Food - Water - Displacement

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WANA INSTITUTE

"Knowledge from the region, action for the region"

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The West Asia - North Africa (WANA) Institute is a non-profit policy think tank based in Amman, Jordan.

Operating under the chairmanship of His Royal Highness Prince El Hassan bin Talal, the Institute works to promote a transition to evidence-based policy and programming to combat the development and humanitarian challenges facing West Asia and North Africa.

The WANA Institute aspires to be a trusted source of knowledge, evidence and opinion, and to provide a forum for open debate for leading researchers and policy makers in the region.

We undertake research, host conferences and conduct training workshops in the areas of social justice, green economy and human security. We believe these three areas represent both the most pressing issues facing our region and the greatest opportunity for our work to create vital impact.

GIZ. Solutions that work.

GIZ provides services worldwide in the field of international cooperation for sustainable development. The German Federal Ministry for Economic Cooperation and Development (BMZ) is the main commissioning party, but GIZ also work closely with the private sector, fostering successful interaction between development policy and foreign trade.

GIZ has been working in Jordan for over 40 years, and has had an office in the capital of Amman since 1979. The civil war in Syria and the political instability of the region are having a direct impact on Jordan, where several hundred thousand people have sought refuge since the start of armed conflict in the neighbouring country. GIZ is supporting Jordan in creating long-term prospects for both Jordanians and Syrian refugees by assisting the host municipalities where many of the refugees are living, and thus contributing to the stability of the country.

The development problems Jordan faces are rooted primarily in the lack of natural resources. Climate change and environmental pollution are other key issues. Currently, Jordanian-German cooperation is focusing on water as well as employment and education. Since 2001, water has been the priority in Jordanian-German cooperation. Jordan is one of the world's most water-deprived countries, and GIZ is helping provide an adequate and stable water and wastewater management system through various measures. To create economic and vocational prospects for Jordanians and the Palestinians and Syrians living in Jordan, a new priority area since 2015 has been to promote measures in education, vocational training and job creation. GIZ is also promoting environmental protection and resource conservation and waste management in Jordan. In addition, there are several regional programmes which are being implemented from Jordan.

Swiss Agency for Development and Cooperation

The Swiss Agency for Development and Cooperation (SDC) has been present in Jordan since 2001. SDC plays an active role in providing assistance and improving the living conditions of vulnerable groups in the Jordanian community as well as other vulnerable groups such as refugees and migrant workers, with special focus on women and children. In order to achieve its overall goal, SDC focuses on three domains of interventions: Basic Needs and Services; Protection; and Water.
In the water domain, SDC is focusing in applying the principals of "Integrated Water Resources Management" (IWRM) in the divers projects forecasted at different level of the water cycle. The foreseen projects are divided in software supports and hardware actions. The engagement of SDC will mainly be:

- Aquifer protection and monitoring actions;
- Fresh water production including traditional water treatment and desalinization;
- Fresh water distribution;
- Improved irrigation with focus on Water Energy and Food Security Nexus;
- Wastewater management
- Rapid aerial survey through Unmanned Aerial Vehicle (UAV) or commonly called drone and
- Vocational training on water project management and water projects implementation;
- Awareness addressed to different water users and at different levels

The Friedrich-Ebert-Stiftung Organization

The Friedrich-Ebert-Stiftung (FES) is a non-profit organization committed to the values of social democracy and the oldest of Germany's political foundations. Founded in 1925, it is the political legacy of Friedrich Ebert, Germany's first democratically elected President. Ebert, a Social Democrat of humble origins, had risen to hold the highest office in his country despite considerable opposition from the undemocratic political elite. He assumed the burden of the presidency in a country, which was crisis-ridden following its defeat in World War I. His personal – often painful experience – in managing to rise through the ranks and in facing political confrontation led him to propose the establishment of a foundation with a threefold aim:

- contributing to international understanding and cooperation wherever possible in order to avert a fresh outbreak of war and conflict
- furthering a democratic, pluralistic political culture by means of political education for all classes of society
- facilitating access to higher education and research for gifted young people by providing scholarships

In his testament, Friedrich Ebert asked for donations from mourners instead of funeral flowers, thus providing for the financial basis of the foundation. Hence, after Ebert's untimely death in 1925, the Friedrich-Ebert-Stiftung came into life. The Foundation was immediately banned when the Nazi regime entered into power in 1933. FES was not re-established until after the end of World War II. Today FES works in more than 100 countries around the world. The foundation continues to pursue the above aims and values, which have lost nothing of their relevance since Friedrich Ebert wisely framed them in 1925.

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Introduction

Countries in the West Asia-North Africa (WANA) region are among the most food import dependent in the world, as well as the most water scarce in terms of availability per capita. With approximately 85 percent of water use in the WANA region attributed to the agricultural sector, the relationship between food and water is particularly significant. Despite this huge investment of water in farming, most WANA states are net food importers, relying on international markets to feed their populations.

The WANA region not only shares bodies of water, it shares a regional food system, and it shares populations — particularly through refugee movement. Both food and water insecurity have been advanced as potential contributing drivers of migration and of conflict, and both are exacerbated by the displacement that results from conflict.

This paper examines how the links between water and food impact displacement in the WANA region, and how these links are impacted by displacement. It encourages a more balanced approach to analysing water and food security, particularly in the context of refugee movement and internal displacement, taking into account the tradeoffs between the two. The challenge is how water scarce countries can manage both water security and food security in a way that does not make them more vulnerable to conflict and displacement.

While the focus of this paper is on displacement, conflict is included as it is often a precursor to large-scale displacement; likewise conflict, in the form of social unrest, is often a result of large-scale displacement.

This paper begins by emphasising the importance of dealing with each intersection within the nexus (food-water, water-energy and energy-food) as a separate and comprehensive sector. The food-water intersection will be examined in-depth, including a literature review followed by the development of a food-water framework through which to analyse impacts of and on this intersection in the context of internal displacement and refugee movement. The following sections focus on the causal links between water security, food security, conflict and displacement; an examination of the literature; a presentation of regional case studies (Iraq, Jordan, Lebanon, Syria and Yemen) that highlight these causal cycles; and the development of a food-water — conflict-displacement problem tree.

Preceding this, it is important to define food security and water security. Food security is said to exist "when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life."[1] Four pillars of food security were later identified and added to this definition: availability, access, utilisation, and stability.[2] Availability commonly refers to the physical availability of sufficient quantity and quality of food, and is closely linked to domestic production, although a country's import capacity and food stocks are also factors. The pillar of accessibility stems from Amartya Sen's concept of entitlements to food, which stresses the importance, not only of supply of food, but of physical and economic access to food, determined by income, assets, and the price of food.[3] Stability of food supply is often tied to international markets, where food price fluctuations and behaviour of exporting countries — such as export bans — can greatly impact the stability of price and quantity of food going to importing countries.

Food security can also exist for some segments of a population within a country, but not for others. For example, in a country that relies heavily on food imports and is also characterised by high income

[1] FAO, Rome Declaration on World Food Security. World Food Summit (Rome, 13-17 November 1996).
[2] FAO, Declaration of the World Summit on Food Security. World Summit on Food Security (Rome, 16-18 November 2009).
[3] A Sen, *Poverty and famines: an essay on entitlement and deprivation* (1981).

inequality, such as Saudi Arabia,[4] those with high incomes would be able to withstand sharp food price fluctuations common on the international market, thus maintaining a level of food security, whereas poorer household that are unable to cope with food price spikes are more vulnerable to falling into a state of food insecurity.

Harrington has identified three routes a country can take to achieve food security: domestic production aimed at self-sufficiency, international trade, or reliance on food aid.[5] Dependence on domestic production is often linked with issues of food availability in countries that have scarce productive natural resources — i.e., is a country physically able to produce enough food? Domestic production is also increasingly linked to the issue of food stability, as changes in the climate are causing increased drought in some regions. Reliance on international trade to maintain food security is more often linked to issues of accessibility, as global food markets are highly volatile and subject to price spikes which are quickly passed on to consumers. Many people in the WANA region live close to the poverty line and spend a large portion of their income on food, meaning that when international prices rise, they become unable to financially access the imported staple foods they need.

Water security has been defined by the United Nations as "the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability."[6] There are, however, a variety of definitions and framings of the concept. Cook and Bakker identify four different framings of water security: focus on quality and quantity; water-related hazards and vulnerability; a human-needs approach, which encompasses access, food security, and human development related concerns; and sustainability.[7]

Many countries in WANA are considered either water or food insecure, and many are both. Countries that are water insecure are usually also food insecure unless the population earns sufficient income to cope with international food price rises. Even countries that are ranked as food secure overall are home to population segments that are vulnerable to food insecurity due to low incomes. However, food price volatility can drastically impact the policies of even wealthy WANA countries, as can be seen in the recent policy shifts away from food import and toward food self-sufficiency in many Gulf States, spurred by the price spikes of 2008 and 2011.

Many countries in the region are also hosts to large numbers of refugees that are reliant on international food aid. Instability in donor funding for food aid programmes is another source of food insecurity for this particularly vulnerable segment of the population.

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[4] Saudi Arabia does not collect / disclose statistics on income inequality, but the country is widely reported to be one of the most unequal. See for example: L Addario, 'Rich Nation Poor People', Time (23 May 2013) <http://time.com/3679537/rich-nation-poor-people-saudi-arabia/> at 10 September 2015.

[5] J Harrington, 'Did food prices plant the seeds of the Arab Spring?' (lecture delivered at the School of Oriental and African Studies, London, 28 April 2011) < https://www.youtube.com/watch?v=_fkbS5EZlbU> at 20 August 2015.

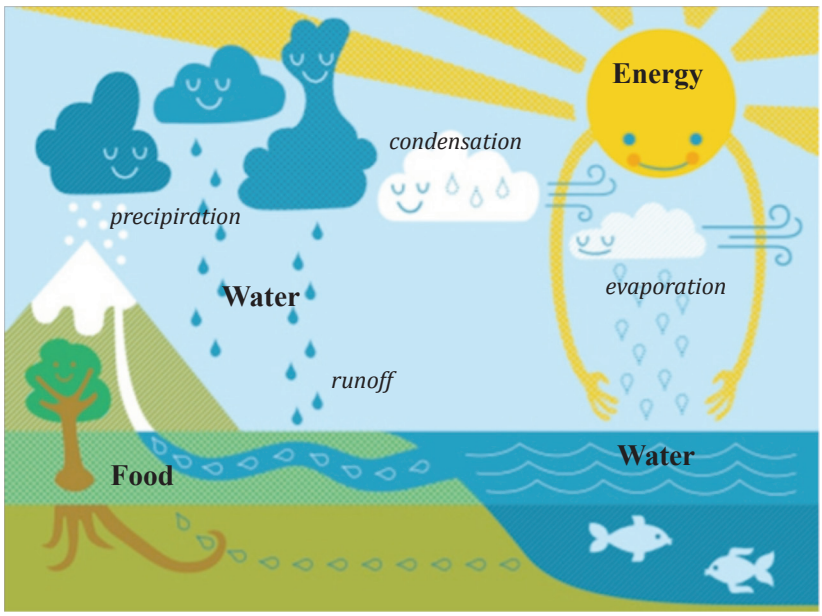
[6] UN-Water, 'Analytical Brief on Water Security and the Global Water Agenda' (2013).

[7] C Cook and K Bakker, 'Water security: debating an emerging paradigm' *Global Environmental Change* 22(1) (2012) 94-102.

1. The Nexus and the Food-Water Intersection

The 'nexus' framework (see figure 2) describes how and where food, water, and energy systems are connected. It can be broken down into three intersections between the systems: food-water, water-energy and energy-food. While these connections have long been understood through the hydrologic cycle (see figure 1), they were 're-discovered' and reconceptualised as the nexus in the mid-1990s.[8] The framework was developed as a way to promote an inter-sectoral approach to efficient resource management to ensure food, water and energy security. Without such an approach, sectors tend to act in isolation, without knowledge of or attention to the way actions within one sector affect another. This is also true of humanitarian responses to human displacement crises: non-government organisation (NGO) reports tend to focus separately on the water sector and the food security and livelihoods sector. Often discussions around efforts to save water in the wake of a refugee influx do not take into account the food security challenges a host community may experience after the arrival of displaced people, and thus the links between water and food can be missed.

Figure 1. The hydrologic cycle.[9]



The remainder of this chapter is divided into two parts: part one will review the literature around the nexus, looking particularly at the food-water intersection of the nexus; part two will examine existing frameworks relevant to the food-water links in the context of displacement and socio-economic considerations, and will present a new food-water framework.

1.1 Review of the Literature

Allan, Keurlertz and Eckart differentiate between the 'grand nexus' (water-food-energy) and two 'sub-nexus' — water-food-trade and energy-climate change.[10] While the water-food-trade sub-nexus has attracted significant interest in recent years, the authors note that despite the acknowledgement over

[8] P H Gleick, 'Water and energy' *Annual Review of Energy and the Environment*, 19(1) (1994) 267-99.
[9] Picture from http://www.ngkids.co.uk/science-and-nature/water-cycle; labels are author's own.
[10] J A Allan, M Keulertz and E Woertz, 'The water-food-energy nexus: an introduction to nexus concepts and some conceptual and operational problems' *International Journal of Water Resources Development*, 31(3) (2015) 301-311.

the past three decades that food and water security are closely linked, there has been little progress in conceptualising and understanding these links. Simple understandings have, however, been established. Bazilian et al, for example, have identified two analytical and policy-making entry points for the food-water link: "[first,] if a water perspective is adopted, then food and energy systems are users of the resource [and second,] from a food perspective energy and water are inputs."[11]

Allan, Keurlertz and Eckart further acknowledge that there have been challenges in putting the nexus to use — particularly the 'grand nexus' — and advocate a move away from assumptions of a rational knowledge-based, optimisable way to allocate and manage resources, to a more actor-focused approach.[12] Indeed, there is noticeably little nexus literature focusing on issues of access and socio-economic impacts of and on people. Allouche argues that while global debates on the nexus reflect particular realities and priorities, these priorities may not be the same at the local level, noting that resource allocation is always political — a fact that the nexus approach tends to overlook.[13]

Allouche et al have identified four additional shortcomings in nexus thinking:[14] 1. The idea that the nexus approach offers new solutions is itself questionable, given the over 20 year history of proposed integrated natural resource management approaches; 2. In practice, it is difficult to integrate the three sectors given that water, land, and energy are governed by different regimes, and the nexus approach may therefore be overlooking the challenges presented by the realities of international political economy; 3. The nexus is framed as a global resource scarcity issue, which disregards the politics of knowledge: the concept of 'scarcity' is often used subjectively, neglecting the power imbalances and inequalities of access that the use of the term may disguise; and 4. There are limits to focusing on optimisation, which "can encourage the commodification of resources, downplaying environmental externalities, such as biodiversity and climate change, as well as poverty alleviation needs, ignoring day-to-day realities, local priorities and needs."[15]

While the food-water nexus literature is primarily written with a global focus, there is substantial writing specifically on the WANA region. Underpinning the food-water-trade sub-nexus is the concept of virtual water — the amount of water used in the production of traded agricultural and industrial goods, and therefore the amount of water indirectly traded between countries — which was initially proposed as a policy tool through which West Asia could ease pressure on domestic water resources, maintain political stability and avoid conflict over water resources.[16] This was a response to speculation in past years over the possibility of 'water wars' between water scarce countries. The bulk of water in the world (70 percent), and particularly in the WANA region (85 percent), is used for agriculture, so the prospect of relying on food imports can potentially save a country a substantial amount of water.

In the past two decades, the region has indeed steadily increased its import of water-intensive food products, particularly cereals and meat. Nonetheless, conflict and human displacement abounds. While virtual water import has contributed significantly to food availability in water scarce countries, it has failed to act as a buffer to many other forms of food insecurity in these countries. Food price volatility, which is prevalent in international markets, can decrease access to food for poorer segments of the population, which in turn increases the risk of social unrest. Whether virtual water import has acted

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[11] M Bazilian et al, 'Considering the energy, water and food nexus: Towards an integrated modelling approach' *Energy Policy* 39(12) (2011) 7896-7906.
[12] J A Allan, M Keulertz, and E Woertz, above n 10.
[13] J Allouche, 'Food, energy and water: the politics of the nexus', The Guardian, (London) 24 June 2014 http://www.theguardian.com/science/political-science/2014/jun/24/food-energy-water-politics-nexus at 20 August 2015.
[14] J Allouche, C Middleton and D Gyawali, 'Technical Veil, Hidden Politics: Interrogating the Power Linkages behind the Nexus' *Water Alternatives* 8(1) (2015) 610-626.
[15] ibid.
[16] J A Allan, 'Virtual water': a long term solution for water short Middle Eastern economies?' (paper presented at the British Association Festival of Science, University of Leeds, 9 September 1997).

sufficiently as a water security tool is equally questionable: if landholders and farmers stand to gain profit from producing and selling food (whether for domestic or export markets) they will likely continue producing — thus, even if a country imports 100 percent of the food it requires, it is not a given that farmers will stop producing or exporting.

Recently, virtual water has been examined along the full food supply chain, taking into account the range of actors involved as water managers (those who decide how much water is used, the efficiency of its use, what the water is used for, and where the final product goes). Sojamo et al highlight the role of the major global agri-business corporations given their control of virtual water (i.e. agricultural) trade.[17] Allan, Keurlertz and Eckart highlight the issue that private sector managers of food supply chains are dysfunctional, not eco-system aware and not precautionary in matters of natural resource sustainability.[18] The authors go on to identify four reasons for this: 1. Food prices are highly politicised and of strategic importance, hence the prominence of taxes and subsidies in the sector; 2. Power relations in food supply chains are asymmetrical, with farmers being weak stakeholders; 3. Those with power in private sector food chains have little power over managing water; and 4. Markets do not pass on the real cost of water in a way that manages demand or that takes into account the scarcity of the resource at the point where production occurs.

Allan asserts that 90 percent of food-water — that is, water used in the food supply chain — is managed by farmers, making their engagement vital, while only 10 percent of food-water is managed by corporations and other private sector actors.[19] However, it is important to consider that farmers are often marginalised in terms of the power they wield both economically and politically. Domestic policies and market factors which make certain choices more or less financially attractive to farmers essentially direct them in how to 'manage' the water they use. Thus, while it is necessary to engage farmers, it would be mistaken to treat them as actors independent of the broader political economy to which they are subject.

Several authors have critiqued the push for reliance on virtual water imports by pointing out that it has "enabled policy makers in the region to avoid the implementation of reforms necessary to improve water resources management."[20] In Jordan, for example, an estimated 76 billion litres of water are lost annually due to aging infrastructure and leaking pipes; despite this, governments and donors often prefer to spend funds on new projects rather than repair existing infrastructure.[21] Agricultural water subsidies are also prevalent throughout the region, which not only discourage efficient water use, but often benefit politically influential land holders above farmers from less well-off socio-economic classes.

Allouche presents another critique of virtual water trade in terms of the security benefits it proposes to offer, arguing that it relies too much on the availability component of food security, neglecting the important role that economic accessibility plays in food security.[22] The popular uprisings around the Arab world, for example, have been linked to food price spikes and the financial pressure put on households in accessing food; physical availability of food has not thus far been an issue in the region. Allouche further claims that while "global trade has enabled national food and water security [it] is now threatened by

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[17] S Sojamo et al, 'Virtual water hegemony: the role of agribusiness in global water governance.'Water International, 37(2) (2012) 169-182.
[18] J A Allan, M Keulertz and E Woertz, above n 10.
[19] J A Allan, 'Water and Food Security: Food-water and Food Supply Value Chains' in M Antonelli and F Greco (eds), The Water We Eat (2015) 17-34.
[20] M Antonelli and S Tamea, 'Food-water security and virtual water trade in the Middle East and North Africa' *International Journal of Water Resources Development*, 31(3) (2015) 326-342; J A Allan. 'Millennial water management paradigms: making Integrated Water Resources Management (IWRM) work' Mafhou, (2001) < http://www.mafhoum.com/press/53aE1.htm> at September 15 2015; M Zeitoun, J A Allan and Y Mohieldeen, 'Virtual water 'flows' of the Nile Basin, 1998–2004: A first approximation and implications for water security' *Global Environmental Change* 20(2) (2010) 229-242.
[21] Mercy Corps, 'Tapped Out: Water Scarcity and Refugee Pressures in Jordan' (2014).
[22] J Allouche, 'The sustainability and resilience of global water and food systems: Political analysis of the interplay between security, resource scarcity, political systems and global trade' Food Policy 36 (2011):S3-S8.

increasing food prices, food sovereignty movements, and land 'grabbing'."[23] Anotelli and Tamea[24] also examine the link between virtual water trade and food prices, noting that "the 2007-2008 price spikes seem not to affect virtual water imports, which keep on increasing steadily until 2009, although the price of food was 50 percent higher than in 1980 and twice as high as in 2000."[25] This highlights the inelasticity of food demand, and points to a need to address how the general population of a country is able to cope with increased prices of imported foods in local markets.

1.2 Food-Water Framework

> The link between water and food is a simple one. Crops and livestock need water to grow.[26]

Yes, and no. One fundamental problem this paper aims to address is that explicit focus on achieving a balance between food security and water security in a population is often overlooked. This is particularly true in times of humanitarian crisis, where focus tends to fall on either the WaSH (water, sanitation, and hygiene) sector, or the food security and livelihoods sector, though seldom both in tandem. In a country like Jordan, which faces absolute water scarcity and heavy dependence on international food imports, a concentration on one can mean a depletion of the other: efforts to ameliorate the impacts of international food price spikes by increasing domestic production can mean a depletion of water resources, while attempts to save water by limiting agricultural sector growth can mean that the population is left vulnerable to volatile food prices.

Based on the literature reviewed in the previous section, it is clear that several components need to be considered in the development of a framework centred around food, water, conflict and displacement. Several conceptual frameworks for understanding the food-water-energy nexus have been proposed in recent years.[27] While many nexus frameworks exist, two limitations inherent in the use of the approach can be identified: First, because the nexus is usually approached as a tri-sectoral system, each of the intersections (and especially the food-water link, for the purposes of this paper) have not been separately and thoroughly conceptualised. Second, most organisations tend to approach issues through a siloed, sectoral approach rather than using the nexus framework and the intersections it introduces for analysis.

These limitations heighten the likelihood that the nexus framework will remain a theoretical exercise, which policy makers and humanitarian agencies may acknowledge but not apply to policy, management and programming. The ramification of this is the continuing of unintended negative impacts of the policies, or lack thereof, of one sector on another.

The Kingdom of Saudi Arabia (KSA), for example, has recently seen a marked increase in its agricultural exports, despite having the lowest rainfall of any country in the world.[28] The country is achieving this through the depletion of its aquifers, which have slow recharge rates. While KSA is in need of achieving both food and water security, export of agricultural goods — or virtual water export — is counter-intuitive when looking at the food and water sectors in tandem. Application of a nexus framework in this case would take into account what is best for the country's food and water (and energy) security when

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[23] ibid.
[24] Antonelli above n 20 326-342.
[25] M Marktanner, S K Das and A Niazi, 'Food security challenges in the Arab States/MENA region in the context of climate change: The role of the regional directors team' (Position paper, Regional United Nations Development Group Arab States/Middle East and North Africa, nexus of climate change and food security. United Nations Development Group March 2011).
[26] UN Water, <unwater.org/topics/water-and-food/en/> at 10 September 2015
[27] D El Costa, 'Conceptual Frameworks for Understanding the Water, Energy and Food Security Nexus' (UN-ESCWA Working Paper 2015) <http://css.escwa.org.lb/SDPD/3581/WP1A.pdf> at 1 September, 2015.
[28] 'Desert blooms: Saudi's agricultural exports soar despite world's lowest rainfall', Albawaba, 1 September 2015 <http://www.albawaba.com/business/saudi's-agricultural-exports-soar-despite-world's-lowest-rainfall%3A-desert-blooms-737860> at 10 September 2015

looking at policies related to agricultural production and export.

Figure 2. Example of the Water-Energy-Food Nexus (UNU, 2013).[29]

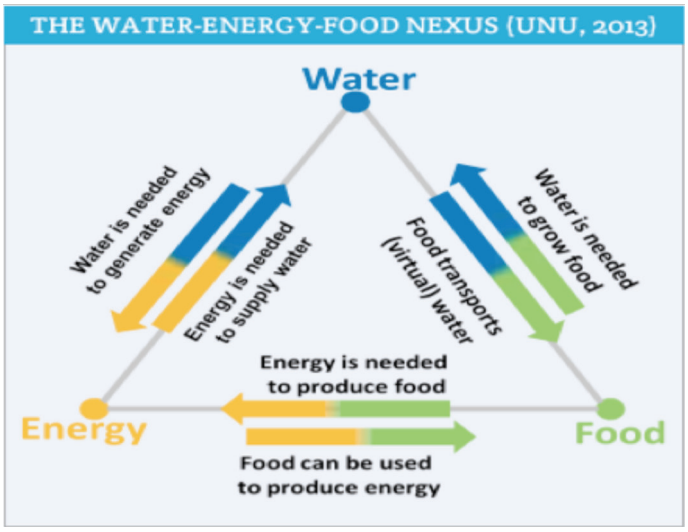
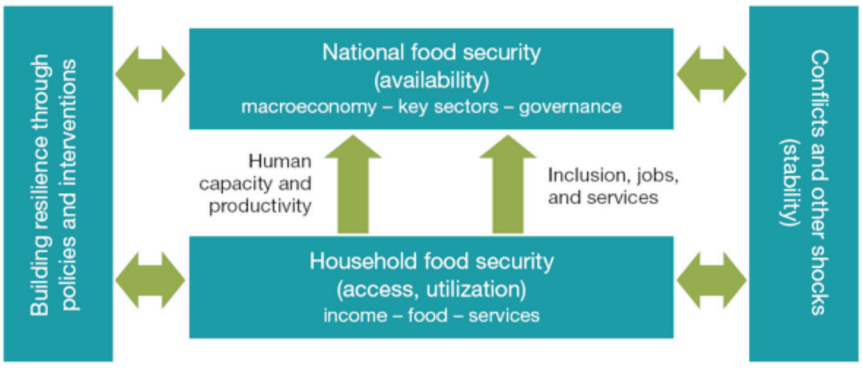


Figure 2 is a straightforward yet useful example of a nexus framework. The food-water interface within the figure depicts two distinct streams linking the two sectors: water is used to grow food, and food is used to transport embedded or virtual water. This is a useful distinction given that the socio-economic issues arising from the production side of food-water and the virtual water import/export side are often different, and arise in different ways. For example, on the production side mismanagement of irrigation water can lead to depletion of water sources to an extent that threatens agricultural livelihoods; on the virtual water trade side, reliance on international suppliers can result in sudden and severe price shocks threatening people's accessibility to food in importing countries.

Beyond this dissection of the food-water intersection, a food-water-displacement framework also needs to expand the understanding of the links between food security, water security and human activity.

Figure 3. The conflict resiliency—food security framework.[30]



Source: Authors' illustration based on Ecker and Breisinger (2012).

[29] C Scott, M Kurian, and J L Wescoat, Jr., 'The Water-Energy-Food Nexus: Enhancing Adaptive Capacity for Complex Global Challenges' (Presented at UNU-Flores, Dresden, Germany, 11-12 November, 2013).
[30] C Breisinger et al, 'Food security policies for building resilience to conflict' Resilience for Food and Nutrition Security (2014).

Figure 3 illustrates the framework developed by Breisinger et al for building the resilience of a population's food security to conflict.[31] The framework considers the availability, accessibility, utilisation and stability of food supplies, and depicts how conflicts and other shocks, such as drought or price shocks, impact food security at national and household levels. It further depicts different factors at both the micro and macro level that can contribute to building resilience to shocks, such as policy, governance, human capacity, and services. This model is helpful in two ways: the distinction drawn between macro-level national food security, and micro-level household food security, helps to identify which actors are most affected by or have most control over particular components of food security. Second, the framework links external influences and pressures (both negative and positive) to national and household food security, showing that decisions made at both national and household scales are often subject to events outside of their control.

Figure 4. Analytical framework of linkages between the climate system, natural resources, human security, and societal stability.[32]

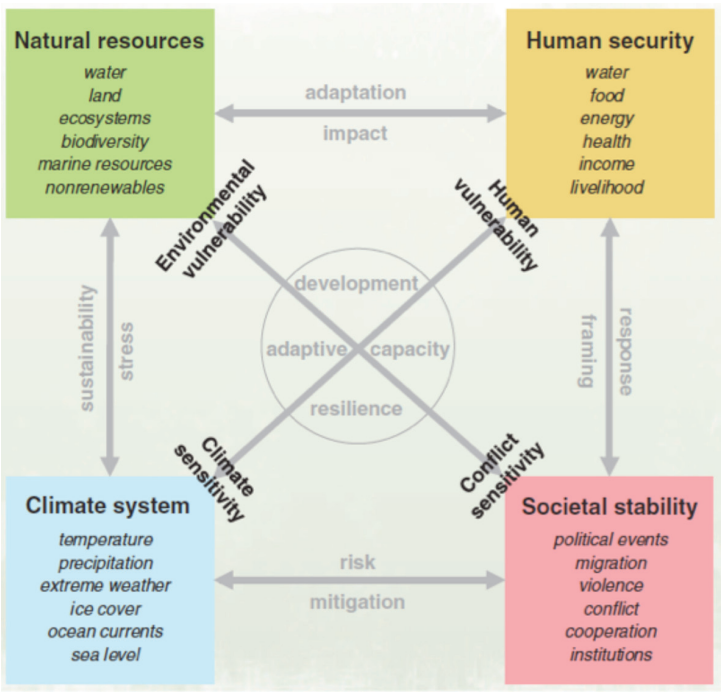


Figure 4 presents a more complex analytical framework put forward by Scheffran et al linking the climate system, natural resources, human security and societal stability. Each grouping can act as both a cause and effect of occurrences from a different category. Here, water is considered within both the natural resources and human security categories, which stresses the importance of water to both the ecosystem and for human consumption. This framework is useful as it unpacks the various factors that need to be considered within each category as well as the different ways that each are connected — not only in terms of impact, but also in terms of action that can be taken (i.e., mitigation, adaptation, response).

[31] ibid.
[32] J Scheffran et al, 'Climate change and violent conflict' Science 336(6083) (2012) 869-871.

Figure 5. Causal relationships and linkages in the Driver-Pressure-State-Impact-Response (DPSIR) framework.[33]

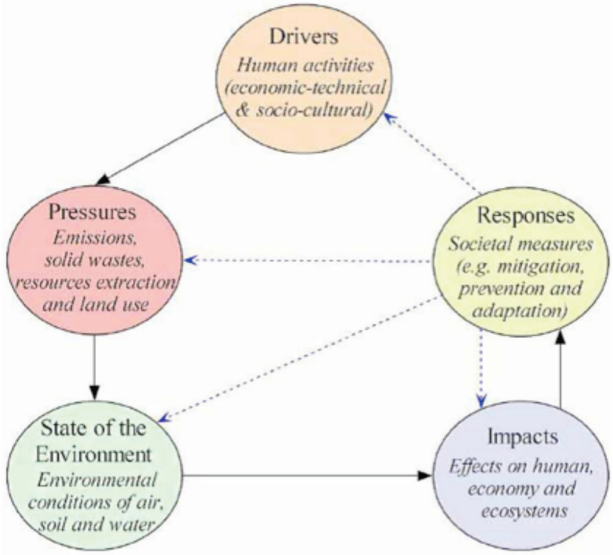


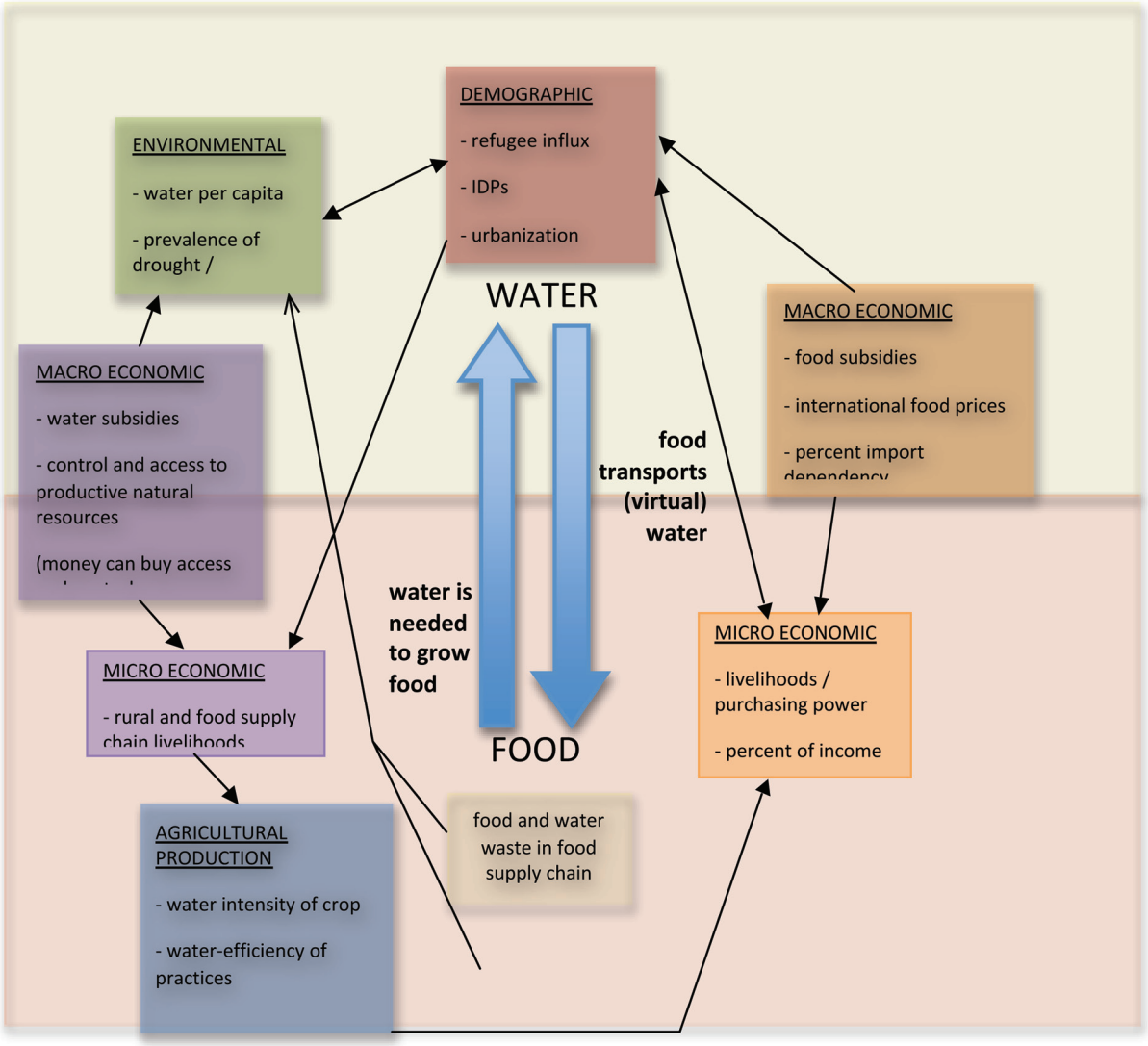
Figure 6 illustrates the basic driver-pressure-state-impact-response (DPSIR) framework, which is used to explain the causal relationships and linkages between society and the environment. Drivers (D) are the activities that result in Pressures (P) directly affecting the State of the Environment (S); these changes in turn have Impacts (I) on the socio-economic welfare of people and on ecosystems, stimulating Responses (R) from society to mitigate, prevent or adapt to those impacts. These responses can in turn lead to new drivers, pressures, changes in the state of the environment, or impacts — be those negative or positive. For example, in an integrated environmental assessment of urban areas in Tehran the DPSIR framework was applied to map the causal chain between urbanisation (D), resource over-exploitation (P), resource availability (S), and human health (among other impacts) (I).[34]

This model is particularly useful as it is able to show the complex and often circular causations between human activity and the environment. However, in the context of food, water and displacement, the links may be more complex. Furthermore, there is a need to consider that not all drivers are human activities, and not all changes in 'state' are changes in the state of the environment, but also changes in the state of the human condition. Take the following example: drought (D) → decreases availability domestically produced food (P) → increases reliance on highly priced imports (S) → decline in economic access to food for segments of the population (I) → increased domestic production using groundwater (R, D) → over-exploitation of water (P) → depletion of water resources (S) → decrease in agricultural activity and livelihoods (I) → urbanisation (R, D) … and the cycle continues.

What is needed is a new framework to illustrate first, the connection between food security and water security, and second, the causal links between food-water and socio-economic factors relating to conflict and displacement. Given that the links between the food (both production and trade) and water sectors are particularly strong in WANA, this paper advocates using a combined food and water security framework. As with the models shown above, this model will attempt to link environmental and natural resource factors with human behaviour, human security, social stability, as well as encompassing both the national and household levels. The primary aim of this framework is to facilitate a way to balance the need for water savings with the need to maintain the physical availability and financial accessibility of food.

[33] P Gabrielsen and P Bosch, 'Environmental indicators: typology and use in reporting' (*EEA Copenhagen* 2003).
[34] L Zebardast, E Salehi and H Afrasiabi, 'Application of DPSIR Framework for Integrated Environmental Assessment of Urban Areas: A Case Study of Tehran' *International Journal of Environmental Research* 9(2) (2015) 445-456.

Figure 6. Breakdown of the flows between water and food



The two distinct flows between food and water — water as an input into food, and food as a carrier of embedded water — as illustrated in the UNU model (2012) are used here as the basis of the framework. Each box presents a category falling under either the 'water is needed for food to grow' or 'food transports (virtual) water' side of the diagram. Both the macroeconomic (issues involving the national and international levels) and microeconomic (involving the household level) are considered separately on each side.

This framework illustrates both the links between food and water, and the connection between these links and the socio-economic factors that drive or are impacted by them. Often, water and food are looked at in isolation in terms of their relationship to human behaviour, for example how either food or water insecurity can lead to conflict and displacement. Analysing these relationships within the same framework can help show how food-related social and economic circumstances can shift due to factors related to water, and vice versa. Such an analysis can enable those working in the development and humanitarian sectors to better understand the related causes and consequences of food and water insecurity in connection with the social and economic well-being and stability of a population.

2. Causal Links Between Water Security, Food Security, Conflict and Displacement

This chapter aims to show the points at which the links between food and water intersect with human displacement and refugee movement. The food and water relationship can either act as a catalyst for displacement, or appear as the outcome of displacement. It is essential to note that more than one of these causal links is often seen within one case — with food-water links appearing both as catalysts and outcomes of displacement — resulting in a vicious cycle of displacement, water insecurity and food security within one country, or within larger parts of the region. The chapter is divided into three sections: first, the literature around causal links between displacement, water security, and food security is reviewed. The literature examined in this section considers the four key causal links: natural resource scarcity as a driver of conflict and displacement; food insecurity as a driver of conflict and displacement; the impacts of displacement on natural resources; and the impacts of displacement on food security.[35] Next, case studies are presented which highlight the complex ways that these links act in tandem within the WANA region; and lastly, a food-water-displacement problem tree is suggested to map out the various causalities.

2.1 Review of the Literature

2.1.1 Water and natural resource insecurity as a driver of conflict and displacement

Authors have claimed that "challenges associated with climate variability and change and the availability of freshwater"[36] are indirect drivers of conflict and migration. It is of interest in this paper to determine the path these indirect links take — for example, how does drought ultimately translate into crisis?

Black et al present a framework in which they identify "five families of drivers which affect migration decisions: economic, political, social, demographic and environmental drivers."[37] They acknowledge that environmental change affects migration indirectly, primarily through economic drivers such as changes in livelihoods, and through political drivers that might impact resource conflicts. However, Selby and Hoffmann argue that "even analyses which argue that impacts of environmental stresses are indirect and one of multiple 'drivers' of conflict and migration still overstate the current and future significance."[38]

Bernauer et al also contend that "there is no systematic and direct causal relationship between environmental degradation and violent conflict,"[39] but rather that economic and political factors determine the ability of a population to cope with environmental changes. These authors cite numerous studies which show that poor economic performance in particular is more likely to breed conflict.

There are some scholars who believe that the link between environmental factors and conflict is stronger than the authors cited above have argued. Hendrix and Salehyan claim "a robust relationship between environmental shocks and unrest."[40] Kahl identifies a composite variable of demographic and

[35] The links between conflict and displacement are not a focus of this paper; displacement caused by large scale conflict is taken here as a widely accepted causal link.
[36] P H Gleick, 'Water, drought, climate change, and conflict in Syria' *Weather, Climate, and Society* 6(3) (2014) 331-340.
[37] R Black, 'The effect of environmental change on human migration' *Global Environmental Change* 21 (2011) S3-S11.
[38] J Selby and C Hoffmann, 'Water scarcity, conflict, and migration: a comparative analysis and reappraisal' *Environment and Planning C: Government and Policy* 30(6) (2012) 997-1014.
[39] T Bernauer, T Böhmelt and V Koubi, 'Environmental changes and violent conflict' *Environmental Research Letters* 7(1) (2012).
[40] C S Hendrix and I Salehyan, 'Climate change, rainfall, and social conflict in Africa' *Journal of Peace Research* 49(1) (2012) 35-50.

environmental stress (DES) which includes "rapid population growth, environmental degradation, and an unequal distribution of natural resources," finding that there is indeed the possibility that this leads to conflict.[41]

2.1.2 Food insecurity as a driver of conflict and displacement

The correlation between food insecurity as a driver of conflict is found to be much stronger than that of natural resource scarcity and conflict and displacement. As stated in the introduction to this paper, food security can be achieved by either domestic production, food aid, or food import. The WANA region is heavily dependent on imports — Egypt, for example, imports 50 percent of the calories consumed in the country, while Qatar imports up to 85 percent of its food demand — which also means reliance on the highly volatile prices of international food markets. IFAD considers the food price spike of 2007-2008 to be a primary factor in the additional four million malnourished people in Arab countries.[42] Bahrain, Jordan, Yemen, KSA, Lebanon, Morocco, and Egypt all witnessed food riots and demonstrations during those years.

Woertz et al finds that WANA countries have been affected by global food price shocks, as food prices are downward sticky (meaning that local prices rise when global prices rise, but do not fall to the same extent when global prices fall).[43] An additional reason for this is that a significant percentage of household income in the region is spent on food (see tables in case studies in chapter 3). In some countries, the impact is offset by subsidies, though these are widely thought to be a fiscally unsustainable strategy for the region.

Based on a review of a number of studies linking food insecurity with conflict and violence, Brinkman and Hendrix concluded that food insecurity is in itself a cause of conflict.[44] Marco Lagi et al specifically examined the links between the global food price spikes of 2011 and the protests leading up to the so-called Arab Spring, and concluded that while other factors may have been involved, "high food prices were a precipitating condition for the unrest".[45] In Egypt, for example, which has a long history of food-related demonstrations, including the notorious 1977 bread riots where 79 people were killed, saw a 37 percent rise in the price of bread during the international food price spike of 2008, and an annual food inflation of 18.9 percent until the uprising of 2011.

In a study of 55 cities in 49 Asian and African countries (including countries within WANA) Hendrix, Haggard and Magaloni found that while international food price shocks act as a significant driver of urban protest and social unrest, this link is contingent on regime type, with food price rise-induced protest occurring more often in more democratic countries.[46] This is confirmed by Hendrix and Haggard, who further show that this occurs because democracies are both more permissive politically and more likely to pursue policies favourable to rural sectors.[47] These findings are significant for two reasons: first, it can be reasoned that if food price protests are more likely to occur in politically permissive countries, these types of protests are far less likely to progress into the large-scale conflicts seen in a country like Syria. Second, the findings suggest that social unrest in undemocratic countries may be more likely to manifest outside of cities due to the relative lack of pro-rural policies.

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[41] C H Kahl, *States, Scarcity, and Civil Strife in the Developing World* (2006).
[42] International Fund for Agricultural Development, *Improving Food Security in Arab Countries* (2009) xii.
[43] E Woertz et al, 'The Impact of Food Price Volatility and Food Inflation on Southern and Eastern Mediterranean Countries' Barcelona Centre for International Affairs, for Union of the Mediterranean (2014).
[44] H Brinkman and C Hendrix, 'Food Insecurity and Violent Conflict: Causes, Consequences, and Addressing the Challenges' (Occasional Paper No. 24 (2011).
[45] M Lagi, K Bertrand and Y Bar-Yam, 'The food crises and political instability in North Africa and the Middle East', (2011).
[46] C Hendrix, S Haggard, and B Magaloni, 'Grievance and opportunity: Food prices, political regime, and protest' (presented at the International Studies Association Convention, New York, August 2009).
[47] C Hendrix and S Haggard, 'Global food prices, regime type, and urban unrest in the developing world' *Journal of Peace Research* 52(2) (2015) 152.

Bush suggests that food price increases can provide the initial incentive for protesting other underlying conditions relating to a population's food security, such as employment, wages or unfavorable policy.[48] Fearon and Laitin find that income, as a measure of access to food, is strongly linked to the initiation of conflict.[49]

2.1.3 Impacts of displacement on water and natural resource security

Refugee influx and internal displacement, along with other forms of population growth, often increase competition for water and other natural resources in the specific areas of rapidly increasing population density. Al-Bakri et al find that within Jordan, uncontrolled population growth is placing stress on the country's natural resources, including the expansion of urban areas and subsequent recession of rain-fed farmland. Irrigated farmland has also decreased, though this is attributed to the decline in quality of water available for irrigation.[50]

Kibreab has argued that while there is little empirical research to support the claim that refugees contribute significantly to environmental degradation, generalising statements made by members of the international community often tend to highlight negative environmental impacts.[51] This can exacerbate the impression of host governments that refugee influx leads to degradation.

While most refugees settle in host communities, a significant number are concentrated in refugee camps. A recent investigation of the impacts on surface water of the Zataari camp in Jordan found that it is a source of pollution both within the camp itself and in the surrounding areas, and that with time the camp may have a detrimental impact on the quality of groundwater beneath it.[52] On this point, Kibreab stresses the importance of choosing a suitable site for camps in order to reduce the potential impacts.[53] A study of a large internally displaced person (IDP) camp in Darfur, South Sudan shows that an increase in camp population corresponded with a decrease in tree and shrub cover, as well as an increase in cultivated farmland;[54] this demonstrates the link between competition for natural resources and the need for food security.

2.1.4 Impacts of conflict and displacement on food security

Hendrix and Brinkman, focusing on the Sahel, found that while food security is a threat multiplier for conflict, conflict is also a key driver of food insecurity.[55] Simmons has identified four ways that conflict drives food insecurity insofar as it affects the availability of food: "[f]irst, conflict disrupts production. Second, conflict disrupts flows of food. Third, the pipeline of public and private investments in food production and marketing activities dries up. Finally, conflict results in outright loss through the destruction of food and food-producing assets."[56] The author notes that people affected by conflict often

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[48] R Bush, 'Food Riots: Poverty, Power and Protest' *Journal of Agrarian Change* 10(1) (2010) 119-129.
[49] J D Fearon and D D Laitin, 'Ethnicity, insurgency, and civil war' *American political science review* 97(1) (2003):75-90.
[50] J T Al-Bakri et al, 'Impact of climate and land use changes on water and food security in Jordan: Implications for transcending "the tragedy of the commons' Sustainability 5(2) (2013) 724-748.
[51] G Kibreab, 'Environmental causes and impact of refugee movements: a critique of the current debate' Disasters 21(1) (1997) 20-38.
[52] S Al-Harahsheh, R Al-Adamat and S Abdullah, 'The Impact of Za'atari Refugee Camp on the Water Quality in Amman-Zarqa Basin' *Journal of Environmental Protection* 6(1) (2015) 16.
[53] Kibreab, above n 51.
[54] M Hagenlocher, S Lang and D Tiede, 'Integrated assessment of the environmental impact of an IDP camp in Sudan based on very high resolution multi-temporal satellite imagery' *Remote Sensing of Environment* 126 (2012) 27-38.
[55] H Brinkman and C Hendrix, 'Food Insecurity and Conflict Dynamics: Causal Linkages and Complex Feedbacks' *Stability: International Journal of Security & Development*, 2(2) (2013) 3-5.
[56] E Simmons, 'Harvesting Peace: Food security, conflict, and cooperation' *Environmental Change and Security Program Report* 14(3) (2013).

suffer from increased poverty, which can further impede post-conflict recovery of agricultural production. During the 2006 war between Israel and Hezbollah in Lebanon many Lebanese farmers were forced to flee their land, leaving crops and animals unattended, which led to production and income loss. The war occurred at peak harvest time for export crops, which further exacerbated the loss. This meant that many farmers were unable to repay debts and acquire capital for the following cropping season, leading to concerns of "a downward spiral of debt and poverty"[57] for these farmers.

Chambers examines host populations which are poorer and more vulnerable than refugees. He builds his analysis along five dimensions: food; land, labor and wages; services; common property resources; and economic development.[58] He stresses the need to distinguish between different socio-economic groups within host populations, noting that "in rural refugee-affected areas, the better-off and more visible hosts usually gain from the presence of refugees and from refugee programs. In contrast, the poorer among the hosts can be hidden losers."[59] Thus, the financial ability to access food may be threatened by refugee presence for poorer segments of the host population, while the financial well-being of other hosts may actually increase.

2.2 Case Studies

The four causal links identified above (natural resource scarcity as a driver of conflict and displacement; food insecurity as a driver of conflict and displacement; the impacts of displacement on natural resources; and the impacts of displacement on food security) can be found in cases across the WANA region. Here, Jordan, Lebanon and Yemen will provide examples of refugee host communities, Iraq will provide an example of a state experiencing internal displacement, and Syria will provide an example of mass refugee exodus.

Table 1. Refugees and Displaced People as of December 2014. UNHCR

	Refugees Residing In	IDPs Residing in	Asylum Seekers Residing in	Stateless Persons Residing in	Refugees Originating From	Asylum Seekers Originating from
Iraq	271,143	3,596,356	8,471	120,000	369,904	103,733
Jordan	654,141	0	18,797	0	1,716	1,305
Lebanon	1,154,040	0	7,434	0	4,272	3,838
Syria	149,140	7,632,500	2,745	160,000	3,883,585	79,670
Yemen	257,645	334,093	8,674	0	2,682	2,737

[57] FAO. Damage and Early Recovery Needs Assessment of Agriculture, Fisheries and Forestry (November 2006)
[58] R Chambers. 'Hidden losers? The impact of rural refugees and refugee programs on poorer hosts' *International Migration Review* (1986) 245-263.
[59] ibid.

2.2.1 Iraq

Iraq has been in a cycle of violent conflict and embargo since the start of the first Gulf War in 1991. This has resulted in many Iraqis fleeing the country over the years, as well as the emergence of a large internally displaced population. Power outages, which have affected the country for more than two decades, affect irrigation systems, which are currently operating at significantly less than their full capacity.[60] Successive wars have also been responsible for the destruction of much of Iraq's water and irrigation infrastructure, without sufficient opportunity for reconstruction.

Since the 1970s, when Iraq was known for its fertile agricultural lands, the country has been plagued by water shortages, high levels of salinity and desertification. Salinity has been caused in large part by poor agricultural practices, specifically improper drainage. Waters of the Euphrates-Tigris have receded considerably, and to compensate, dependence on groundwater for irrigation has increased, with no government oversight on its extraction.[61] This has had a devastating impact on Iraq's agriculture. While the country has remained significantly more reliant on domestic production in recent years than many other countries in WANA, it is estimated that at least 40 percent of agricultural land — or 25,000 hectares — is becoming too saline to grow crops,[62] and desertification is claiming 40-50 percent of what was once lush farmland.[63] These factors have made agricultural livelihoods difficult, risky, and sometimes impossible, and have been responsible for an increase of people moving from rural to urban areas.

The International Organization for Migration noted that drought was a primary cause of migration in Iraq between 2007-2009.[64] At that time, the Government took significant measures to mitigate the impact of the drought, introducing mandatory irrigation rationing and allowing only certain strategic crops (such as rice, corn, sunflowers, cotton and vegetables) to be planted during summer.[65] Normally, Iraq produces nearly self-sufficient amounts of wheat and barley, but measures taken by the government caused those production values to drop to 70 percent of what is typically grown.[66]

Despite the difficulties the sector faces, Iraq remains more reliant on its domestic food production than many other countries in WANA, thanks to sufficient rainfall in the north of the country.[67] This means that Iraq is more vulnerable to environmental risks and issues of access to natural productive resources for its food security than to the volatility of international markets.

The most recent conflict has also resulted in control by Daesh of water resources and farmland, disrupting 40 percent of the country's wheat production and causing thousands of Iraqi farmers to flee their land.[68]

In the case of Iraq, water-related environmental pressures such as drought and salinity has driven

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[60] NGO Coordination Committee for Iraq, 'About Iraq' <http://www.ncciraq.org/en/about/about-iraq> at 1 September 2015.
[61] ibid.
[62] USAID, 'Agriculture Reconstruction and Development Program for Iraq (ARDI) A Transition Plan for the Agriculture Sector in Iraq Final Report: Volume 1' (2004).
[63] UNESCO Iraq Office, 'Integrated Drought Risk Management - DRM, National Framework for Iraq. Executive Summary' (2010).
[64] International Organization for Migration, 'IOM Iraq Displacement Reports: Special Focus — Water Security' (September 2010).
[65] Iraq: Death Knell for Agriculture? (IRIN News. 28 April 2009) <http://www.irinnews.org/report/84142/iraq-death-knell-for-agriculture> at September 1 2015.
[66] ibid.
[67] FAO, 'Iraq: Serious food security concerns due to conflict' (25 June 2014) http://www.fao.org/news/story/en/item/237162/icode/ at 25 August 2015.
[68] See: FAO, 'Farmers and Herders in Iraq in Dire Need of Support' (10 November 2014). <http://www.fao.org/news/story/en/item/265143/icode/>; A Nusca, 'As Conflict Persists, Iraq's Wheat Production Hangs in Balance' (13 August 2014.) <http://fortune.com/2014/08/13/as-conflict-persists-iraqs-wheat-production-hangs-in-the-balance/> at 1 September 2015.

urbanisation from rural farming areas as it became increasingly risky to engage in agriculture as a livelihoods strategy. Conflict and lack of access to natural resources has further compounded this internal displacement. In order to preserve food security through domestic production to the extent possible, the Government has taken policy measures to ensure that water use in agricultural production has focused on strategic crops. Nevertheless, both reliance on international food markets and food prices has increased. While there is clear evidence that conflict has exacerbated both water insecurity through the take-over of water resources, and food insecurity through the halting of a large portion of domestic production, there is no evidence pointing to displacement itself as a cause of either food or water insecurity within Iraq.

Figure 7. Diagram of relationships between conflict, agriculture and quality of life

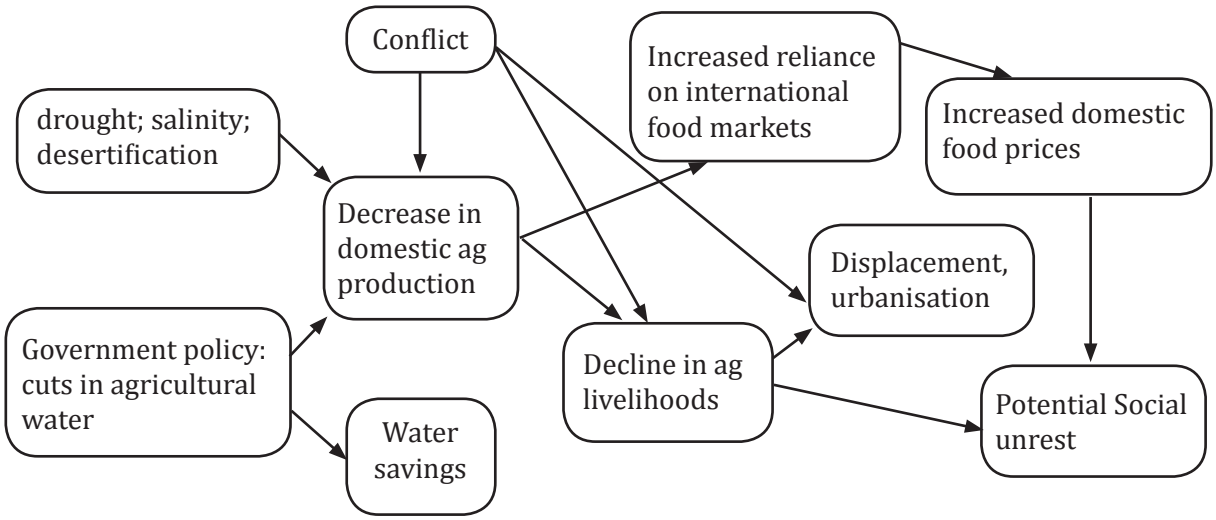


Table 2. Iraq Food-Water Data

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Share of food expenditure of the poor (%). FAO		49								
Domestic food price volatility (index). FAO	83.7	54.9	43.8	35.2	23.4	15.9	24.5	22.7	16.4	
World food price volatility	9.80	5.60	6.80	9.90	6.50	5.70	6.90	7.80	6.40	
Cereal import dependency ratio (%) (3-year average). FAO	5.61	56.9	59.9	62.5	61.45	58.6				
Food subsidies as % of GDP. Arab Organization for Agricultural Development (AOAD).						~ 3.25				
Risk of food insecurity: macro-level and micro-level. IFPRI[69]						n/a 27.56				
Total renewable water resources per capita (m3/inhab/year) FAO AQUASTAT		3127					2741		2661	
Water withdrawal for agricultural use as % of total water withdrawal. World Bank								79		
Rate of urbanization (% per year — 5-year average). CIA Factbook.										3.01

2.2.2 Jordan

Jordan has long played host to a large number of refugees, particularly from Palestine (1948 and 1967), Iraq (1991, 2003, and 2014-present), and most recently, Syria (2011-present). Jordan is also one of the most water resource-scarce host countries in the region.

An International Labour Organization study by Ajlouni and Kawar examines the impact the Syrian refugee crisis on agricultural markets and food prices:[70]

> The fragility of Jordan's agricultural sector, which employs a significant number of Jordanians and which is heavily dependent on exchanges with Syria, has been exacerbated by increased pressure on natural – including pastoral – resources and the productive base. Furthermore, food prices have been affected by pre-existing government austerity measures, implemented over the past two years to reduce subsidies on food and fuel. All of the abovementioned have increased Jordanians' vulnerability to shocks, but especially where communities are hosting large numbers of refugees. Such vulnerability, together with regional uprisings, has created and increasing sense of discontent and frustration for citizens.[71]

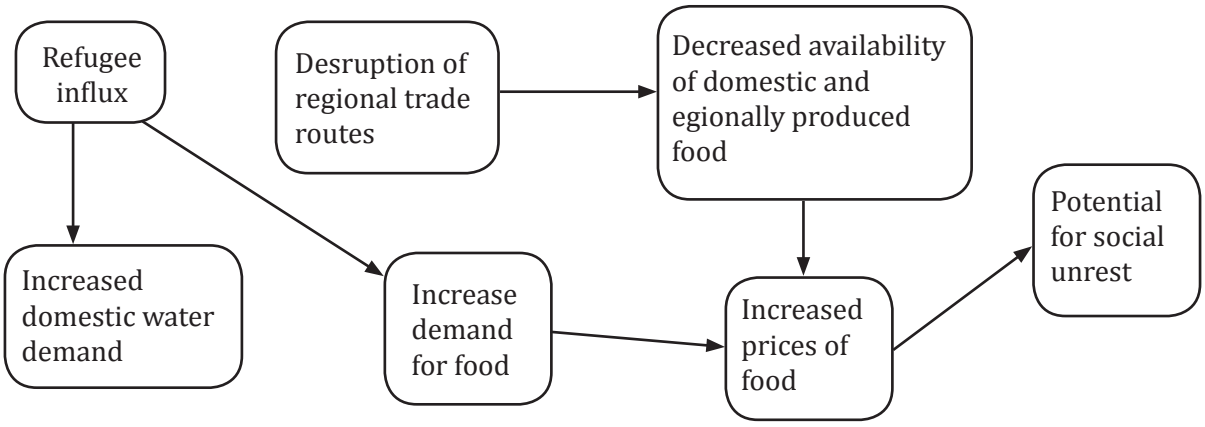
Jordan is also experiencing negative impacts on natural resources — particularly its already scarce water resources — due to the pressures of increased population that the refugee crises in surrounding countries has brought.[72] The food supply system has also been disrupted, affecting food security in terms of both the availability of and economic access to certain products. Poultry and poultry products, for example, which

[70] S Ajlouni and M Kawar, 'The impact of the Syrian refugee crisis on the labour market in Jordan: a preliminary analysis' (ILO Regional Office for Arab States Beirut, 2014).
[71] id.
[72] Mercy Corps, above n 21.

were mainly imported from Syria, are now in short supply. This has been further exacerbated by cuts in fuel subsidies in Jordan as chicken farming is associated with high heating needs, resulting in a three- to four-fold increase in the price of eggs.[73] Jordan already heavily subsidises bread, a major staple food for the country's population, and there are warnings that proposed cuts to this subsidy (which would see the cost of bread more than double) would have negative repercussions particularly for lower-income households.[74]

As an already water-scarce host country, Jordan's water resources have been further stretched by the influx of refugees from Syria and Iraq. The Syria crisis has caused an increase in demand for food in Jordan, subsequently making the country more reliant on the international market for its food supply, where it had previously depended more on securing food from other states in the region. Due to the disruption of trade routes caused by the Syria war, intra-regional trade has been made more difficult. This has led to an increase in domestic prices which, given the large share of income spent on food, presents a burden for average households. A compounding issue is the downward pressure on wages in certain sectors, creating a double burden of rising food prices and lower wages for those households.

Figure 8. Diagram of relationships between refugees and increased stress on resources



[73] FAO, *Agricultural Livelihoods and Food Security Impact Assessment and Response Plan for the Syria Crisis in the Neighbouring Countries of Egypt, Iraq, Jordan, Lebanon and Turkey* (2013).
[74] A Qaraleh, 'Experts warn against lifting bread subsidy', The Jordan Times, (Amman) 14 May 2015 <http://www.jordantimes.com/news/local/experts-warn-against-lifting-bread-subsidy> at 10 September 2015.

Table 3. Jordan Food-Water Data

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Percent of consumer expenditures spent on food (%). USDA						36.0	37.1	37.5	37.8	
Domestic food price volatility (index). FAO	9.9	7.9	10.9	8.9	9	9.1	8.8	13	6.1	
World food price volatility	9.80	5.60	6.80	9.90	6.50	5.70	6.90	7.80	6.40	
Cereal import dependency ratio (%) (3-year average). FAO	96.6	96.8	97.7	97.7	96.7	96.2				
Food subsidies as % of GDP. Arab Organization for Agricultural Development (AOAD).						~1				
Risk of food insecurity: macro-level and micro-level. IFPRI[75]						13.9 8.3				
Total renewable water resources per capita (m3/inhab/year) FAO AQUASTAT			165.7				133.7		128.8	
Water withdrawal for agricultural use as % of total water withdrawal. World Bank	64	63	62	58	56	57	54	53		
Rate of urbanization (% per year — 5-year average). CIA Factbook.										3.79

2.2.3 Lebanon

Currently, Lebanon hosts the highest number of refugees from the Syrian war.[76] The country has also long hosted large numbers of Palestinian refugees from 1948 onwards, many of whom remain in refugee camps. The huge influx of Syrian refugees has had negative impacts on host communities, including increased poverty and vulnerability, competition for jobs and decreased income, competition in business, increased inflation and prices, and strains on services — particularly health care, education and solid waste management.[77]

Recently the country's agricultural sector has been deeply affected by drought,[78] leading to disputes between farmers over water use, and causing a substantial decline in domestic food production. Given, though, that Lebanon relies on imports for 90 percent of its food, it is unlikely that this decline in production will result in a marked decrease in overall food availability. This is most visible in the fruit and vegetable market, which has seen prices increase dramatically.

[75] C Breisinger et al, 'Beyond the Arab Awakening' (IFPRI 2012): A country's macro-level food security is defined as the share of food imports divided by total exports plus net remittance inflows (food imports / [total exports + net remittance inflows]); the prevalence of child undernutrition (expressed as a percentage) is used as a micro-level food-insecurity indicator.
[76] UNHCR. 2015. Country operations profile: Lebanon. http://www.unhcr.org/pages/49e486676.html [accessed 1 September 2015].
[77] ILO, Assessment of the Impact of Syrian Refugees in Lebanon and Their Employment Profile (2013).
[78] M Alami, ' Food Insecurity a New Threat for Lebanon's Syrian Refugees' (IPS News) 22 July 2014. <http://www.ipsnews.net/2014/07/food-insecurity-a-new-threat-for-lebanons-syrian-refugees/> at 1 September 2015; 'Lebanon faces water crisis after record winter drought' (AFP) 9 May 2014. <http://www.middleeasteye.net/news/lebanon-faces-water-crisis-after-record-winter-drought-1118861571> at 1 September 2015.

Most households in Lebanon are considered food secure. However, lower income households, which tend to spend more of their income on food, are vulnerable to any changes in food price. Increased cost of fruits and vegetables impacts the nutritional content of the diets of the population that cannot afford higher prices, as these are often seen as non-essentials, with demand being more elastic.

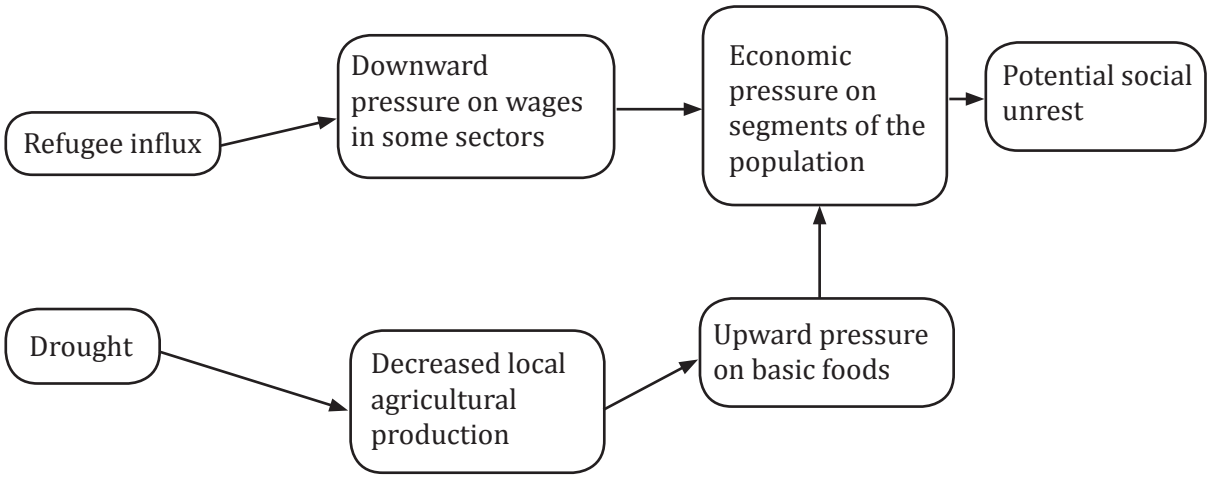
Imported food is also being affected, with shortages of subsidised wheat flour reported, in turn increasing prices of flour, and even leading to industrial action by bakers in Lebanon.[79] This situation is similar to the events that occurred in Egypt after the food price spikes of 2008 and 2011 in the lead-up to the Egyptian uprisings.

The domestic prices of food have also increased since the closure of Syria as a trade route. Prior to the conflict, Lebanon benefitted from cheap food imports both from Syria and from other countries but passing through Syria. The absence of these cheaper goods has increased the cost of domestically produced goods as well as of goods imported from other sources.[80]

Besides relying on the availability of water, Lebanon's agricultural sector has also long relied on seasonal workers coming from Syria. From the beginning of the crisis, Lebanon pursued an 'open border' policy whereby Syrian refugees were allowed to work for the first 6 months without a permit — though recently, this policy has changed, with a detrimental impact on the agricultural sector. It is estimated that 24 percent of Syrians working in Lebanon work in agriculture earning significantly less than the local minimum wage, placing them below the poverty line.[81]

Similar to Jordan, as a country hosting a large number of refugees Lebanon is experiencing downward pressure on wages in certain sectors. This is coupled with increased demand for food, and thus an increase in prices. While Lebanon does not face the same levels of water insecurity as Jordan, recent drought has affected the agricultural sector significantly enough to contribute to price rises in certain goods that would normally be produced domestically. For certain segments of the population, decreased wage and increased food prices are the cause of immense economic pressure, which runs the risk of social instability.

Figure 9. Diagram of the impacts of refugees and drought



[79] FAO, *Agricultural Livelihoods and Food Security Impact Assessment and Response Plan for the Syria Crisis in the Neighbouring Countries of Egypt, Iraq, Jordan, Lebanon and Turkey* (2013).
[80] ILO, above n 77.
[81] ibid.

Table 4. Lebanon Food-Water Data

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Food as a percentage of total household consumptions (%). Nomura Food Vulnerability Index (NFVI)					34					
Domestic food price volatility (index). FAO										
World food price volatility	9.80	5.60	6.80	9.90	6.50	5.70	6.90	7.80	6.40	
Cereal import dependency ratio (%) (3-year average). FAO	82.6	82.4	82.3	85.3	87.1	88.3				
Food subsidies as % of GDP. Arab Organization for Agricultural Development (AOAD).						<0.25				
Risk of food insecurity: macro-level and micro-level. IFPRI[82]						16.5 15				
Total renewable water resources per capita (m3/inhab/year) FAO AQUASTAT		1088					969		933.8	
Water withdrawal for agricultural use as % of total water withdrawal. World Bank								60		
Rate of urbanization (% per year — 5-year average). CIA Factbook.										3.18

2.2.4 Syria

Syria presents a case where cycles of food-water insecurity and displacement — though arguably quite indirect — can be clearly identified both within the country and beyond its borders. The causes of the current crisis are multiple, and there has been a significant amount of work examining the possible environmental drivers that impacted water availability and the agricultural sector. From 2006-2010, just prior to the crisis, Syria had experienced its worst drought in decades.

Gleick[83] contends that while there are many interconnected factors that contributed to the crisis, water and climate change played a direct role in Syria's economic decline, leading to displacement and an increase in urbanisation, food insecurity, and in unemployment, which in turn led to social and political instability in the country.[84]

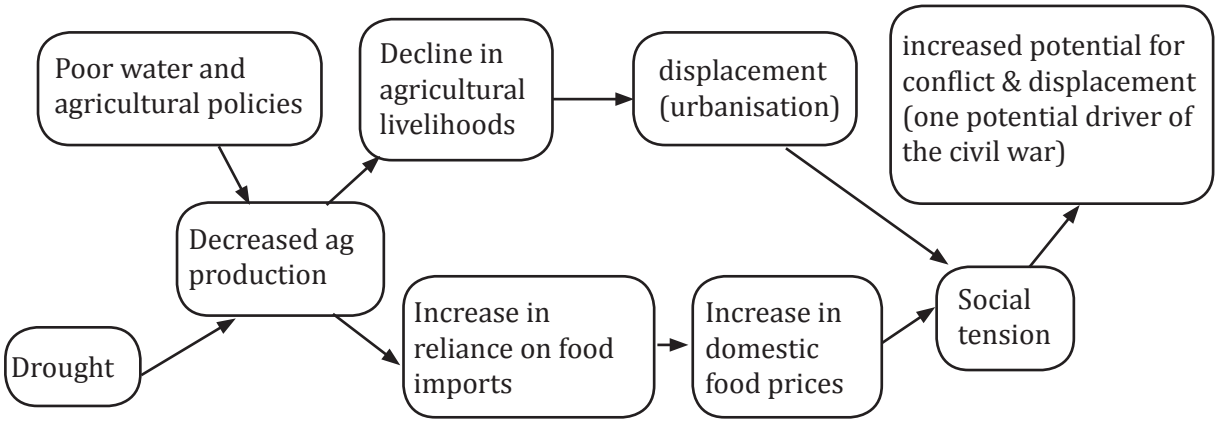
There are, however, differing opinions on this subject. De Chatel for example has argued that structural mismanagement combined with high population growth was at the heart of the water crisis, and that pointing to climate change and drought as the key drivers takes accountability away from the regime.[85] The blame should instead be placed on the inability of the regime to cope with environmental changes.

[82] C Breisinger et al, 'Beyond the Arab Awakening' (IFPRI 2012): A country's macro-level food security is defined as the share of food imports divided by total exports plus net remittance inflows (food imports / [total exports + net remittance inflows]); the prevalence of child undernutrition (expressed as a percentage) is used as a micro-level food-insecurity indicator.
[83] P H Gleick, 'Water, drought, climate change, and conflict in Syria' Weather, Climate, and Society 6(3) (2014) 331-340.
[84] A Beck, 'Drought, dams and survival: linking water to conflict and cooperation in Syria's civil war' International Affairs Forum 5(1) (2014) 11-22.
[85] F De Châtel, 'The role of drought and climate change in the Syrian uprising: Untangling the triggers of the revolution' *Middle Eastern Studies* 50(4) (2014) 521-535.

As discussed above, the Syria crisis has drastically affected the food system of the region and the ability of WANA countries to maintain stability in food security. Prior to the war, neighbouring countries had long relied on Syria as an exporter of both cheap agricultural goods and agricultural inputs — the regime having supported the agricultural sector through heavy subsidies. The cost of agricultural inputs in bordering countries has now increased because of this. In 2011 and 2012, the Food and Agricultural Organization identified the specific regional impacts as "(i) a decline in total agricultural trade; (ii) a considerable drop in bilateral agricultural trade with Syria and in transit trade through Syria; (iii) a significant change in trading routes in the region; and (iv) increased informal trade across the borders with Syria."[86]

While it appears that water-related environmental factors played a role in increasing urbanisation of agricultural labourers prior to 2011, these factors were quite clearly exacerbated by poor water and agricultural policies. Urbanisation may thus have led to social tensions which may have been a factor fuelling the discontent that ultimately led to conflict, though the extent of this is not clear. Both domestic food prices and cereal import dependency increased steadily in the year leading up to the crisis, indicating that poor water policy greatly impacted the availability of cheaper domestically produced agriculture.

Figure 10. Diagram of the relationships between poor water and agricultural policies and drought



[86] FAO. *Agricultural Livelihoods and Food Security Impact Assessment and Response Plan for the Syria Crisis in the Neighbouring Countries of Egypt, Iraq, Jordan, Lebanon and Turkey* (2013).

Table 5. Syrian Arab Republic Food-Water Data

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Share of food to total household expenditure (%). EIU estimate					47.9* (NFVI)		45.6	45.6	45.8	45.8
Domestic food price volatility (index). FAO	11.1	17.9	18.9	16.3	12.7	12,4	28.7	32.4		
World food price volatility	9.80	5.60	6.80	9.90	6.50	5.70	6.90	7.80	6.40	
Cereal import dependency ratio (%) (3-year average). FAO	19.1	18.3	20.3	36.7	46.6	43.2				
Food subsidies as % of GDP. Arab Organization for Agricultural Development (AOAD).						~2.75				
Risk of food insecurity: macro-level and micro-level. IFPRI[87]						9.7 28.6				
Total renewable water resources per capita (m3/inhab/year) FAO AQUASTAT		858.9					767.5		767.2	
Water withdrawal for agricultural use as % of total water withdrawal. World Bank								80		
Rate of urbanization (% per year — 5-year average). CIA Factbook.										1.37

2.2.5 Yemen

Conflict in Yemen has significantly intensified since March 2015. However, the country has long been host to a large number of refugees from Somalia,[88] and more recently from Syria.[89] Leading up to the most recent conflict, the population of Sana'a was one of the fastest growing in the world at 7 percent per year, primarily due to refugee influx and urbanisation. Many of these refugees fled to urban areas, putting additional stress on the local water systems; it is widely believed that Sana'a may become the first capital city in the world to run out of water.[90]

Yemen as a case study is particularly interesting given the country's history of water-intensive qat farming (which accounts for up to 90 percent of Yemen's groundwater consumption)[91] and the extreme scarcity and high rate of exhaustion of its remaining water resources. The agricultural roots of water scarcity in this case are quite clear. Qat benefits from water — which means flood irrigation is the norm — and farmers earn more from such crops than from others.[92] There is thus no incentive to use more

[87] C Breisinger et al, 'Beyond the Arab Awakening' (IFPRI 2012): A country's macro-level food security is defined as the share of food imports divided by total exports plus net remittance inflows (food imports / [total exports + net remittance inflows]); the prevalence of child undernutrition (expressed as a percentage) is used as a micro-level food-insecurity indicator.
[88] C Giesecke, 'Yemen's Water Crisis: Review of background and potential solution'. (USAID Knowledge Services Center (KSC) Research Series 2012).
[89] C Anne, 'Syrians in Yemen: Back to Square One' (Al Jazeera) 26 May 2015. <http://www.aljazeera.com/news/2015/05/syrians-yemen-square-150519102335187.html> at 1 September 2015.
[90] C Boucek, 'Yemen: Avoiding a downward spiral', Carnegie Endowment for International Peace (2009).
[91] ibid.
[92] ibid.

water efficient irrigation methods or to diversify to other crops. Inadequate water and agricultural policies have thus made it possible for the agricultural sector to use excessive amounts of water, yet not contribute substantially to the country's domestic food production.

Production of qat increased 13-fold between 1970 and 2000, while grape production increased only two-fold in the same period of time.[93] According to Yemen's Ministry of Agriculture and Water Resources, qat cultivation is currently increasing by around 12 percent each year.[94] The Government of Yemen is aware that improving the country's water scarcity situation depends on encouraging a decrease in qat production, but is hesitant to do so given the importance of qat to farmers' livelihoods and other benefits cultivation of the drug brings to communities:[95]

> Research has shown that there are also some beneficial aspects to qat cultivation by increasing the availability of local services and generating employment for rural Yemenis from other parts of the country. In an assessment of qat in Yemen, the World Bank noted that the qat trade facilitates regular transfers of money from cities to rural areas. Moreover, the vast majority of income from qat sales remains in the local area, and employment in qat cultivation helps to limit urbanization.[97]

However, the negatives far outweigh the benefits. Qat has been identified as a main cause "of poverty in the country, decreasing productivity, depleting scarce resources, and consuming an increasingly larger portion of household budgets."[97] In terms of food security, land and water resources that were once used for food production have greatly decreased, and the country is now highly dependent on the international market for its food.[98] From 2009-2011 the cost of food in Yemen rose more than 20 percent while some food items doubled in price within a year, with 90 percent of households citing these price rises as the main shock they were affected by.[99] To further exacerbate the food crisis, the Government of Yemen does not have the funds to import and subsidise food for its population.[100]

Much of Yemen's population experiences poverty and food insecurity, ranked by International Food Policy Research Institute as the 11th most food-insecure country in the world,[101] and with 45 percent of the country living below the poverty line.[102] The 2008 food price spike alone was responsible for pushing a further 6 percent of Yemen's population into poverty.[103] The population is also highly dependent on domestic agriculture for livelihoods, with nearly one-third employed in agriculture,[104] which is not the case in many WANA region countries.

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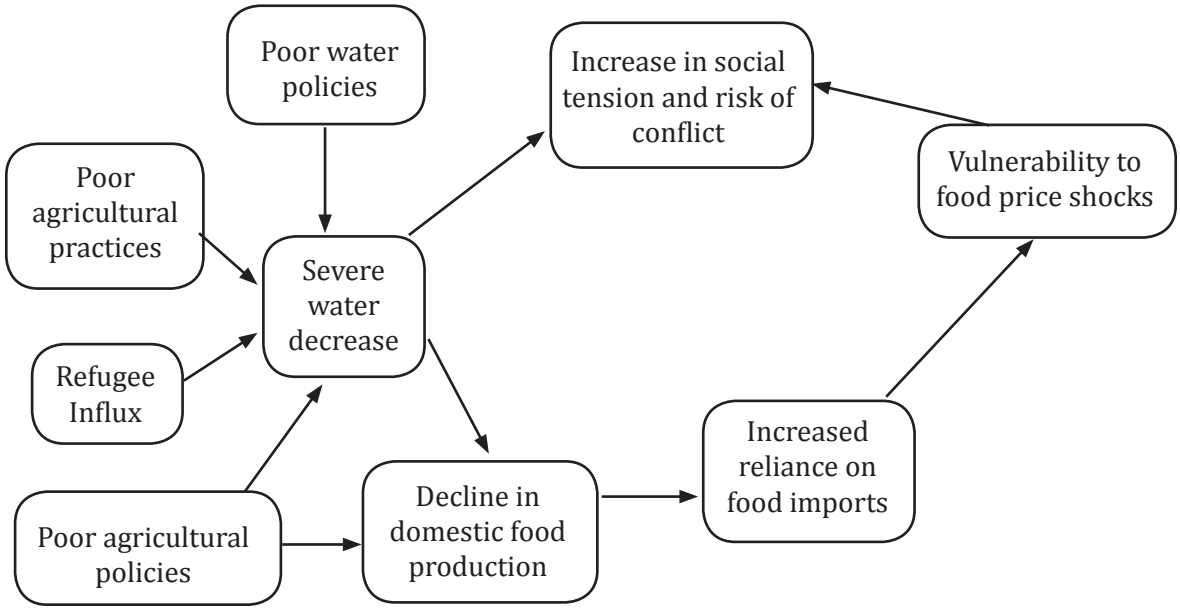
[93] MPIC (Ministry of Planning), *Implementing the poverty reduction strategy in rural areas* (2003).
[94] A Heffez, 'How Yemen Chewed Itself Dry', (Foreign Affairs) 23 July, 2013 <https://www.foreignaffairs.com/articles/yemen/2013-07-23/how-yemen-chewed-itself-dry> at 1 September 2015
[95] Giesecke, above n 89.
[96] ibid.
[97] ibid.
[98] WFP, *The State of Food Security and Nutrition in Yemen* (2012).
[99] ibid.
[100] P Kenyon, 'Water, Food Shortages Squeeze Yemen' National Public Radio (NPR): News & Analysis, World, US, Music & Arts (3.June 2008) <http://www.npr.org/templates/story/story.php?storyId=90328214>
[101] IFPRI, 2010 *Global Hunger Index, The Challenge of Hunger: Focus on the Crisis of Child Undernutrition* (2010) <http://www.ifpri.org/publication/2010-global-hunger-index> at 15 September 2015.
[102]World Bank, 'High Food Prices: A Harsh New Reality' (29 February 2008) <http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/0,,contentMDK:21665883~pagePK:64165401~piPK:64165026~theSitePK:469372,00.html> at 1 September 2015.
[103]http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/0,,contentMDK:21665883~pagePK:64165401~piPK:64165026~theSitePK:469372,00.html
[104] WFP, above n 98.

Yemen also provides an example of a country where strong links between water scarcity and conflict are perhaps more present, with 70-80 percent of conflicts in the country's rural regions identified as being water-related.[105] Abdulrahman Al Eryani, Yemen's former Minister of Water and Environment, believes that rising militancy in the country is rooted in competition over natural resources, manifesting in tribal, sectarian or political conflicts.[106]

Yemen faces absolute water scarcity, stemming primarily from poor agricultural practices. Despite the importance of agriculture to the country, the sector has not been regulated to prioritise food production, nor has water use in agriculture been regulated. Large numbers of refugees fleeing to urban centres has further exacerbated water scarcity in the cities. Reliance on virtual water imports and dependency on international food markets has kept many people food insecure, which for a country already suffering from high levels of poverty can be particularly problematic, with a greater chance of this leading to social unrest and conflict.

Figure 11. Impacts of a severe decrease in water



[105] A Heffez, 'How Yemen Chewed Itself Dry', (Foreign Affairs) 23 July, 2013. <https://www.foreignaffairs.com/articles/yemen/2013-07-23/how-yemen-chewed-itself-dry> at 1 September 2015

[106] L Kasinof, 'At heart of Yemen's conflicts: water crisis' (The Christian Science Monitor 2009) <http://www.csmonitor.com/2009/1105/p06s13-wome.html> at 1 September 2015.

Table 6. Yemen Food-Water Data

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Household income spent on food (%). FAO			65							
Domestic food price volatility (index). FAO	35	22.2	33.2	9.7	13.9	12	15.3	11		
World food price volatility	9.80	5.60	6.80	9.90	6.50	5.70	6.90	7.80	6.40	
Cereal import dependency ratio (%) (3-year average). FAO	81.6	78.8	78.2	80.1	80.9	81.2				
Food subsidies as % of GDP.										
Risk of food insecurity: macro-level and micro-level. IFPRI[107]						15.4 58.6				
Total renewable water resources per capita (m3/inhab/year) FAO AQUASTAT		99.14					88.04		86.04	
Water withdrawal for agricultural use as % of total water withdrawal. World Bank								91		
Rate of urbanization (% per year — 5-year average). CIA Factbook.										4.03

[107] Breisinger see note 69.

2.3 A Food-Water—Conflict-Displacement Problem Tree

The problem tree below illustrates the possible causal links between food, water, conflict and displacement. Links are based on the cases examined above. Because cases involving refugee movement often bridge two or more countries, the diagram is meant to depict possibilities across the region, sometimes with causes originating in one country with impacts seen in another. These links are often also circular, whereby the impact seen within one case of conflict or displacement acting as a driver for a new case.

The case studies tell us a great deal about the four relationships outlined in section 3.1 and depicted in the problem tree here. Drought causing loss of agricultural production has been seen in Syria and Lebanon. In the case of Syria, drought may have been one contributing factor to the social and political unrest that ultimately resulted in conflict and displacement, following the top outer boxes of the problem tree. In the case of Lebanon, drought was seen as leading to a decrease in local goods available on the market, and subsequent higher domestic prices, though this has not led to the same unrest experienced in Syria.

Within the problem tree, it is seen that conflict can impact the regional food supply system, ultimately leading to greater food insecurity in neighbouring countries. Prior to the conflict, Syria was both a substantial producer of agricultural goods and an integral part of a transit route through the region for the agricultural goods of other countries. Since the conflict, countries such as Jordan have both been less able to export goods to neighbouring countries through Syria, and have had to rely more on international markets. In both of these cases, increased food insecurity is an ultimate repercussion.

The impact of poor agricultural and water management as experienced in Yemen is also depicted within the problem tree. Yemen has experienced refugee inflows, another driver of water scarcity. As shown, there is a cycle between decreased water supply and food insecurity, through reduced domestic production leading to increased reliance on international markets. Yemen is perhaps the most vulnerable country in the region to this kind of accessibility-based food insecurity, due to existing low income levels.

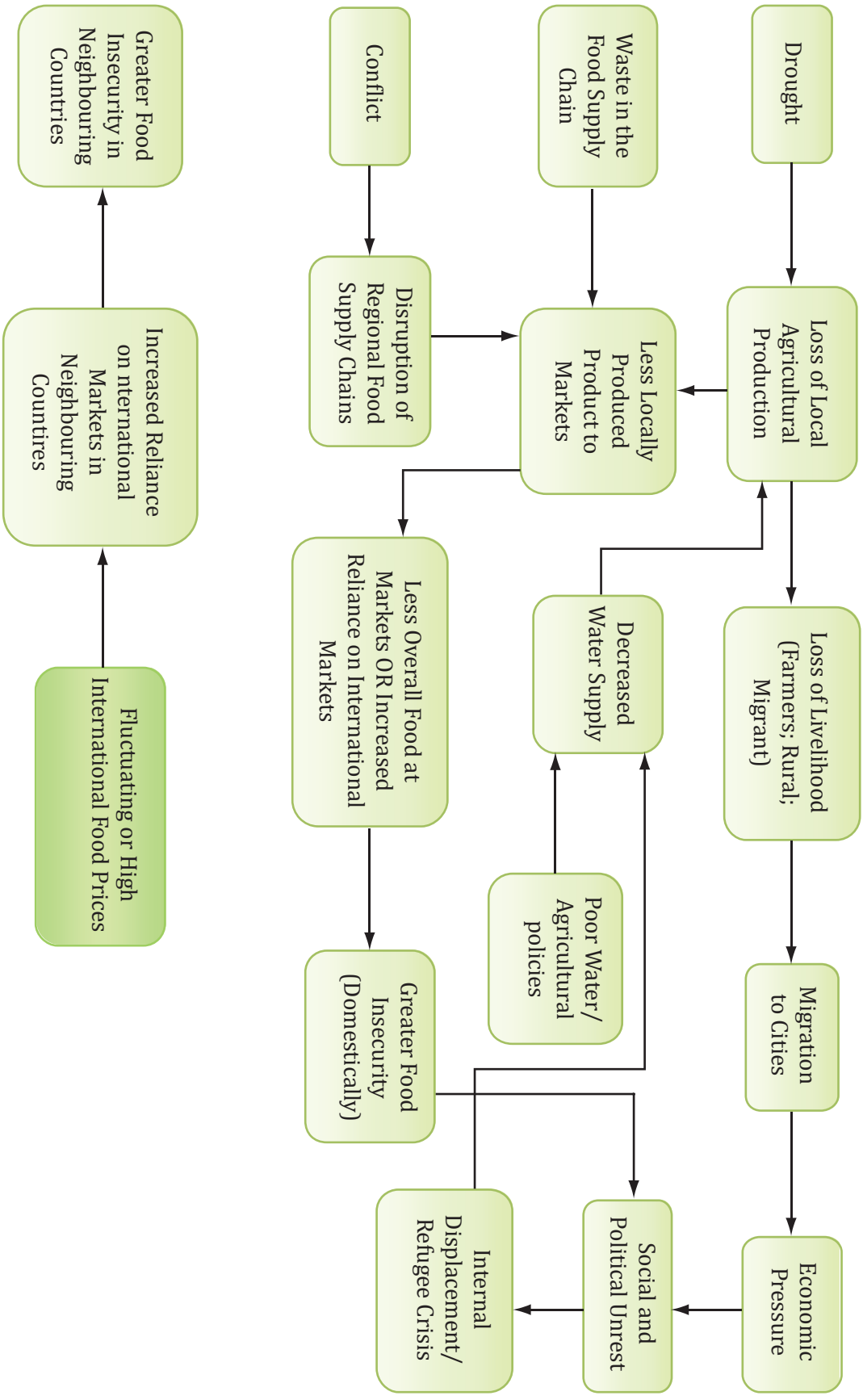


Figure 12: Food-Water—Conflict-Displacement Problem Tree

3. Conclusion

Given the scarcity of water in most WANA countries, the import of virtual water in the form of food products has been a convenient solution to preserve remaining water resources and to ensure food security for the region's populations. However, in light of the global food price spikes over the last decade, it has become clear that achieving food security is not straightforward for countries that are heavy food importers. Governments have begun to look at alternative solutions, including a return to domestic production. The challenge is how water-scarce countries in the region can balance water security and food security.

This paper has attempted to create a framework that facilitates analysis of both food security and water security. In cases where populations are highly vulnerable to shifts in international food prices, there may be benefits to finding water-efficient ways of supporting domestic food production. In a case like Yemen, however, where both food and water security challenges are grim, water and agricultural policies that are more strategic in terms of supporting local food security needs must be developed. Such solutions cannot be found without further research into understanding the causal relationships discussed throughout this paper.

Conflicts resulting in large numbers of internally displaced people and refugees can add immediate pressure to neighbouring countries and urban centres. These pressures can affect both already scarce resources and the socio-economics of host populations. In either case, pressures can add to social tensions and then erupt into larger conflicts. For this reason, addressing the water and food security needs of populations dealing with displacement is an immediate and necessary concern. Moreover, to mitigate displacement, and the conflicts causing displacement, countries must find ways to balance the needs for both water and food security based on the needs of their populations.

If reducing water used for agriculture exacerbates poverty and increases the risk of social tension because people cannot afford to purchase imports, a better approach might be to encourage more efficient and strategic use of water geared towards boosting domestic food supply. On the other hand, if a population is relatively wealthy and able to withstand the price volatility that comes with dependence on international food markets, virtual water import becomes a safer option. Both scenarios, however, come with risk: domestic agriculture can be unexpectedly threatened by conflict, as seen most recently in Iraq, and virtual water import may be unexpectedly threatened by trade embargos.

Governments, international organisations and development agencies working with refugee populations regularly produce research on refugees and either the water or the food sector. Taking up the food-water intersection approach would encourage a necessary shift towards examining the mutual impacts of the food and water sectors in displacement contexts. Such a shift requires a move away from the siloed approach taken by most organisations and more integrated thinking between departments. In doing this, organisations will be in a stronger position to exert greater influence on governmental policy — one of the most significant means of change — and towards a more strategic approach to food and water security planning.

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