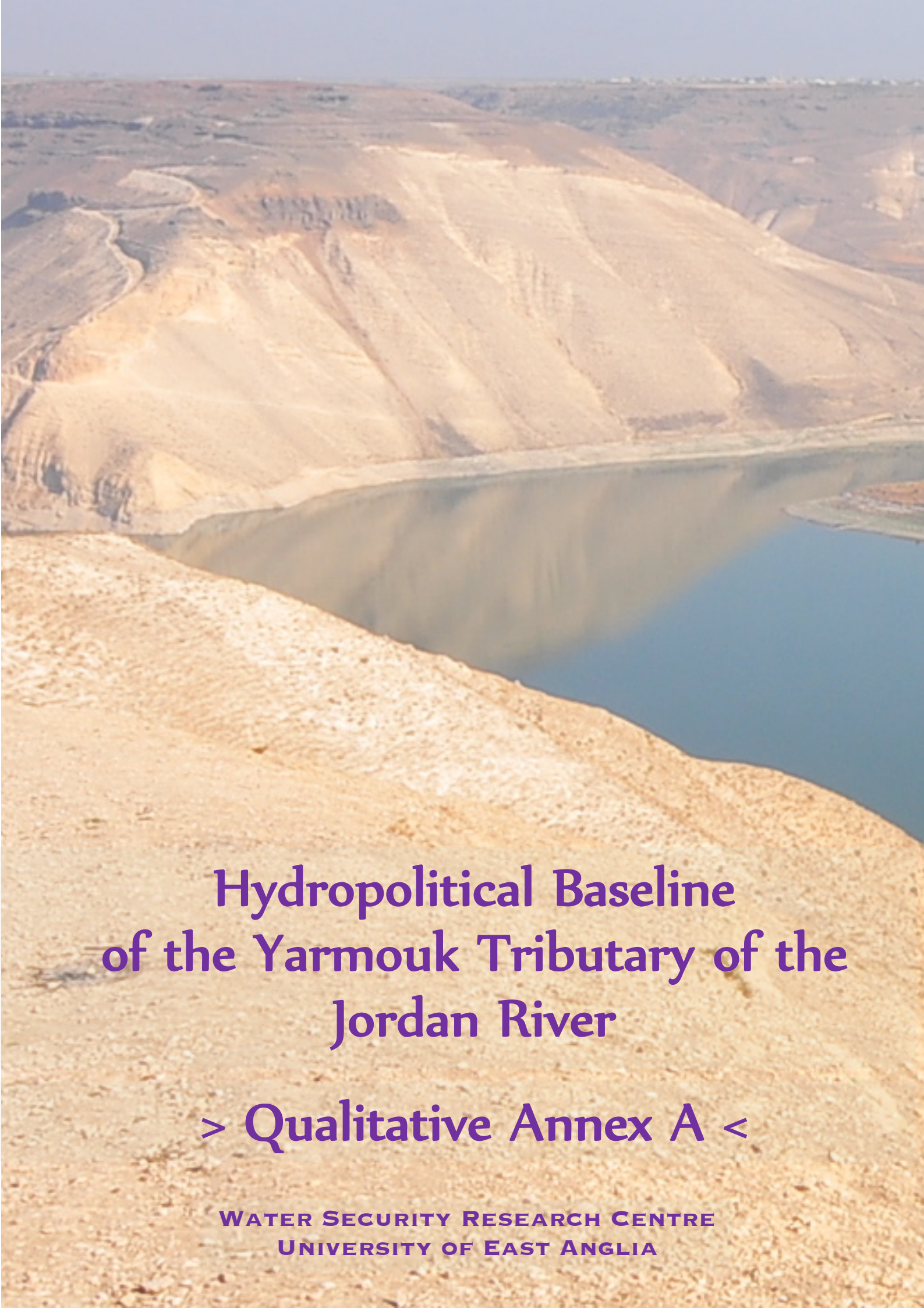

Hydropolitical Baseline of the Yarmouk Tributary of the Jordan River

> Qualitative Annex A <

Water Security Research Centre
University of East Anglia

Hydropolical Baseline Study of the Yarmouk Tributary of the Jordan River

QUALITATIVE ANNEX A

This study was written by Mark Zeitoun, Muna Dajani, Chadi Abdallah, Sharif Youmans, Sa'eb Khresat and Heather Elaydi of the Water Security Research Centre of the University of East Anglia (UEA). The research was supported financially by the UEA and the Swiss Agency for Development and Cooperation (SDC).

The contents do not necessarily reflect the views of the SDC or the Swiss Federal Department of Foreign Affairs.

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Cover photo: The al Wehdeh Dam Reservoir on the Yarmouk tributary viewed from Jordan, November 2015. *Source*: Heather Elaydi.

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Qualitative Annex A

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A1 Research methodology

Research was conducted between January 2016 and October 2019 by a team led by Prof. Mark Zeitoun of the UEA Water Security Research Centre. Field research was led and conducted by Dr Muna Dajani of the London School of Economics and Political Science. Technical research and satellite imagery analysis was led by Dr Chadi Abdallah and the GIS team at the *Centre National de Recherche Scientifique* in Beirut. , Prof. Sa'eb Khresat, Dr Sharif Youmans, Heather Elaydi, Eileen Hofstetter, Mufleh al Abbadi and Patrice Moix helped to conceive, design and execute the research, and provided feedback throughout. Peer review was carried out by Yves Haeberlin, Clemens Messerschmid, Nabil El Mashad, Benjamin Roberts-Pierel, Hussam Hussein and Michael Talhami. The design and development of the research methodology and data assessment were conducted by the team, primarily at workshops in Amman in February 2016, April 2017, and February 2018.

The report also reflects feedback received from the Jordanian Ministry of Water and Irrigation and Jordan Valley Association (at four workshops throughout 2017 and 2018), and from the Syrian Ministry of Water Resources (at two workshops held in 2018).

Data on surface water, geology and groundwater were acquired through a review of all publicly available literature and an extensive set of unpublished literature provided by the Ministry of Water and Irrigation or the Jordan Valley Authority in Jordan. The quality of this data is highly variable, and the text of the main report draws attention to the resultant limitations wherever relevant.

Thirty-three people were interviewed, including water researchers, policy makers and practitioners from Syria, Jordan and Israel, as well as researchers from outside the region. The identity of each has been anonymised.

Fourteen archives and libraries were visited, including: *British*: The National Library Archives; Palestine Exploration Fund; *French*: Archives de Nantes; Institut Française du Proche-Orient (Beirut); *Israeli*: Zionist Archives; Israeli State Archives; Water Authority Archives; National Library – Hebrew University; *Jordanian*: Water Authority Library; Royal Scientific Society; Council for British Research in the Levant; Natural Resources Authority Library; *Syrian*: The Syria Report (magazine); *Other*: Oregon State University Middle East Collection.

The analytical methods employed are presented within the text of the report.

A2 Understanding water conflicts

A2.1 Conflict resolution vs. conflict management

Accepting that power plays a determining role in the creation, maintenance or challenge of any transboundary water arrangement, the goal of hydro-diplomacy should be conflict *resolution* (or transformation), rather than conflict management. Water conflict management efforts seek to soothe tensions just enough to prevent a water conflict from becoming armed. Because diplomats are often obliged to show success (Zeitoun*, et al.* 2016), a conflict management approach is easier; it is normally amenable to the basin hegemon, and inevitably seeks the low-hanging fruit. But conflict management has no strategic element, no will to explore the bigger picture or better alternatives. Asymmetries in power – and their devastating effects – are thus likely to be underplayed or ignored in this pursuit (e.g. Delli-Priscoli*, et al.* 2008).

Conflict resolution efforts, on the other hand, seek to put an end to an untenable situation (see e.g. Kriesberg 2009). While conflict transformation efforts are similar (e.g. Lederach 2005), they are more pragmatic for accepting the reality of constantly changing circumstances surrounding a conflict. In recognising that any effort to seek a permanent end to conflict will eventually fail, the conflict transformation approach is more realistic for diplomats, too, especially for environmental conflicts (Rodríguez*, et al.* 2006) subject to constant changes in society and climate.

A2.2 Power and hydro-hegemony

Thinking on 'hydro-hegemony' recognises that a position of hegemony in a basin may be held by one riparian actor if there is clear asymmetry in its favour of the balance of three 'pillars': riparian position, exploitation potential and power (Zeitoun*, et al.* 2006). The approach accepts that expressions of power and power asymmetry are key elements in determining outcomes of water conflicts, and the character of interaction between States over the flows. 'Power' is gauged here in various forms. *Structural power* relates to the military and economic strength of a State; *bargaining power* is a measure of a State's ability to negotiate for its interests, and stems from its legitimacy in a relationship and is backed up by structural power; *ideational power* is a measure of a State's ability to present transboundary water arrangements and solutions as inevitable, typically traced through the effectiveness of the narratives it develops in relation to the arrangement.

Basin 'hegemons' are the most powerful State at the basin level (in the International Relations sense of the term 'hegemon'). With sufficient asymmetries in structural and ideational power, however, a state of Gramscian hegemony can arise; that is, the

stability of an arrangement that is backed up by both force (of one side) and consent to the arrangement (by the other sides). Hydro-hegemons have been found to establish and consolidate control over transboundary resources through any of a number of tactics informing strategies of a) resource capture; b) containment of challenges from other actors; and c) integration of interests through the use of incentives.

Bargaining and attempts to 'sanction' discourse are seen as forms of soft power that complement more overt expressions of hard power (Zeitoun*, et al.* 2011). Both broad forms of power are evident throughout the Jordan River Basin and its Yarmouk tributary: as we will see, the consequences of Israeli and Syrian expressions of hard power complement less directed expressions of soft power.

A3 Yarmouk water institutions

A3.1 Jordanian water institutions and management related to the Yarmouk, in brief

There are three main authorities in the Jordanian water sector: the Ministry of Water and Irrigation (MWI), formed in 1988, has the mandate to develop policies, bylaws and procedures; the Water Authority of Jordan (WAJ) is responsible for the control, management and development of the water sector; and the Jordan Valley Authority (JVA) manages and controls the irrigation water and infrastructure, including dams, canals and distribution systems in the Jordan Valley, extending 'from the Yarmouk to the last farm turnout in the Southern Ghor' (World Bank 2001: 3, Zoubi 2008). The JVA is also charged with strategic water management, in particular for dealing with transboundary issues. As such, the JVA is responsible for preparing a daily balance of the Yarmouk tributary downstream and its discharges, as well as taking water measurements in the side wadis, the Mukheibeh wells, discharge from the Wehdeh Dam, and the Lake of Tiberias conveyor (MWI, 2014).

National water policy in Jordan was developed in the 1950s, largely as a response to the 1948 *Nakba* and the sudden increase in people from Palestine (Haddadin 2006). Haddadin (2006) has described the East Ghor Canal Law of 1959 as an 'unprecedented policy of irrigated-land reform'. The East Ghor Canal Authority – headed by Nicholi Simansky (see Annex A4.2) – was incorporated soon after and became responsible for designing the procedure for the redistribution of the irrigable land and all related matters of planning and construction of the canal (FO 1959). The Jordan Valley Plan (1973-1979) was the first comprehensive plan for the development of the valley carried out by the Government of Jordan, in the aftermath of the 1967 war and the resultant destruction of villages and infrastructure. Under this plan, the Jordan Valley Commission was established in 1973 as an independent commission under the prime minister's office. The Jordan Valley Commission became the Jordan Valley Authority in 1977, and the JVA remains the responsible body until the present time.

The JVA transformed the landscape of the Jordan Valley with the introduction of modern irrigation technology, intensively irrigated market agriculture, village planning and social services to cover basic needs. Unlike the undeveloped rangeland and rainfed areas that covers most of Jordan, the 'development of the Valley was one of the most expensive per capita development projects in the world' (Dajani, in Layne 1994). The legal basis for land reform was outlined in the 1959 East Ghor Canal Law, and started in 1962 (Molle*, et al.* 2008) –

long before the establishment of the JVA in 1977.

"Interestingly, in this important but tiny [Jordan River] valley, a conflict relationship daily takes place around water: local low-status population – Palestinian refugees, settled Bedouin tribes, side by side Egyptian and Pakistani labourers – steal water in irrigation and do not fit to the technical discipline imposed in the last decades due to increasing water scarcity and rural marginalisation, where water has become a medium of a conflict situation towards the state and aid agencies. Since regional issues have been depoliticized, water is daily re-politicized in practice in the work system by the illegal tapping and water stealing as acts against the state and vis-à-vis aid 'technical' order and aid" (van Aken n.d.).

Other ministries involved in Jordan's water sector include the Ministry of Agriculture, Ministry of Planning and International Cooperation, and the Ministry of Environment. Hussein (2017) details how Jordanian policy is shaped by the complex relationships and varying degrees of influence of the 'shadow' government, tribal elites, UN agencies, NGOs, agribusinesses and farmers' unions.

A3.2 Syrian water institutions and management related to the Yarmouk, in brief

Water resources in Syria are managed by a variety of government agencies, principal among which is the Ministry of Water Resources (MoWR). Under the Ministry of Irrigation until 2012, the MoWR is responsible for the development, management and monitoring of the country's surface and groundwater. Restructuring within the ministry in 2013 means that at the level of central government, the MoWR operates through the General Commission of Water Resources (GCWR). The GCWR has replaced all of the previous six basin-level General Directorates, including the Water Corporations for Dera'a, Al Suweida and Al Quneitra. Each governorate has a Directorate of Water Resources which is to work closely with the GCWR (Galili (pers. comm.) 2016).

Development of the agricultural sector in Syria emulates the development seen in its neighbours. Development intensified particularly under the Ba'ath regime from the 1960s until the early 2000s. The Ba'ath policy of rural development 'was driven by several conflicting imperatives' of State-led development based on socialist agricultural sector reforms and the development of peasant cooperatives. After decades of stagnating development, competing socialist and private-sector investments and ideologies, and a largely unsuccessful policy of national food self-sufficiency, water resources have been overexploited, polluted and misused in most basins (see Springborg 1982, Barnes 2009, Hinnesbusch 2011).

Mourad and Berndtsson (2012) lay the blame for lack of good governance in the water sector on a lack of cooperation and overlap between the government departments. Barnes (2009) highlights how the delineation of the country's water resources by the Ministry of Irrigation relies on maps of agroclimatic zones and on drainage basins to plan and develop the

country's strategic water plans. The inconsistency between the physical drainage basin delineation and the hydraulically defined basins (see Section 3.1.1) brings about the inevitable clash between general basin directorates, another administrative arrangement to manage and plan water use in the basins. The water sector has also been characterised by a lack of engagement with water users, especially farmers, and a lack of good governance, regardless of all efforts to develop and upgrade consistent and effective administrative units (Daoud 2014).

Water Law 31 was passed in 2005 to legislate water as public good, ownership rights to water sources, well-drilling licences and permits, water-user cooperatives, as well as fines and policing water-use violations.[1] However, the law lacked clarity and had contradictory articles regarding water as a public good and private ownership of water sources. As such, a national campaign to adopt modern agricultural techniques was launched in 2005 with a budget of about SYP 45 million (around USD 1 million). Illegal well drilling had begun in the 1990s, and increased especially after 2000 to reach a climax after 2011. One of the measures undertaken was to curb illegal well-drilling through the establishment of small, medium and large dams throughout the country in order to reduce water use and depletion (Hinnesbusch 2011, Galili (pers. comm.) 2016). The government encouraged water users to reduce the dependence on illegal well drilling by using the water from abundant water reservoirs through networks. A second official reason for the dams was the desire to 'stop every drop of water from reaching Israel' (Tawil (pers. comm.) 2017). Despite the contradiction with the stated political goal, the first efforts to switch to modern irrigation techniques occurred in the Yarmouk tributary basin (Galili (pers. comm.) 2016).

In fact, Syrian use of the Yarmouk mainstream and its tributaries began in 1947, with the Lower Yarmouk Canal Development project, by which diversion of water from the major springs of Muzeirib and Zayzoun for irrigation was enhanced (JVA 1988). Interestingly, the Muzeirib scheme was considered at a Syrian-Jordanian committee on Yarmouk development held in Damascus in September 1951, and Jordanian representatives noted that the scheme would result in reduction of flows in the river's lower reaches (FO 1951).

Development of the water in the Yarmouk tributary basin continued throughout the 1960s, with increased pumping of the springs to upland areas and the beginning of construction of retention dams to store flood flows (e.g. the Lower Yarmouk Canal Development project, and the 1967 Middle and Upper Yarmouk projects). By the 1980s, 21 dams were noted with a total theoretical capacity of 91.7 MCM (JVA 1988).

Following the 1987 agreement between Jordan and Syria, a report on the Wehdeh Dam project conducted by the Harza Engineering Company as part of the Jordan Valley Irrigation Project Stage II, reveals how Syria made the dam conditional on Jordan's

1 Water Legislation Law 31 (2005) in Arabic: mowr.gov.sy/index.php?d=64&id=124 ; in English: mpfpr.de/fileadmin/media/Water_Law/Nationales_Recht/Treaties_Syria/Water_Legislation_Law_No_31_English_2005.pdf

agreement to Syria having the right to store more 'than was assumed for any previous water balance study' (JVA 1988: 1). The report then specifies that 'Syrians will place 155.3 MCM, 94.4 MCM will be located upstream from the Wehdah site and 60.9 MCM will be downstream of the site on Wadi Raqqad' (JVA 1988: 4) – a storage capacity already greater than the 156 MCM agreed to in the 1987 Jordan-Syria Treaty. Consequently, the report highlights that as a result of the agreement, the water available for Jordan from the Yarmouk tributary basin will decrease, making it necessary to revisit the study and calculate the new water balance according to increased Syrian depletion of the Yarmouk.

The decline in retention of storage reservoirs since the start of the crisis in Syria in 2011 (Avisse*, et al.* in preparation) suggests that groundwater is making up the difference, possibly through a greater number of illegal wells. There are reports of over 300 unlicensed wells pumping in Lake Muzeirib alone, though actual abstractions are probably limited by lack of electricity or fuel to run the pumps (Etana 2015). The unsustainable use threatens to affect the lake, and thus the main drinking water supply of Dera'a.

A3.3 Israeli water management in the Yarmouk Triangle – the JVWA

The only area of Israel proper within the Yarmouk tributary basin is within the so-called 'Yarmouk Triangle', circumscribed by the Lower Jordan River to the west, the Yarmouk tributary to the south, the southern tip of the Lake of Tiberias in the north, and the 1949 Demilitarised Zone between Syria and Israel. Centred at the confluence of the two rivers, the fertile land has been planted for hundreds of years. The first Zionist farmers to use these flows were the agricultural kibbutzim (settlements) established in the early 1940s, and Israeli settlements in the Occupied Syrian Golan Heights following 1967. In addition, fish ponds at Himmeh/Hamat Gader have been maintained for the past several years on the western bank of the Yarmouk mainstream (Zrike 2006).

A3.3.1 The origins of the JVWA

Water in the area is currently managed by the Israeli Jordan Valley Water Association (JVWA). The JVWA retains a semi-independent status from the official Israeli water supplier Mekorot, because of its origins. The '5 Kibbutzim' water-pumping plant shown in Figure A 3.1 was designed by the engineer Simcha Blass and was built in the early 1940s.[2] Flows were pumped from the Yarmouk tributary as the Jordan River soon proved insufficient to meet the demands of the water-intensive crops such as bananas. The electricity to run the station was provided by Pinhas Rutenberg's Palestine Electrical Company hydropower plant, and the pumping station was working at a capacity of 500m^3/h, providing 7 MCM/y (Ynet 2005). The height of the water at this point was raised 38 m and channelled

[2] Blass was one of the leading Israeli water planners and a bitter opponent to the Johnston Plan (Belkin*, et al.* 2000).

through an aqueduct which still stands today (Figures A 3.1 and A3.2). The kibbutzim closer to the Yarmouk mainstream took water directly from it with their own pumps. The 'Shagham' was one such pumping station (an abbreviation of the Sha'ar Ha Golan and Masada – the two kibbutzim that used to operate them), located at Point 110 of the border, and seen in Figure A.3.1

Figure A 3.1 The 5 Kibbutzim pumping plant (*left*) and the aqueduct channelling water to the agricultural land (*right*). Source: (Ynet 2005 (photographs by Eliahu Cohen)).

Figure A 3.2 Remains of the old aqueduct near Beit Zera', with banana plantation in the background, 2016. *Source*: M. Dajani.

Figure A 3.3 Israeli guard standing over the Shagham (Sha'ar Ha Golan) pumping station on the bank of the Yarmouk mainstream. *Source*: ISA (1939).

The Israeli Jordan Valley Water Association (JVWA) was eventually established in 1978 as an agricultural cooperative for the production and distribution of water in the area's 11 kibbutzim (Ashdot Ya'cov, Ashdot Ya'cov Ehud, Afikim, Sha'ar Golan/Masada, Beit Zera', Dagania Alef/Bet, Tel Katzir, Masada, Kinneret, Almut). The JVWA centralised the pumping works and established a unified body to manage and control water infrastructure in the area.

A3.3.2 The political influence of the JVWA and sandbag weirs at Adassiyeh

Throughout the decades of negotiations with Jordan, the farmers in the Yarmouk Triangle have claimed 40 MCM/y for their use (Haddadin 2000), though the Johnston Plan set an allocation of 25 MCM/y which eventually laid the basis for the Israeli-Jordanian negotiations and peace treaty. The power and influence of the Yarmouk Triangle farmers in demanding their historical use of the Yarmouk in light of Israeli-Jordanian water negotiations and cooperation is well-covered in Sosland (2007). The head of the secret negotiations was Noah Kinnarty, a farmer and also chief JVWA official, and later chief negotiator over water issues with the Palestinians. Interviewed by Sosland, Kinnarty explains how farmers would seek to increase the flow of the Yarmouk towards their pumps, as in the case in 1979 when they manipulated the rock weir previously buildt by the Jordanian authorities – see Figure A 3.4.

The manipulation was done without Israeli government approval in an effort by the farmers to defy any arrangement which did not secure their historical use. Following the agreement between the Israelis and Jordanians regarding the building of a sandbag weir later that year, secret talks continued to ensure the flow measurements were satisfactory to each party by adjusting and manipulating the sandbags depending on the flow (Nathan (pers. comm.) 2017a).

Figure A 3.4 Rock weir built by Israel to raise the water level and allow additional pumping. *Source*: ISA (1939).

The JVWA also remains the main body responsible for operating the main pumping station at Yarmoukim. As described in greater detail in Section 5.3.2, the JVWA ensures that the farmers of 'the triangle' continue to receive their share of water allocation with little to no interruption (Nathan (pers. comm.) 2017a). A farmer interviewed also shared the same sentiment, by emphasising that 'water is always available for us' (Barach 2016).

A4 Development plans and infrastructure

A4.1 Ottoman, Zionist and Transjordanian plans and infrastructure pre-1948

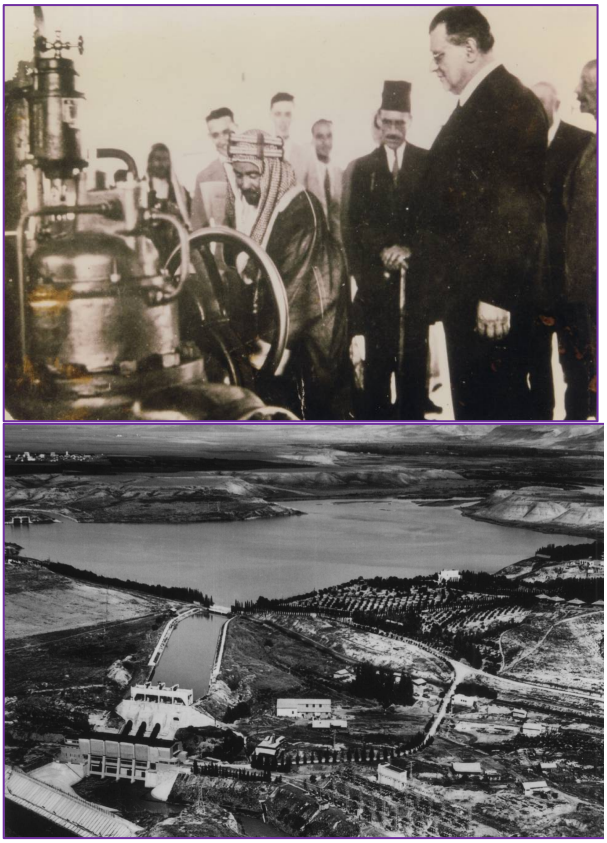
The first noted plan for the Yarmouk was the 1913 Ottoman concession that led to the **Franjieh Plan**. The plan, which never materialised, proposed to transfer 100 MCM/y of the Yarmouk flow to the Lake of Tiberias with the aim of irrigating the Jordan Valley and for electricity generation (FAO 2009, Klinger*, et al.* 2016). The Ottomans also conceded in 1914 use of parts of the Jordan and Yarmouk for hydroelectric and other purposes to Greek citizen Euripides Mavrommatis, in what became known as the '**Mavrommatis Concession'** (see CO 1926, CO 1927a).

The plans were rejuvenated under the British when in 1926 they granted a concession to Russian businessman and Zionist leader Pinhas Rutenberg to use the Yarmouk and Jordan waters and start building the **Naharayim power plant** on 6,000 dunums of land (Rutenberg Concession 1921, CO 1927b, Reguer 1995). The power plant's dam on the Yarmouk was 14 m high and created a reservoir covering 300 acres near the confluence of the Yarmouk mainstream and the Jordan at Naharayim (the place of the meeting of the two rivers). The plant was completed in 1930 and formally inaugurated on 6 June 1933 by Emir Abdallah, the ruler of Transjordan, in what Melton (2016) asserts is an indication of a close relationship between Rutenberg and the emir because of shared interest in the Jordan River (see also Avitzur 2003). It produced between 50 and 64 million kWh of electricity (Avitzur 2003) until 1948, and was initially crucial to expanding the 'carrying capacity' of the land of Palestine – the argument made by Zionists to the British authorities to increase Jewish immigration to the country (Reguer 1995: 704). By the time it was occupied by Iraqi forces in 1948, the importance of the plant had dropped in light of other sources of electricity, supplying just a quarter of the British Mandate's electricity demand (Avitzur 2003).

The 1939 **Ionides Plan** published on behalf of the Mandate Government of Transjordan provided the first estimate of the region's water resources in the hope of using the water of the Yarmouk tributary to irrigate the Jordan Valley via the Lake of Tiberias (Etana 2015; Greco 2004). The plan concluded that the water available was not sufficient to meet the needs of a new Zionist state (Haddadin 2000). Attached to the Ionides Plan was a small scheme for development on the Yarmouk mainstream. It required a lead-off from the Yarmouk mainstream by means of a breakwater or pumps to feed a 12-mile canal that would run off probably into the Wadi Yabis. Interestingly, a clause in the terms of the concessions permitted Transjordan to use any waters from the Yarmouk that the Palestine Electric Company did not require

(see below). The small Yarmouk Scheme was argued against, on the basis that the concessions might need the whole of the Yarmouk in the future (Dearden 1958: 154, 155).

Figure A 4.1 Left: The inauguration of the Palestine Electric Company's Naharayim power plant in 1933, by Emir Abdallah of Jordan. Owner Pinhas Rutenberg looks on. The importance of the plant dropped soon after, as other sources of electricity were developed. Right: aerial photograph of the power plant. Source: Israeli Ministry of Foreign Affairs 2003.



In response to the findings of the Ionides Plan, the 1944 **Lowdermilk Plan** proposed storing water from the Yarmouk mainstream in the Lake of Tiberias, and diverting the Jordan and the Litani to irrigate the Naqab (Negev) Desert in southern Palestine, as well as a transfer from the Mediterranean Sea to the Dead Sea (Adelphi, 1992). Each of these proposals was first advocated by Theodore Herzl and later by M. Abraham Boucart (Haddadin, 2003). While this plan was abandoned after World War II (Baim 1997), it enjoyed US support, and went on to form the basis of thought around water resources for the newly established Israeli State (Alatout 2009; Haddadin 2003; (Al-Kloub*, et al.* 1998). The Ionides Plan was elaborated on in the more technical Hays-Savage plan, which became known as the **1948 TVA on the Jordan** (a.k.a. the 'Hays Plan' or the 'Lowdermilk-Hays Plan'). The United States recommended implementation of the plan (Baim 1997) and it gained 'unqualified support' from Chaim Weizmann, the Jewish Agency president who became Israel's first president (Hays 1948), in order to support increased (Jewish) immigration to Palestine. Alatout (2009: 379) points to the extent of the influence of Lowdermilk's work in the region, stating that due to this plan 'the hydrological construction of the national space preceded and shaped the political construction of the nation-state'. He also emphasises the narratives of abundance and need for technical solutions within the plan, arguing that the diversion of the Jordan River to the Naqab exhibits an assumption of abundance, but abundance needing redistribution.

A4.2 Jordanian, Syrian and Israeli plans and infrastructure post-1948

Following the 1948 *Nakba* and the influx of Palestinian refugees into Jordan (and the Jordanian-administered West Bank), the Government of Jordan sought to reignite efforts to develop its water sources. The 1949 MacDonald Survey and the 1951 **MacDonald Plan** proposed to use the Lake of Tiberias as a storage reservoir to feed irrigation canals on the east and west sides

of the Jordan River. The former was eventually built in 1977 as the East Ghor (later 'King Abdallah') Canal; the latter was never built though remains a key piece of infrastructure planned for the budding state of Palestine (NSU 2005). One highlight of the plan was that it emphasised working within the basin, i.e. prohibiting out-of-basin transfers: 'on moral and natural bases… the waters in the catchment area should not be diverted outside that area unless the requirements of all those who use, or genuinely intend to use the waters within the area, have been satisfied' (MacDonald & Partners 1951). The idea of using the Lake of Tiberias as a reservoir was rejected by the Arab states and Israel alike (Alatout 2006, Alatout 2011).

The **Simansky project** proposed two canals to use the water of the Yarmouk mainstream without storage of floodwater. As the first head of the East Ghor Canal, Nicholi Simansky operated under the assumption that an accommodation with Israel would never be achieved. The canals (22 km and 60 km long) were to enable the offtake to be selected at a point where interference by Israel would be difficult. The main canal also had a water level that was 10 m higher than the Murdoch Plan (FO 1951), as discussed in Box 2.

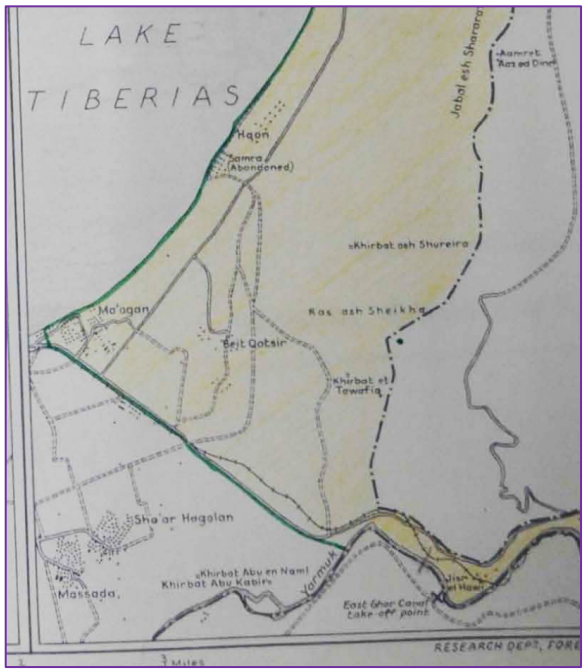
Plans for the development of dams on the Yarmouk mainstream started with the 1952 **Bunger Plan**, which proposed a 160-m-high dam (with a storage capacity of 500 MCM) at Maqaren (see Suleiman 2003) as well as the East Ghor Canal (EGC) and a diversion dam at Adassiyeh to divert the flows regulated by the Maqaren Dam into the EGC. The Bunger Plan was 'the first to propose a site for storage of Yarmouk floods other than Lake Tiberias' (Haddadin 2006: 239) and provided for Jordan and Syria a rather satisfactory technical and political base. Pushing for an economic project to settle the refugees, and backed by the United States, UNRWA pledged their support for the Bunger Plan. The plan also served as the reference point for the first Syrian-Jordanian negotiations to develop and utilise the Yarmouk mainstream. The Israeli Government vigorously opposed the all-Arab scheme that did not conform to the 'truly regional' Lowdermilk-Hays Plan (Alatout 2011) leading to a withdrawal of US support. UNRWA subsequently also pulled its involvement in the plan (Haddadin 2000). International efforts turned towards a plan which satisfied all riparian states, including Israel (Dearden 1958).

UNRWA then commissioned the Tennessee Valley Authority (TVA) to carry out what became known as the **Main Plan**, after its lead Charles T. Main. As with the Bunger Plan, (and notwithstanding the Hays-Lowdermilk Plan), in-basin water use was emphasised (Lowi 1993: 83). US diplomat Eric Johnston was sent out to negotiate an agreement in 1953 for unified development of the Jordan Valley. [3] Concurrently, Israel was moving forward with its 1953 seven-year plan, including the construction of an intake in the demilitarised zone (DMZ) (see Map 5.1) for what was to become the National Water Carrier. The southern sector of the DMZ was the largest: it ran south of

3 Concurrently, Israel was moving forward with its 1953 seven-year plan, developed from the regional Lowdermilk-Hays plans. The work started with construction of an intake to the National Water Carrier in the Demilitarised Zone and the draining of the Huleh Lake, which was met by Syrian military and political opposition.

the Lake of Tiberias and met with the Yarmouk mainstream at the border between Israel, Jordan and Syria (Neff 1994). (See Box 3, for more on Himmeh).

Figure A 4.2 The Demilitarised Zone, including Himmeh. Source: (map from 1965 in FCO 1979).

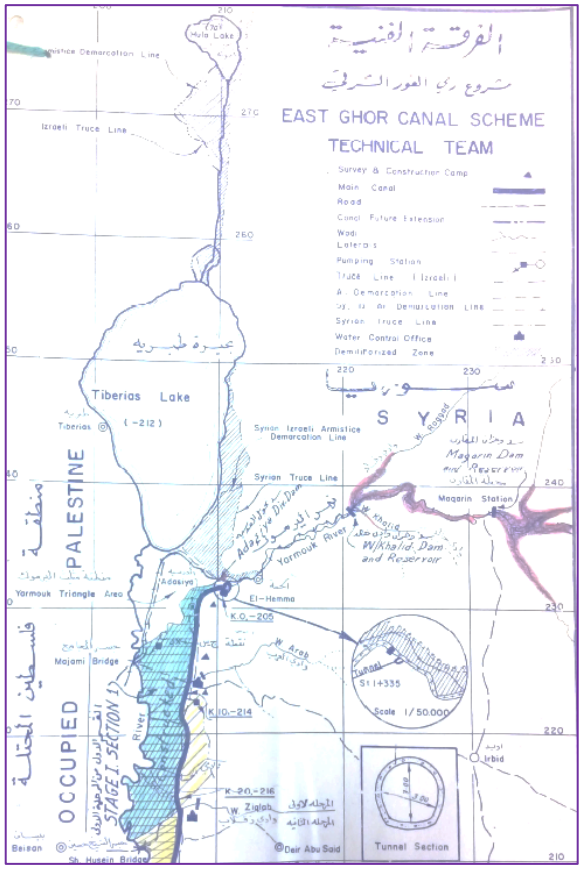


A4.3 The Khalid and Khalid Ibn al Waleed/Mukheibeh Dams

The significance of the **Khalid Dam** was its geographical location on the confluence of the historically precipitous Wadi Raqqad, which is a major channel of winter floods into the Yarmouk mainstream (Hof 1995) and Wadi Khalid in Jordan. The proposition to include Wadi Khalid as a storage site within Arab territory was meant to ensure the Yarmouk Scheme would go ahead without Israeli approval. The Harza Engineering Company developed the Yarmouk Scheme in 1953-1955 at the sites of Maqaren and Wadi Khalid. Jordanians were negotiating in the 1960s to build the Khalid Dam at 11 m ASL with a storage capacity of 300 MCM, or a basic scaled-down version at 3.5 m BSL with a capacity of 200 MCM (FO 1962).

The Jordan Development Board supported the plan to build the Khalid Dam as it offered the possibility of extending the canal system through a siphon to the planned West Ghor Canal (FO 371/164137, 1962) with the additional flood of the Raqqad secured. However, British officials commented that Jordanian officials were pursuing the Jordan Valley development plan 'with political rather than technical considerations in mind'. Moreover, US representatives had always overtly rejected the funding of the Wadi Khalid project and regarded the Maqaren Dam as the only one the US Government would be able to accept (FO 371/164137, 1962). The position was to satisfy Israeli concerns regarding upstream damming of the whole Yarmouk mainstream, which would jeopardise what it saw as its share of the flood flows to be used in the Yarmouk Triangle. The American justification for this is that it was outside the Johnston Plan and would allow Israel to also take more water than its allocation. Interestingly, the Development Board was in close contact with the Lebanese group associated with the Litani Scheme, whose director general, Saleh Halawani, submitted recommendations for the Yarmouk River Scheme (FO 1962).

Figure A 4.3 East Ghor Canal Scheme, showing the location of the Khalid Dam and Reservoir. *Source*: FO (1962).



The construction of **Khalid Ibn al Waleed Dam** (also known as Mukheibeh Dam, and not to be confused with the Khalid Dam), began in 1964. The Arab Plan for the diversion of the upper headwaters of the Jordan River (1964) envisioned diversion of the water from the Banias to the Yarmouk mainstream into a dam at Mukheibeh, with a capacity of 390 MCM. Suleiman (2003) reports that construction of the small Khalid Ibn al Waleed Dam on the Yarmouk mainstream began in 1966 and was 20% completed when it was destroyed by Israeli aircraft during the Six-Day War. The dam was being built by Arab contractors Osman Ahmed Osman and supervised by the Yugoslav company Energoprojeckt (Ibrahim 2013). Though the Government of Jordan announced the work was proceeding in 1967, no progress materialised. The Banias-Yarmouk Canal was targeted by Israel in mid-July 1966 causing severe damage and halting all work there. The dam works were also hit by Israeli shells on 9 January 1967 (Sosland 2007). Ibrahim (2013: 87-92) provides a personal account of the bombing from the perspective of one of the dam's construction crew. A previous JVA official makes the direct link between this component of the regional Arab Plan and the 1967 war: 'With the loss of Palestine, the Khalid Dam was lost with it.'

Figure A 4.4 The destroyed accommodation site of the Mukheibeh Dam Project. *Source*: Malek Ibidat, Fursan News.

A5 Negotiations and interaction over Yarmouk mainstream flows

A5.1 Jordanian-Syrian state interaction (1953-2017)

The extent and nature of transboundary water interaction between Syria and Jordan has always reflected the state of political relations between them.

A5.1.1 Negotiations prior to the 1953 Jordan-Syria Yarmouk Treaty

It is difficult to trace when the idea of a dam at Maqaren (and other Yarmouk development) was first proposed, though it is likely that the idea was driven primarily from the Jordanian side. The first record of Jordanian-Syrian interaction over the Yarmouk following both countries' independence is predictably found in the aftermath of the 1948 *Nakba* and creation of the state of Israel. British correspondence refers to a letter sent by the Department of Lands and Surveys in Amman to the Middle East Department of the Foreign Office stating that the Government of Syria first suggested to hold meetings between Syrian and Jordanian engineers around April 1950 in order to discuss the use of the Yarmouk mainstream flows. Dated 22 October 1951, the letter further states that '…in spite of frequent reminders that the Government of Jordan was only too anxious to co-operate, nothing had happened', and that 'the Syrian officials were most friendly and co-operative in every way' (FO 1951).

The first Yarmouk-related meeting which took place between the Syrian and Jordanian Ministries of Foreign Affairs was held in Damascus in October 1951 (FO 1951). The meeting was attended by the irrigation expert Nicholi Simansky and Eng. Ezziddin Younis, on behalf of the Government of Jordan, and by Eng. Fawzi Khabbaz and Mr. Fahmi Qabbani on behalf of the Government of Syria. With lack of data identified as the main obstacle to an optimal plan for the use of the flows, the two sides agreed to begin keeping rainfall records (in named Jordanian and Syrian stations),[4] and discharge measurements of springs (in Jordan and Syria).[5] A further outcome of the meeting worth noting are the details acquired about Syria's Muzeirib development scheme, which was by that

4 Dera'a, Muzeirib, Al Sheikh Maskin, Quneitra, Nuwa [Syrian], Samer and Mukheibeh [Jordanian].

5 Muzeirib, Es Sukhna el Kubra, Es Sukhna es Sughra, El Bandak, El Ajami, Zayzoun, El Ash'arai, El 'Azzuli, Al Hareer, Wadi Khaled, Mukheibeh, Himmeh, Adassiyeh [Jordan]. It is worth noting that Himmeh is listed as a site on the Jordanian side, due to its designation as part of the Palestine Mandate, until it was 'recaptured' by Syria during 1948.

time fully utilised by the Syrians without 'appreciably affecting the discharge of the river' at the Jordanian end.

The Bunger Plan provided the push necessary to lay the political track for the construction of the Maqaren Dam. By March 1953, the Government of Jordan and UNRWA signed an agreement to implement the Bunger Plan. The Jordan-Syria Treaty was signed just a few months later, on 4 June 1953. As discussed in greater detail in Section 8.3, the agreement stipulates that Syria has the right to use the water of the springs emerging in its territories above the elevation of 250 m ASL and will benefit from three quarters of the power generated by the dam, even though no rights are accorded to Jordan, which agreed also to bear all the costs and risks of construction. Interestingly, the text of the treaty was based on an American draft[6] (of 5 August 1952) that was much more favourable to Jordan, in the sense that it also covered the construction of the East Ghor Canal, placed some restrictions on Syrian water use if the flow into the dam reservoir were to fall below 333.5 MCM/y, and made no blanket provision of water rights to Syria[7] (FO 1952: 1421/71).

The agreement was never just purely bilateral of course. As we have seen, the Maqaren Dam was completed (as the Wehdeh Dam) more than half a century and two treaties later, due in no small part to Israeli tactics as well as Syrian stalling (see next section). Haddadin (2007) recalls that during a visit of the Jordanians to Syria as part of the feasibility study to be carried out by Harza Engineering Company for the Yarmouk Scheme in 1974, the Jordanians were surprised that Yarmouk tributaries were blocked by earth-fill dams,[8] which ultimately reduced the flow to Maqaren and eventually made the Maqaren a less feasible project. The number and location of all dams on the tributaries had been agreed to by both sides in the 1987 Syria-Jordan Agreement. These, and the other dams remain a source of dispute until the present time, as discussed in Section 8.3.

A5.1.2 Negotiations prior to the 1987 Jordan-Syria Yarmouk Treaty

The period which followed the 1953 Syrian-Jordanian agreement was a very turbulent time for the Arab countries, with the Arab Cold War (1957-1970), the Baghdad Pact and the Suez Canal War all freezing inter-Arab relations (Curtis 2006). As Haddadin (2006: 250) notes: 'The political atmosphere between Jordan and Syria has been strained most of the time since April 1957, when the Arab "cold war" commenced. Their relations went through a hot and cold cycle for more than half a century, and the political thermometer affected the workings of the joint Yarmouk committee to the extent that it never met between 1967 and 1975 or between 1980 and 1986.'

6 The document records the participants: Suleiman Sukkar, Anwar Nusseibeh, M. Simansky, Issedin Younis Daghistani, Mills Bunger, Leland Graham.

7 The same document reveals an interesting comparison with the Nile: 'It will be very interesting to see how the agreement plays out. The agreement shows some resemblance to the Nile Waters agreement, with Syria playing the role of the Sudan and Jordan that of Egypt. If Syria abides by their undertakings to use less water in low years which has a parallel in the recent supplementary agreement between Egypt and Sudan which authorised the latter to draw a small extra amount of water out of the river by pumps' (43).

8 These included Wadi Zeidi, Wadi Al 'Allan, Wadi Thahab, Wadi Hareer and Wadi Raqqad.

The atmosphere of transboundary water interaction at the time was equally tense. Israel had begun its All Israel Plan (1951-1955) to drain the Huleh marshes and divert the Jordan River by constructing the National Water Carrier. The Johnston Negotiations of 1953 to 1956 nonetheless focused the attention of the Arab countries on formulating a unified Arab position in regard to the sharing of the waters of the Jordan River Basin. The Arab League appointed an Arab Technical Committee to study the Johnston Plan.

The Jordanian-Syrian Joint Committee established after the 1953 Treaty met in Amman following five years of dormancy (The Financial Times 1962). The priority items for discussion included the extension of the East Ghor Canal and construction of the Khalid Dam, funding for both of which was being secured from the Kuwaiti Government. Another interesting turn was to transfer the Yarmouk Scheme from the East Ghor Authority (EGA) to the Jordanian Development Board.[9] According to British officials, this was done to appease the Syrians, who were suspicious of the EGA being an 'American-run outfit' (FO 1962). The Syrians were insisting on the scheme being 'as Arab as possible' with a rise in nationalistic sentiment among development practitioners in Jordan (FO 1962).[10] Then-Jordanian Prime Minster Wasfi Al Tel explained: '[T]he Jordanians were in this with a very difficult partner – Syria. The Syrians were full of complexes.' The Syrian side insisted that for the final survey and design of the dam, 'imperialist' consulting engineers (i.e. United States, United Kingdom, West Germany) must be excluded. In return, the Jordanians had insisted on the exclusion of any participants from behind the Iron Curtain (FO 1962).

In trying to understand the Syrian position, the American officials also expressed their lack of perspective: 'I am afraid we have so far drawn a blank and that prospects of our getting any hard facts from the Syrians about this are not good,' and 'Syrian officials hold their cards very close to the chest indeed on matters touching on their co-operation or lack of it with Jordan' (FO 1962).

The Jordanian approach vis-à-vis transboundary water interaction with Israel was equally cautious, as Jordan wanted to avoid jeopardising Syrian cooperation. The Jordanian-Syrian Joint Committee selected the Yugoslav company Energoprojekt to carry out the design and plans for the Yarmouk Project, in an agreement signed between the company and the Government of Jordan (FO 1963: 28), which included a Maqaren Dam of 170 m in height and 457 MCM capacity.

In the wake of the 1967 war (and Israeli occupation of the Golan Heights), no joint meetings took place on the Yarmouk Scheme, though Jordan was keen during this period to finalise the EGC and so secure the water needed to fill it. Coincidentally, the 1970s were times of conflict and

9 The Jordanian Development Board was an institution created in 1952, born out of British attempts to centralise all development activities in Jordan and to assert political influence in the region (Kingston 1996). The establishment of the board became a prerequisite for any British funding and loans.

10 The Development Board was close to the general director of the Litani Scheme, Salah Halwani, who visited the dam sites and canal and submitted recommendations for the Yarmouk Scheme.

negotiations for the Jordanians with the Israelis, through American mediation to find technical and practical solutions to the water issues arising in the lower Yarmouk mainstream. Such negotiations developed in parallel with growing pressure on Jordan to increase its water supply in light of increased Syrian use of the waters of the Yarmouk mainstream (Haddadin 2007).

Following Hafez Al Assad's 1973 coup against the Government of Syria, and the acquiescence of the King of Jordan to the Arab Summit decision that the Palestinian Liberation Organization is the sole legitimate representative of the Palestinian people, the relationship between Syria and Jordan was rekindled, and the Yarmouk Scheme was revived (Haddadin 2002a). Though the 1953 Treaty allows for the utilisation of springs above 250 m ASL, the earth-fill dams were not stipulated in the agreement and Jordanians considered this a violation of the treaty. The Government of Jordan pushed on, commissioning a feasibility study for the Maqaren Dam, and initiatives to attract donors in London and Amman. However, its relationship with Syria deteriorated once again from 1977 until 1986, in large part because of the Iran-Iraq war and disagreement over the Muslim Brotherhood (Hussein 2016, Hussein*, et al.* 2017) Though Syrian approval was once again sought for a new arrangement for the Maqaren Dam, it was never issued (FCO 1979). A number of amendments and agreements over the Yarmouk mainstream were nonetheless signed between the two states during this period. A 1977 amendment to the 1953 treaty stipulated that Jordan would receive the right to utilise all the water and electricity generated from Maqaren, in return for Jordan supplying Syrian villages with water and electricity (US CFA 1979, Sosland 2007). In a meeting with the American ambassador to Jordan, the first director of the JVA Omar Abdullah Doughkan confirmed that while the Government of Jordan had officially ratified the amendment, it was still 'on President Assad's desk' (Action Aid 1976). An agreement to codify the design of the Maqaren Dam and Syrian use of it was signed in 1978, but never made it through constitutional procedures in Syria (Sosland 2007). Meetings of the Joint Committee resumed in 1986, and the negotiations introduced new Syrian conditions regarding the specifications of the Maqaren Dam to a height of 70 m.

The Jordanian side had of course become aware of the reduced feasibility of the Maqaren Dam in light of increased Syrian use and construction of earth-fill dams. The 1979 Jordan Valley Irrigation Project Stage II (prepared by Harza Engineering Company) thus proposed a diversion of Wadi Raqqad in Syria through Wadi Al 'Allan and into the Maqaren Reservoir, in order to compensate for the reduction of flow from the established sources into the dam (Harza 1979, Haddadin 2002a).

In 1987, the Syrians and Jordanians signed a new treaty which replaced the 1953 agreement and conceded to Syria the right to use water stored in 26 dam reservoirs, and to use 10 MCM from the yield of the Wehdeh Dam.

A5.1.3 The run-up to construction of the Wehdeh Dam

Following a further warming of relations, the Jordanian Minister of Water and Irrigation Kamel Mahadeen and his Syrian

counterpart Minister Abdul Rahman Madani agreed on 3 May 1999 to begin construction of what was now (and henceforth) referred to as the Wehdeh Dam. The Jordanian-Syrian Joint Committee meeting minutes indicate that the basis of the decision remained the 1987 Treaty, and expressed a preference to seek Arab donor funding (a long-held Syrian position).

Figure A 5.1 Signing the meeting minutes of the Joint Syrian-Jordanian Committee on the Yarmouk that enabled the construction of the Wehdeh Dam, May 1999. Minister of Water and Irrigation Kamel Mahadeen and the Syrian counterpart Minister Abdul Rahman Madani. *Source*: Alamy, 1999.

The meeting also resulted in discussions over Syria's release of 8 MCM of water to flow to Jordan that summer. During the years 1999-2002, media sources reported Syrian releases of 3 to 8 MCM for several months from the newly completed Basel Al Assad Dam in Sahem Al Jawlan (see Table 5.1), as decreed by President Hafez Al Assad, and later Bashar Al Assad.

Table A 5.1 Details of Syrian water releases to Jordan. *Source*: Authors from sources noted.

Year	Quantity of water	Source of water
1999	2 MCM/month for four months (750 litre/sec) or total of 8 MCM (Al Hayat Newspaper, 14 May 1999; (KUNA 1999)	Sahem Al Jawlan Dam
2000	600 litre/sec, from August-October/3.5 MCM (ME newspaper, 10 August 2000)	Basel Al Assad Dam, Sahem Al Jawlan
2001	2 MCM (al Farawati 2001), based on SANA* article 14 July 2001)	Basel Al Assad Dam, Sahem Al Jawlan
2002	3 MCM, 700 litre/sec for 54 days (IMRWA, based on SANA article, 28 August 2002)	Basel Al Assad Dam, Sahem Al Jawlan

*SANA is the official Syrian news agency

In 2001, Jordanian Minister of Water and Irrigation Hazem Al Naser announced the construction of the long-awaited Wehdeh Dam starting in March 2002 and also refuted the claims of violations of the 1987 treaty: 'I saw the [Syrian] dams empty. They gave us what they have,' said Naser, referring to the 2 MCM of water Syria had given to Jordan that month. 'Only one dam [had water]... It contained 5 MCM. Three million cubic metres were kept for the needs of the area [in Syria] and two [MCM] were given to us,' said Naser. 'I cannot but thank the Syrians for their contribution' (KUNA 1999).

Relations between the states continued to ebb and flow along with the regional politics (including, e.g. the US/UK invasion of Iraq), and discussions on the size and shape of the Wehdeh Dam continued (Adelphi 1992, Greco 2005). A third Jordanian-Syrian bilateral Yarmouk agreement in 2001 is said to have reduced the height and capacity of the dam even further, to remove the

hydroelectric component, agree to 37 Syrian dams, and guarantee flows for Jordan (Rosenberg 2006). In fact, this agreement never saw the light of day, though the description of further Jordanian concessions is in keeping with its interaction over the decades (Hussein*, et al.* 2017).

Construction of the long-awaited dam began in 2003 and was officially inaugurated by Jordanian King Abdullah and Syrian President Bashar Al Assad in February 2004, beckoning the rekindling of cooperation between the two countries, as there were 18 other agreements signed on trade and cooperation. The Syrian-Jordanian relationship froze again soon after the inauguration, and Jordanian accusations of Syrian violations of the 1987 treaty began in earnest.

Figure A 5.2 Syrian President Bashar Al Assad and Jordanian King Abdullah inaugurate the Wehdeh Dam, 9 February 2004. Source: Assafir.

A5.2 Jordan-Israel interaction (1960-2017)

Jordanian-Israeli interaction over water has been well documented (see e.g. Hof 1995, Wolf*, et al.* 1995, Beaumont 1997, Haddadin 2002a, Shamir 2003b, Sosland 2007). This section is thus limited to reviewing the main strategies, narratives and dynamics of the negotiations that have been developed within this interaction.

Israel developed a *quid pro quo* approach to justify its own diversion of the Jordan – the National Water Carrier, completed in 1964. Israeli government officials insisted that the US–supported Yarmouk-Jordan Valley Scheme would violate the rights of Israeli farmers to use Yarmouk flows, and reduce the quality of the Jordan River below the Yarmouk tributary (FO 1959: VR1421/3). The Israeli side also pressured the Jordanian side to design the Adassiyeh Weir jointly (through sabotage of any unilateral Jordanian attempts to build the weir, as previously discussed), largely during periods when Jordan was seeking Syrian consent for the Wehdeh Dam.

The negotiations and attempts at cooperation between Jordan and Israel after 1967 considered larger political issues, such as the occupation of the West Bank in 1967, and curbing the Palestinian Liberation Organization's (PLO) influence in Jordan and occupied territories. The PLO's operations inside Israel had intensified in the late 1960s, leading to Israeli strikes on infrastructure and farmland in the Jordan Valley. Israel also attacked the first leg of the East Ghor Canal at least eight times in the period 1969-1970, halting Jordanian plans to expand it, displacing many residents out of the valley (Sosland 2007), and securing 60-70 MCM/y for the Yarmouk Triangle farmers (see Annex A3.3) (Libiszewski 1995, Sosland 2007).

The Government of Jordan meanwhile pushed for completion of the Maqaren Dam, through Bunger and Harza's plans for

a second storage reservoir just further downstream to capture the Raqqad baseflow (FCO 1979). Israeli threats to stop the project were based on concerns expressed about the flows being reserved for use by Palestinians in the downstream West Bank (which was understood to mean Israel would have to reduce the flow to its own population (FCO 1979)). With the Syrian-Jordanian relationship constantly oscillating, Israel was viewed as 'a major obstacle to finalising the [Maqaren Dam] project' (Sosland 2007: 104).

A5.2.1 US diplomacy and Jordanian-Israeli negotiations

With US support, for example, successive Israeli governments stressed that any such upstream development must be accompanied by a written guarantee to continue to secure 25 MCM/y for the farmers of the Yarmouk Triangle (FO 1968, FCO 1980) (see Section 5.3.2). Significantly, the letter from acting US Deputy Chief of Mission Samuel Hart to Israeli Deputy Director General of the Ministry of Foreign Affairs Moshe Alon states that 'the 25 MCM would be *additional* to waters flowing past Adassiyeh during the rainy season' (Hart 1978, emphasis added) thus demonstrating Israeli interest to continue to make use of the excess flows – an interest later agreed to by the Government of Jordan in the 1994 Peace Treaty (see Section 7.1). Furthermore, the Palestine Electrical Company (PEC) counsel soon after stated its claims for concessionary rights to the use of the Jordan and Yarmouk and urged the United Kingdom and UNRWA to make a satisfactory arrangement to protect its rights (FO 1953: 1532/18). The PEC also framed its position as one of seeking cooperation between Israel, Jordan and 'possibly Syria', highlighting how its facilities (hydroelectric works on both sides of the Jordan and Yarmouk) were in Jordanian territory. The strong assertion of the PEC's rights resulted in the Government of Jordan decision to cancel the PEC concession, claiming that a state of war existed between Israel and Jordan (FO 1953: 1532/18). This decision was never ratified.

As (later ICJ judge) Richard R Baxter (1977: 5) writes in his legal assessment of the Maqaren Dam, Israel's extension of control over the Golan in 1949 'enhanc[ed] Israel's capacity to influence the diversion operation so as to assure the quantity of the flow allowed to continue down the Yarmouk'. The situation reached a high point of tension in 1979, when Israeli troops kidnapped Jordanian guards so that Israeli farmers could clear the channel of the sandbags, in order to ensure enough water continued to flow to them further downstream (Sosland 2007: 114).

At this stage, the Jordanian side insisted on sole management of the weir, and further rejected the construction of the dam at Himmeh, considering it as territory occupied by Israel. The Government of Jordan was obliged to maintain Syria's consent over the Maqaren project, but could not risk overt cooperation with Israel (Sosland 2007). Jordanian rejection of the Egyptian-Israeli peace talks was also met with US withdrawal of its foreign assistance to Jordan in 1980, including funds earmarked for the Maqaren project (though technical problems and lack of clarity from Syria were cited (FCO 1979). The issues remained unresolved as indirect negotiations carried into the 1980s.

The US also considered separating the Adassiyeh Weir from the Maqaren Dam proposal in order to 'avoid [the] need for Israeli concurrence' (US DoS 1979). With the two components of infrastructure thus successfully separated, the Jordanian-Israeli negotiations could resume in secrecy. The focus of the Jordanian-Israeli secret talks (more famously known as 'the picnic table talks', for some of the meetings which took place at a picnic table at the confluence of the Yarmouk tributary with the Jordan), were thus focused on the Adassiyeh Weir and diversion arrangements. The results of the 'picnic table talks' (and public statements to build the Adassiyeh diversion) were to become enshrined in Annex II of the 1994 Peace Treaty (see Section 8.2). The Jordanian-Israeli arrangement was first tested during the algal bloom scandal of 1998 when the water sent to the KAC from Tiberias resulted in algal blooms and other organic pollution (the source of which was attributed to climate change (see Abbt-Braun*, et al.* 2010, Barinova*, et al.* 2010)). The issue was resolved through discussion and tensions have been low ever since.

A5.2.2 Assessment

Compared to the interaction over the Yarmouk tributary basin between Jordan and Syria (see Section 6.2), Jordanian-Israeli transboundary water interaction appears much more straightforward. On the public level, Jordan sided with the other majority Arab states throughout the tumultuous years of the Johnston Negotiations and Arab Diversion Plan up until 1967. The Israeli occupation of the Golan brought Jordan in direct contact with Israel over the diversions at Adassiyeh for the East Ghor Canal, the first phase of which it completed in 1969, and the period of violence (Israeli bombing of the EGC, kidnapping of soldiers at Adassiyeh) was in full swing. Out of the public eye, Jordanian-Israeli negotiations were taking place concurrently, and evolving to the point that Jordanian negotiators had now to consider Israeli interests in their discussions with Syria. The talks were maintained as the violence diminished, and emerged as the Water Annex of the 1994 Peace Treaty. Jordan and Israel have continued to take risks together ever since. Even through periods of tensions, the interaction has led to the construction of the Adassiyeh Diversion Weir (which was realised even before the Jordan-Syria Maqaren Dam), negotiated the Red Sea-Dead Sea Canal, and are currently in the middle of the Jordan Red Sea Project, which sees Jordan exchanging 60 MCM/y of desalinated water it pays for against 50 MCM/y of Tiberias flows in the north of Jordan.

A6 Agreements and interests

A6.1 Franco-British water agreements

Water use between the *sanjaks* (governorates) of the early Ottoman period was generally not governed. The people living in the Hauran Plain traded commonly, regularly crossing the upper reaches of the Yarmouk (Wadi Thahab and Wadi Zeidi at that point). Further downstream, the *Sharia't el Menadireh* was more of a barrier (see Section 5.2.1), though movement across the river was facilitated towards the end of Ottoman rule with the many bridges of the Hejaz railway.

The river began to act more as a political border during the British Mandate Period (see Section 5.2.2), when water-sharing arrangements were detailed by Article 8 of the 1920 Franco-British Convention on *Certain Points Connected with the Mandates for Syria and the Lebanon, Palestine and Mesopotamia*. The article stipulates:

> 'Experts nominated respectively by the Administrations of Syria and Palestine shall examine in common within six months after the signature of the present convention the employment, for the purposes of irrigation and the production of hydro-electric power, of the waters of the Upper Jordan and the Yarmuk [sic] and of their tributaries, after satisfaction of the needs of the territories under the French mandate [meaning Syria]. In connection with this examination the French Government will give its representatives *the most liberal instructions for the employment of the surplus of these waters for the benefit of Palestine*. In the event of no agreement being reached as the result of this examination, these questions shall be referred to the French and British Governments for decisions…' (emphasis added) (GoP 1946, see also GoP 1947, Baxter 1977: 77).

The political context in the background of these discussions included French concerns over rights for the Hejaz railway right of way (which passes along the Yarmouk), and Pinhas Rutenberg's lobbying of British authorities to build the Naharayim hydroelectric plant (which was completed in 1930). French and British authorities also signed a Water Agreement on 19 November 1921, which sought to secure water rights for Palestine (at least to dam Tiberias and the Huleh marshes), and discussed Yarmouk flows in relation to contestations over ownership of Himmeh. A 1932 British Memorandum on Yarmuk [sic] Valley Rights comments that:

'The Trans-Jordan-Syria Frontier Agreement [of 1920] in its final form contains in the Yarmuk [sic] Valley section the following provision: "Nothing in the preceding

definition of the frontier shall have the effect of modifying the *water regime relative to the Yarmuk and its tributaries as provided in Article 8 of the Franco-British Convention of the 23rd December, 1920*"' (original emphasis) (FO 1968: 59).

The 1932 Memorandum goes on to detail how contested the validity and applicability of the water agreement is, notably the doubt about whether it was ratified and, so, entered into force. In any case, the treaty is wholly ambiguous, specifying little more than a promise of a 'liberal attitude' on the part of the French. The amount of water that might be 'liberally' allocated to British Mandate Palestine at the time was subject to accurate quantification of Yarmouk flows, and determination of the preferred irrigation practices – a job undertaken by the French Civil Engineering Services (see FNA (1921b).

A year after the Water Agreement was signed, a British-French joint *Commission de répartition des eaux fluviales entre la Syrie et la Palestine* agreed:

- That *50% of the annual runoff water of the Yarmouk tributary basin and its tributaries could be attributed to Palest*ine for irrigation or hydropower purposes, *plus any runoff that was not used by Syria*;
- the methodology to determine the annual runoff water: a five-year study (1922-1926) by using named gauging stations on the Yarmouk River and its tributaries;
- that Syria retained its rights over the waters of the Yarmouk mainstream and its tributaries, subject to the aforementioned obligation to allocate 50% of the runoff water to Palestine;
- to store waters intended for Palestine by undertaking works on the Yarmouk mainstream and its tributaries, even those in Syria; and
- to wait until the border in the Upper Jordan region was settled before going forward with the attribution of the waters in this region (FNA 1921e).

The French Authorities (specifically M. Archaud) were not satisfied with the outcome of their negotiations with the British, noting in particular that the 1921 Water Agreement threatened the economic interests of Syria (FNA 1921c). The French position taken during the negotiations was within the context of a threat of rebellion of the Druze of the Hauran Plain – a consideration of internal Syrian dynamics not typically considered when the hydropolitical story of the Jordan River or its Yarmouk tributary is recounted.

In any case, the further studies undertaken on the irrigation potential and Syrian water needs (e.g. to power mills) made it clear that allowing half of the flow to continue to Palestine (as promised to the British authorities) was not feasible. As the *Memorandum on Yarmuk Valley Water Rights* states, 'The result of all this seems to be that Palestine's water rights in the Yarmuk and its tributaries are non-existent, except in so far as they may be derived from international usage' (FO 1968: 57). In fact, and as shown in Sections 6 and 7, Israel (if not Palestine) has managed to maintain a share of the Yarmouk flows roughly equal to Jordan's.

Box A1: The first expression of Jordanian rights to the Jordan and Yarmouk

One of the first Jordanian expressions of national rights to Jordan/Yarmouk waters came in May 1947 from Prime Minister Rifai. Concerns about the implementation of water development schemes were described as 'made by interested Jewish bodies and organisations', and captured as follows:

'The Government of the Hashemite Kingdom of Transjordan has not previously wished to take steps to stress their established rights in the waters of the Jordan and Yarmouk rivers. Now however this Government considers it of the highest importance to avoid possible future misunderstandings that Your Excellency should be asked to inform the Palestine authorities that the Transjordan Government attaches great importance to the use to which the water of the Jordan and Yarmouk rivers may be put and that it wishes to be informed of any irrigation plans which may be drawn up by the Government of Palestine' (FO 1947).

A6.2 Summary of interests in the Yarmouk

In a sense, the main interests of riparian states within the Yarmouk has been to use as much as possible. But interests have changed considerably over the years, such that Syria will rely more than ever on it, Jordan is still seeking to augment drinking water supplies and Israeli dependence is waning, though the ideological component remains strong. The current and future interests are of course key to any diplomatic effort.

A6.2.1 European colonial and Zionist water-related interests

The archives show French interest in the Yarmouk flows was to secure the use of Syrian water mills, to irrigate the Hauran Plain, and to satisfy the population of Jabal el Druze. British authorities (at least in part as a response to Zionist influence) tried to secure as much of the Yarmouk as possible for Palestine. The 1921 agreement stipulated this to be as much as half the regular flow, and all excess flows in the 1921 Water Agreement. The efforts largely failed, as did parallel efforts to include the Litani within Palestine's borders (see Zeitoun*, et al.* 2013). As the 1932 Memorandum on Yarmouk Water Rights shows, the British position softened, but the authorities continued to push for the construction of Pinhas Rutenberg and the PEC's hydroelectric plant. Both British and French authorities were keen to have secure control over the Yarmouk tributary valley, to ensure the continued functioning of the Hejaz railway line, at least until Syria and Jordan achieved their independence.

A6.2.2 Syrian interests in the Yarmouk

Early Syrian interests in the Yarmouk were to provide drinking water to unserved cities, and irrigation for livelihoods and/or food security. Following the *Nakba*, several Syrian governments included the Yarmouk tributary in the wider Jordan River plans to use against Israel. From 1967 until the present time, Yarmouk flows have also gained importance for the agricultural development in Al Suweida, Dera'a, and, to a lesser extent, Al Quneitra Governorates. With the current crisis in Syria, interests in the Yarmouk are expected to focus on maintaining livelihoods for residents, and underpinning future redevelopment and

state-building efforts. Syrian interest in the Yarmouk tributary basin will also continue to remain associated with those on the Tigris and Euphrates and Assi/Orontes Rivers.

A6.2.3 Jordanian interests in the Yarmouk

Early Jordanian interests in the Yarmouk were centred on irrigation and the potential for hydropower, as evidenced by the push to build the Maqaren Dam. Development of the Jordan River Valley also relied on a secure source from the Yarmouk, and was initiated in 1947, but supported in earnest in response to the sudden influx of Palestinians who fled the *Nakba*. Interests in hydropower had waned by the time the dam was built in 2006, but remain focused on supplying irrigation water for the Jordan River Valley. Considering the few alternative resources that Jordan has available to develop, and repeated influxes of people fleeing violence (Palestinians after 1948, 1967, and 1990; Iraqis after 2003; Syrians after 2011), Jordanian interests in the Yarmouk have long been and remain partly to augment the supply of drinking water. This is in stark contrast to the interests of the other States, whose main concern is primarily geopolitical or for agricultural livelihoods.

A6.2.4 Israeli interests in the Yarmouk

Following the destruction of the PEC hydroelectric plant in 1948, Israeli interests in the Yarmouk tributary became centred on securing a supply for the farmers of the Yarmouk Triangle (see Annex A3.3). Israel has also used the flows to normalise relations with Jordan, as shown by the Water Annex of the 1994 Jordan-Israel Peace Treaty. With desalination flows constantly increasing, Israeli dependence on the Yarmouk flows is waning, though the current arrangement and use of the flows remains central to the JVWA. However, water still remains part of the Israeli/Zionist ideology (Bar-Gal 1991, Rook 2000, Alatout 2009, Da'Na 2013), and the use of Yarmouk flows will be central to any future political agreement with Syria.

A7 The path to an equitable and sustainable arrangement

This section builds on the analysis to suggest ways to improve the transboundary water arrangements in the Yarmouk and wider Jordan River Basin. It first summarises past and current interests in the flows. It then summarises the current arrangements before suggesting two alternative future arrangements and sketching the path towards the preferred one.

A7.1 The limitations of technology

Technology has at least partially solved the problems created by the irrepressible

supply-side mentality. Israel recycles roughly 60% of wastewater captured, representing 80-90% of water used in agriculture (see also Al-Sa'ed*, et al.* 2013, IWA 2015, Gilmont*, et al.* 2017). Jordan currently uses roughly 51 MCM/y of recycled wastewater for agriculture, and plans to reach 60% reuse by 2025 (MWI 2015, MWI 2016b). However, untreated wastewater continues to contaminate water supplies in Lebanon, Syria and Palestine, and remains a substantial source for 'additional' flows.

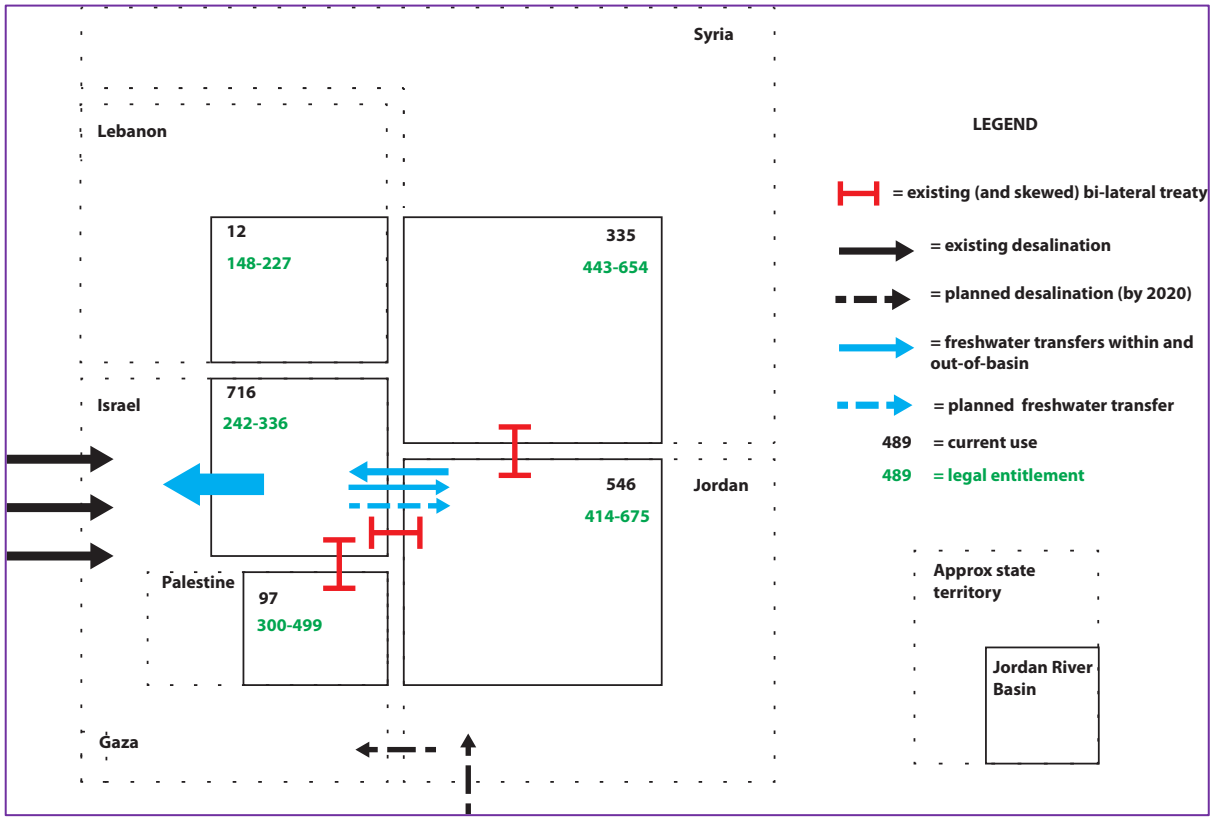
Israel also currently desalinates up to 600 MCM/y (Katz 2016) and plans by 2020 to desalinate 750 MCM/y (IWA 2012), which is more than treble the amount of water used by Jordan along the entire Jordan River Valley. In exchange for more of the contested flows Israel controls in the Lake of Tiberias to be supplied to Jordan (via the Northern Water Carrier), Jordan will by around 2020 be pumping desalinated water in the other direction, from Aqaba to Eilat. Desalination has its merits, particularly for dry coastal areas. But desalination also has its limitations, notably for demand centres that are distant from the source (because of the high energy costs associated with transmission); the inflexibility in the supply (production has to be constant in order to recover costs, even if the demand drops); and the quality of the water provided (growing health concerns are being noted about long-term consumption of water that is stripped of its nutrients). While improvements in technology cannot replace the equitable and sustainable management of water resources, they may serve to partly lay the path towards it, as discussed in Section 9.1 and detailed in Annex A7.5.

A7.2 The current arrangements are inefficient, and inequitable

As discussed in Section 1.1 and seen throughout the analysis, the scramble to meet rather than to manage water demand through ever-greater exploitation means that the Jordan River Basin in 2018 is not just 'closed' in the hydrological sense, but effectively sealed shut.

The current transboundary water arrangements across the Jordan River Basin are presented in the sketch of Figure A 7.1. The figure shows that the basin has not been developed in the unified way that US envoy Eric Johnston envisaged over 60 years ago, to say the least. What exists is a cacophony of infrastructure and agreements that reflect an incessant quest of warring or friendly States to develop a resource that cuts across their political borders.

Figure A 7.1 Sketch of current Jordan River transboundary water arrangements. Average flow figures are very rough estimates. *Source*: Authors, based on multiple sources listed in the text. Numbers to be revised.

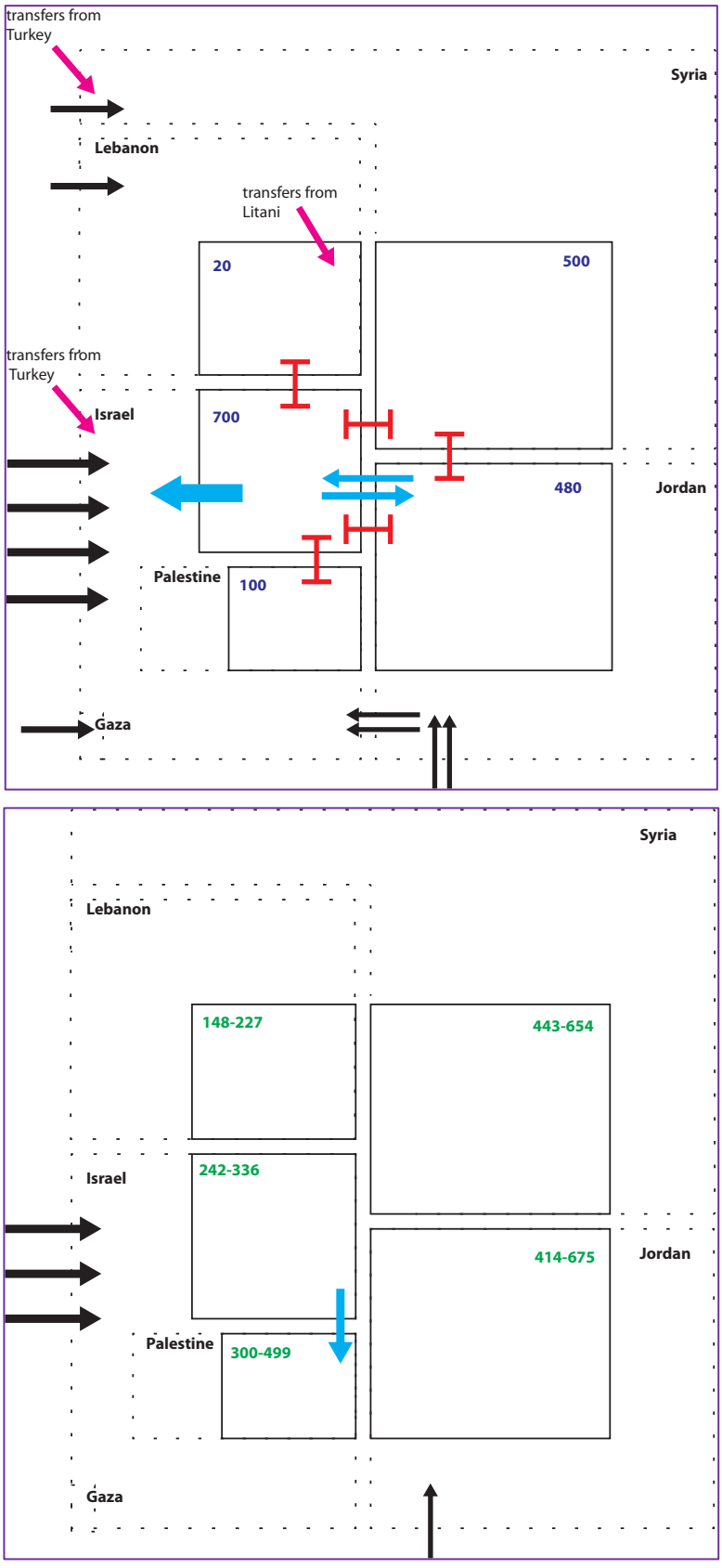


The result is as inequitable as it is inefficient. Freshwater is pumped out of the basin while manufactured (desalinated) water is pumped in. Rivers are allowed to flow downstream only to be pumped back upstream. The National Water Carrier has been pumping approximately 280 MCM/y on average for more than half a century, and remains a significant national drain of energy. The Lake of Tiberias is thus the source for Israeli farmers over 100 km away (in the Negev), and (soon) for residents of Irbid living more than 1,000 m above the lake. More of the Yarmouk flows are pumped into the Lake of Tiberias (and for local Israeli use in the Yarmouk Triangle) than are diverted by gravity into the KAC. Some of the water pumped into the lake is then pumped *back* to the KAC. The logic of the Yarmouk-Tiberias 'water swap' has in any case been obviated by dams built both upstream (the Wehdeh Dam) and downstream (the Karameh Dam, were it functional).

A7.3 Uncertain and very different futures

The residents of the Yarmouk tributary basin face constant political change, massive demographic shifts, highly variable weather and probably long-term changes in climate, and a recurrent possibility of punctual or drawn-out war. The two potential basin-wide arrangements shown in Figure A 7.1 will respond to the uncertainty in very different ways.

Figure A 7.2 Sketch of Jordan River transboundary arrangements in 2070 (*top*) under the 'business-as-usual' scenario, and (*bottom*) under the alternative 'equitable and sustainable' scenario. Average flow figures are very rough estimates. *Source*: Authors, based on multiple sources listed in the text. Numbers to be revised.



A7.4 The business-as-usual scenario

If the pattern of water development that has led to the current arrangement is to persist for the next 50 years, any conception of the basin inevitably includes evermore uncoordinated and redundant infrastructure that will continue to push the basin's water resources beyond their sustainable limits. Those limits are dropping, as the effects of climate change are becoming more well known (Kelley*, et al.* 2015, Selby*, et al.* 2017). It is not impossible to picture continued obstructions to state development, and possibly latent conflict manifested again as violence, as it was in the 1950s and 1970s.

The near future is so prescribed, to be sure. First, desalination levels in Israel are increasing to the point that the State is actively looking for contracts to guarantee sale of volumes it purchases from private manufacturers. Second, and according to the 2012 Jordan Red Sea Project deal, Israel is to pump an additional 50 MCM/y of Tiberias flows to Jordan via the Northern Transmission Line by 2020, in exchange for 60 MCM/y of desalinated water produced and pumped by Jordan to Eilat. The former flows are contested by Lebanon, Syria, and Palestine, while the latter manufactured flows are supplemental.

The sketch in Figure A 7.1 of the 'business-as-usual' scenario is an initial projection of the future in 2070 based on the established pattern of water development and sharing, and improved political relations between all States. This 'business-as-usual' scenario in 2070 would see:

i) *Continued out-of-basin exports of freshwater* via the National Water Carrier, by this time for well over a century, the pumping equipment and carrier itself requiring routine maintenance and scheduled replacement;
ii) *Continued water swaps* under the Yarmouk-Tiberias exchange and the Northern Transmission Line, with the pumping equipment and transmission lines requiring routine maintenance and scheduled replacement;
iii) *desalinated flows increased* marginally in Israel (beyond its 2018 production rates), doubled in Jordan at Aqaba, and introduced at a large scale (i.e. 100 MCM/y) in Lebanon, Syria and Palestine (via Gaza);
iv) *out-of-basin imports* via transfers from the Litani River in Lebanon (see Phillips et al. (2005) or the Ceyhan and Jeyhan Rivers in Turkey (though for several reasons this option is not likely to complement (much less supplant) desalinated flows); and
v) three more bilateral water agreements as part of political treaties between Israel and each of the other Jordan River riparian States, each of them skewed.

A7.5 The equitable and sustainable scenario

An improved arrangement is even more simple to envision, if challenging to implement. This is one where the flows are used within their sustainable limits and are shared equitably amongst the five riparian States (and equitably within each, as well). Politically suicidal for most politicians in the region, this vision is also mission impossible for most diplomats. The development of an alternative vision nonetheless remains the first step in the resolution/transformation of

any conflict (see Section 2). Following the ideas of what an improved transboundary water arrangement looks like, the work required is then to develop first the plan, and then the ideas and knowledge required to support it.

The sketch of the alternative scenario is an initial projection of the future in 2070 based on a **transition phase** and improved political relations between all States. The modelling for such a scenario is provided by van Veen et al. (2017), which relies on improved irrigation efficiency in Syria,[11] and swapping desalinated flows in Israel for reallocation to neighbours. The more equitable and sustainable scenario envisaged here is predicated on in-basin use (thereby making the most of gravity), a partial redistribution of the flows towards their legal entitlements, and effective management by all States. More specifically, the equitable and sustainable scenario would see:

i) *desalinated flows sustained* at their current levels in Israel;

ii) *replacement of the 'water swap'* between the Yarmouk and Tiberias, in favour of an improved weir at Adassiyeh. This is based on the rationale that to use water more efficiently, *more* flows could be diverted (by gravity) into the KAC, rather than be pumped to Tiberias (and back). This would make full use of the capacity of the KAC, though it would require a full feasibility study as discussed in Section 9.3.

iii) *replacement of the Adassiyeh Weir* with one that would ensure a greater supply of flows for the East Ghor Canal, and environmental baseflows for the Jordan River and remainder of the Yarmouk tributary;

iv) *replacement of the Northern Transmission Line*, in favour of a financial arrangement for the desalinated flows produced at Aqaba (below). In the case that sufficient quantities were diverted to the KAC, the Northern Transmission Line would become redundant, thus saving a considerable amount of money and suggesting renegotiation of the 2012 Dead Sea agreement;

v) *Aqaba desalinated flows secured* to Eilat through an agreed financial arrangement;

vi) *gravity flows to Palestine*, via the West Ghor Canal envisaged by Ionides (see (NSU 2005);

viii) *development of conjunctive groundwater and surface water management* (in line also with soil water management).

vii) *development of food imports management plan* to make the most of 'virtual water', in all States. Such a strategy can build on the idea of strategic substitution, or of ever-increasing 'crops per drop' (water-use efficiency) by replacing locally-produced irrigated crops with imported rainfed crops, and diversifying the economy so that water is used for more 'dollars per drop' (allocative efficiency) (Allan 2001);

ix) *intensification of demand-management and wastewater reuse* in all States, the latter to emulate current Israeli levels of

11 The merits of improved irrigation efficiency in Syria require further investigation. As mentioned in Section 2.4, the current 'inefficient' levels of irrigation results in a greater flow to the river (Lankford's (2013) idea of 'paracommons'). Increasing the efficiency of use will not necessarily result in a greater flow to the river, as assumed under the scenario in van Veen et al. (2017).

60% of domestic wastewater produced; and

x) *a multilateral agreement* across the basin based on the principles of International Water Law and guided by the Model Treaty clauses.

The alternative scenario has numerous benefits. Apart from the political and security pay-offs that would accompany resolution of the water conflict, the scenario is also more efficient. Much more water would flow by gravity than is currently being (or planned to be) pumped uphill, in particular the increased flows into the East Ghor and (proposed) West Ghor canals.

REFERENCES

Pleas refer to the main text of the Yarmouk Hydropolitical Baseline study.