services and achieve financial sustainability. The BWE must work with municipalities to reduce illegal connections and enlist subscribers. It is also expected to share revenues with municipalities and pay their power bills.

### Restoring a climate of trust

Available analyses of the roles of stakeholders in the Lebanese water sector (Farajalla *et al.*, 2015; Pierpaoli *et al.*, 2016) have observed a climate of mistrust and denial of responsibility among the various actors, public and private. This includes not only the agricultural establishment, and many powerful and long-entrenched interests, but also those engaged in the humanitarian sector.

Nongovernmental actors complain of the lack of a credible strategic plan, and argue they are powerless to change the situation. They feel that this justifies working around the situation and turning it to their favour as best they can.

### Working across jurisdictions

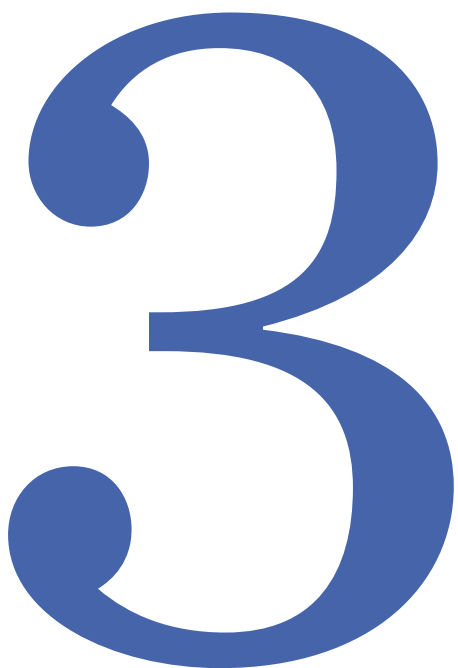
Action at the local level is critical to achieving the humanitarian WASH agenda. However, effective relations and co-ordination across other levels of governance (regional-national-international) are important.

The operation and maintenance of all of the wells, distribution networks and wastewater treatment plants depend on the regional-level support of the BWE. This requires the BWE, municipalities and contractors to work together and achieve an effective handover process following construction of additional infrastructure in the municipalities. International organisations have not always considered needs related to this handover.

Several humanitarian NGOs have approached the BWE directly, offering to pay for water supply services for displaced people living in NGO-created settlements. However, these agreements require national-level approval to be legal (BWE, 2016).

# Recommendations

The integration of long- and short-term solutions across the humanitarian, national development and international climate change agendas in the Bekaa offers both challenges and opportunities. These could build on some positive developments accompanying the international effort unfolding in the Bekaa. These are worthy of further consideration among the international scientific and donor communities through partnership with stakeholders at both national and local levels. Our analysis to date suggests there is potential for progress on three key fronts: accommodating the water needs of displaced people; improving planning to reduce future water stress; and engaging local populations.



## Three areas for progress

1. **There is scope to accommodate the water needs of displaced people.** The current crisis and lack of long-term environmental response is increasing water scarcity, pollution variability and vulnerability to climate change. But displaced people are not the largest consumers of water. Their needs could be accommodated harmoniously through careful integration with the spatial and temporal demands of other water users if these were fully mapped and analysed effectively. Balancing water demands and availability requires a level of information and co-ordination that is not presently available.
2. **There is scope for better informed and improved planning to reduce future water stress.** A credible long-term strategy for the region is needed. It should be based on open and effectively managed databases, and enhanced compliance by users in different sectors. New databases and capacities established through international humanitarian responses could provide the foundation for such a system. However, the

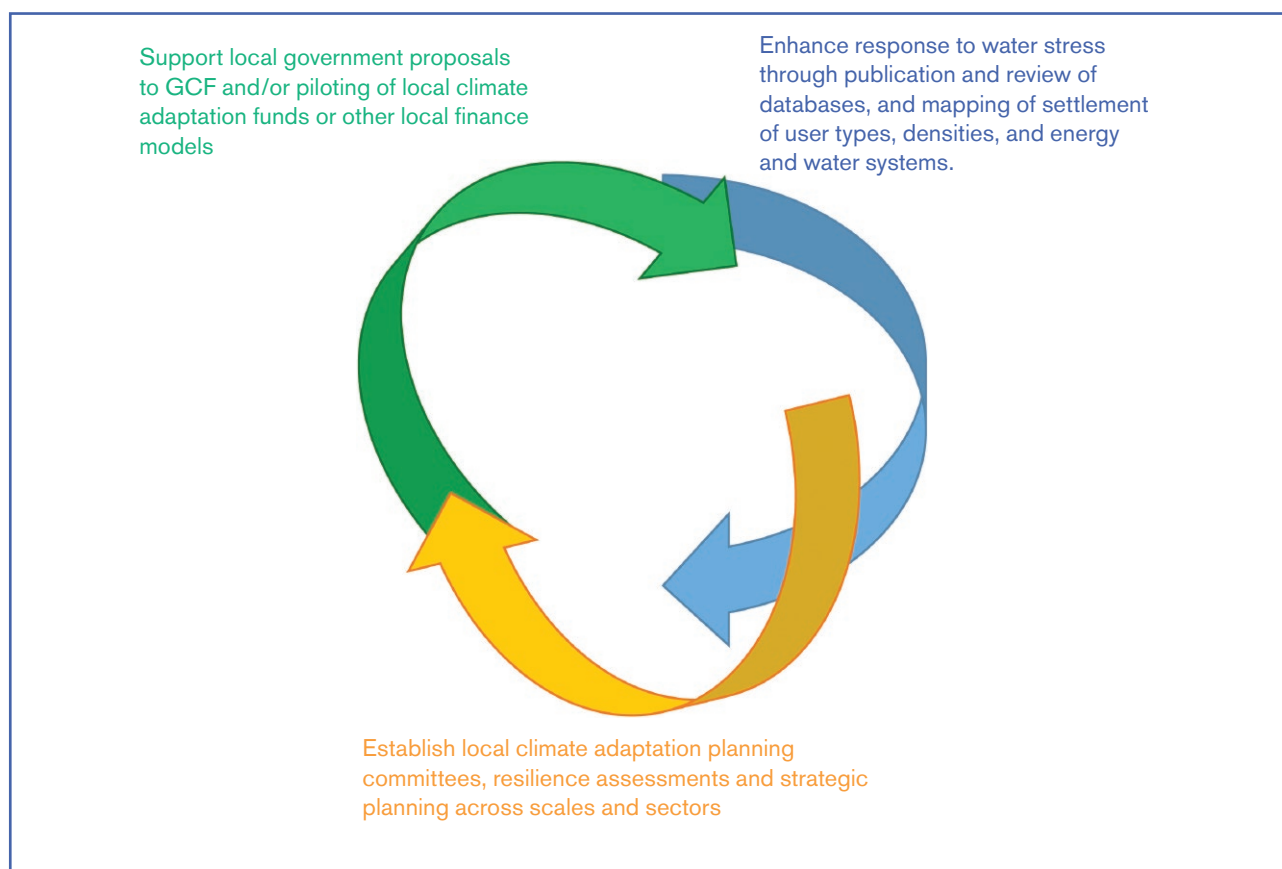
humanitarian response is intentionally temporary. It has no mandate to provide long-term systems. Similarly, LARI is limited by a mandate that focuses on agricultural research although it also considers ecological aspects.<sup>2</sup>

3. **There is scope to engage recently elected local governments.** Institutional support in place includes informal and illegal institutions and practices. Strengthening participation at the local level contributes to long-term economic and social (institutional) resilience. This is central to grounding the Lebanese INDC to climate change mitigation and adaptation, as well as the SDG agenda, in a domestic context. Participatory adaptation planning, supported by local financing mechanisms, could help mobilise local participation, activate civil society and bridge the formal-informal divide.

### Reconciling the three agendas

The three planning agendas (see Figure 2) for humanitarian response, water resource stewardship and climate change in the Bekaa each require effective consideration of the others to achieve, and sustain, success (Figure 5).

Figure 5: Three complementary entry points recommended to rebalance water stress



<sup>2</sup> See: <http://www.lari.gov.lb/MissionHistory/tabid/56/Default.aspx>

## Overcoming information gaps

Balancing and redirecting water demands and availability require a level of information and co-ordination not presently available in the Bekaa Valley. The same is the case across much of the surrounding region. However, in the case of the Bekaa, the international humanitarian response is already creating new databases and capacities that could provide the foundations for such a system (as discussed earlier and analysed in Figures 3 and 4).

What is still missing – and all the more urgently needed – is a credible long-term strategy and process to overcome water stress. This should be based on open and effectively managed databases to continuously share, update and review the best available information. Such a system should help overcome the climate of mistrust and denial of responsibility that prevails among the various different actors, public and private. This is a necessary part of adaptation planning and crisis prevention.

## A new strategic approach

Through this exploratory analysis, we have identified some complementary entry points for a new strategic approach to rebalance water stress in the context of the Bekaa. Each would require discussion among the various stakeholders and partners involved at national, local and international levels. Each would also require a different timeframe and level of financial commitment.

### Pilot # 1: Planning

**A pilot climate mitigation and adaptation planning** could strengthen local institutions and capacities, including financial and human capacities across local-regional-national scales within Lebanon and improved co-ordination of international actors. Such a process to be launched at the local level (including identification of stakeholders and their preferred modes of participation) would take **a minimum of 3–5 years to establish at an estimated cost of £2 million**. This should be led by the national government and ecological research institutions in Lebanon and include civil society. LARI has a strong track record in participatory agro-ecological research with resource users in the Bekaa. It is also the institution that has been collecting environmental data and analysing soil and water conditions for resource users in the Bekaa over the past decades.

The pilot should focus on changing attitudes to the formal and informal systems for collective resource stewardship. A range of examples from other dryland contexts, including some from Europe, United States and some others are available in the published literature

on common pool resource management. An example from IIED's recent adaptation experiences in a more difficult dryland environment is available at: <http://www.iied.org/participatory-investment-planning-for-environment-water-energy-arid-uncertain-environments>. This experience has demonstrated that climate change adaptation planning offers a wide cross-sectoral framework that allows for downscaling or domestication of international and national plans for mitigation and adaptation to climate change.

Rather than focusing exclusively on the water sector or water and agriculture alone, a more comprehensive cross-sectoral adaptation approach is required to address water stress (in line with the global definition of SDG 6.4.2 UNWater, 2016). This has to include consideration of economic development priorities across a broader range of sectors.

Further, IIED's experience in adaptation planning confirms a need for greater attention to energy sources used to balance water stress, including renewable energy options. These are often particularly well-suited to dryland conditions. They can significantly lower costs and avoid the rapid increases in emissions that might otherwise have to accompany expansion of water services.

### Pilot # 2: Investment, monitoring and assessment

Pilot investments across sectors and scales in selected municipalities or *cazas* should aim to enhance water resource conditions and economic development. This includes investments in urban areas to simultaneously enhance access to water and economic activities (in agriculture and other sectors), while simultaneously pursuing a low-carbon development pathway.

A system to identify, implement and track the impacts of investments in climate mitigation and adaptation planning and finance on resource conditions and development indicators would take **at least 5–10 years to put in place at an estimated cost of £5–10 million**. Such a system could be designed to build capacities and system coherence at the municipal and/or *caza* levels. Cost-benefit analysis (see Box 3) would be an essential component in the development and monitoring of any pilot funding system.

International climate finance mechanisms oriented to channel public finances to the local level are increasingly available. These mechanisms are designed to give greater control to local planning. This often contrasts to the more traditional top-down project planning approaches that tend to prevail in the water sector in many countries (not only in Lebanon).

Local authorities can develop climate change adaptation and mitigation plans (including water sector strategies). In these cases, they could possibly access international financing from the Green Climate Fund and other sources.

In many developing countries, climate funds are accessed through accredited National Implementing Entities (NIEs). However, there is no accredited NIE in Lebanon. Nevertheless, Lebanese municipalities may still develop climate adaptation plans and proposals for consideration by the MoE and UN Development Programme.

### Pilot # 3: Science, innovation and capacity building

Enhanced information management concerning the present and anticipated future balance of water extractions in relation to its availability is essential to achieve the previous two proposals. This pilot should be implemented either before or in parallel to pilots 1&2, or as a standalone action. International and national information management initiatives under development led by FAO and MoEW may take time. However, they could be boosted and accelerated through pilot initiatives at regional and local levels over **a minimum 1–3 year timeframe at a cost of £0.5–1 million per year.**

This could be done through an SDG-focused initiative e.g. around SDG 6.4 in the Bekaa. Such an initiative should include both Lebanese and international universities, as well as LARI and the BWE, if possible. It should also encourage practitioners in the Bekaa to enroll in and/or complete study courses that could help their work on related topics.

Updated progress reports on the state of knowledge of water stress and strategic planning to overcome it should be continuously peer reviewed and published on the internet annually. An expanded international initiative could be considered depending on the level of interest among national agencies in other countries beyond Lebanon. This could track water balances in a series of different case study basins located in several different countries. It could offer insights concerning the feasibility, effects and other pros and cons of alternative ways of working to enhance information management for balancing water stress.

Such an initiative might include the Middle East and North Africa (MENA) region (e.g. after King and Jaafar, 2015). Experiences of successful adaptation to climate change across different sectors of the economy in other dryland contexts beyond the MENA region could also be of interest. Some examples can be found at: <http://www.iied.org/introduction-drylands-building-climate-resilience-productivity-equity>

Discussion among various stakeholders at national, local and international levels should further refine any or all of the proposed actions. Conversely, it might lead to rejection of all three and another rethink.

## Beyond the Bekaa

IIED strongly believes that local participation is the key to sustainable development. We have argued that such local engagement should be convened around credible scientific information and supported through sufficient resources for investment. These elements may play out differently in the Bekaa and its surrounding region because other drylands have different humanitarian challenges and patterns of human mobility. In light of this, the experience and learning process unfolding in the Bekaa may be of significant interest to the international community.

# Acronyms

AREC	Advancing Research Enabling Communities Center
BWE	Bekaa Water Establishment
IAMP	Inter Agency Mapping Platform
IIED	International Institute for Environment and Development
LARI	Lebanese Agricultural Research Institute
LCRP	Lebanese Crisis Response Plan
LRA	Litani River Authority
MENA	Middle East and North Africa
MoE	Ministry of Environment
MoEW	Ministry of Energy and Water
MRR	Maps of Risks & Resources
NGO	Nongovernmental organisation
NIE	National Implementing Entity (for the Green Climate Fund)
NWSS	National Water Sector Strategy
PRL	Palestinian Refugees from Lebanon
PRS	Palestinian Refugees from Syria
SDG	Sustainable Development Goal
SEA	Strategic Environmental Assessment
UNDP	UN Development Programme
WASH	Water, Sanitation and Hygiene

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Three major international agendas concern building resilience to climate change, achieving sustainable development in marginal dryland environments and responding to humanitarian crises. These agendas often compete with each other for support and attention. When crises become acute, sustainable development and the climate change agenda may suffer reversals that will leave populations ever more vulnerable. However, the agendas can also complement each other. This paper reflects on recent experiences in Lebanon's Bekaa Valley, where an international humanitarian effort has created both challenges and opportunities for balancing water stress over both the short- and long-term horizons.

IIED is a policy and action research organisation. We promote sustainable development to improve livelihoods and 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 decision-making arenas that affect them – from village councils to international conventions.



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This research was funded by UK aid from the UK Government, however, the views expressed do not necessarily reflect the views of the UK Government.



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