Hydro-political Baseline of the Upper Jordan River

The Association of the Friends of Ibrahim Abd el Al

Mark Zeitoun, Karim Eid-Sabbagh, Muna Dajani, and Michael Talhami

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Cover photo:
Hasbani Springs, one of the sources of the Jordan River. Hasbaya, Lebanon, January 2011 (Muna Dajani).

Table of Contents

TABLE OF CONTENTS III

FIGURES VI

TABLES VII

ACRONYMS VIII

PREFACE IX

EXECUTIVE SUMMARY X

PART A. BACKGROUND 14

1 INTRODUCTION 14

1.1. WHY THE UPPER JORDAN? 14
1.2. BASIC HYDROPOLITICS 15
1.3. STUDY LIMITATIONS 17
1.4. STUDY STRUCTURE 18

2 SNAPSHOT OF THE UPPER JORDAN 19

2.1 SOURCES OF THE JORDAN 19
2.2 NO 'NORMAL' BORDERS 23
2.3 INTERESTS AND HEGEMONY IN THE UPPER JORDAN RIVER 27
2.4 INSTITUTIONAL ARRANGEMENTS OF WATER RESOURCES MANAGEMENT 30
2.4.1 WATER INSTITUTIONS IN LEBANON 30
2.4.2 WATER INSTITUTIONS IN ISRAEL 33

3 UPPER JORDAN FLOWS AND USE 36

3.1 BASINS AND SURFACE WATER 36
3.2 HYDROLOGY 40
3.2.1 FLOWS MEASURED IN LEBANON 40
3.2.2 FLOWS MEASURED IN ISRAEL 42
3.2.3 SURFACE WATER QUALITY 46
3.3 HYDROGEOLOGY, SPRINGS AND GROUNDWATER FLOWS 46
3.3.1 TRANSBOUNDARY GROUNDWATER 49
3.3.2 A SIDE NOTE ON LITANI-HASBANI HYDROGEOLOGICAL CONNECTIONS 50
3.4 LAND USE 51
3.5 WATER ABSTRACTIONS 53
3.5.1 WATER ABSTRACTION AND USE IN LEBANON 553
3.5.2 WATER ABSTRACTION AND USE IN ISRAEL 54
3.5.3 HISTORIC DEBT - WATER UNDER THE BRIDGE? 55

PART B. ANALYSIS 57

4 HYDROPOLITICAL HISTORY OF THE UPPER JORDAN 57

4.1 OTTOMAN EMPIRE (< 1916) 58

4.2 BRITISH AND FRENCH EMPIRES (1919 – 1948) 59
4.2.1 ZIONIST LOBBYING FOR EXPANDED BORDERS OF PALESTINE DURING AND AFTER WORLD WAR 1 59
4.2.2 ZIONIST LOBBYING FOR EXPANDED BORDERS IN FRENCH MANDATE LEBANON 61
4.2.3 ZIONIST PRESSURE FOR EXPANDED BORDERS IN BRITISH MANDATE PALESTINE 62
4.3 BATTLES OVER THE UPPER JORDAN (1948 – 1978) 664
4.3.1 A BATTLE OF PLANS 64
4.3.2 THE JOHNSTON NEGOTIATIONS 65
4.3.3 WATER AND THE 1967 SIX-DAY WAR 67
4.4 OCCUPATION OF SOUTHERN LEBANON / OPERATION LITANI (1978 -2000) 69
4.4.1 DEBILITATION OF THE AGRICULTURAL SECTOR 69
4.4.2 BOX: ISRAELI DIVERSION OF THE LITANI? 71
4.5 CONTINUED BORDER TENSIONS (2000 – ONWARDS) 73
4.5.1 THE 2002 WAZZANI DISPUTE 73
4.5.2 CHEBA'A FARMS 77
4.5.3 GHAJAR 78

5 WARS AND WATER 81

5.1 UNDERSTANDING WATER AND WAR 81
5.2 WATER AND WAR IN LEBANON, PALESTINE AND ISRAEL BEFORE 2006 83
5.3 WATER AND WAR IN ISRAEL DURING THE 2006 WAR 84
5.4 WATER AND WAR IN LEBANON DURING THE 2006 WAR 85
5.4.1 QUANTIFICATION OF THE DAMAGES TO WATER INFRASTRUCTURE IN LEBANON 85
5.4.2 DAMAGES TO PUBLIC WATER RESERVOIRS 90
5.4.3 OTHER WATER-RELATED DAMAGES 93
5.4.4 THE EFFECT OF THE WAR ON HYDROPOLITICS 96

6 UPPER JORDAN NARRATIVES AND DISCOURSE 98

6.1 LEBANESE NARRATIVES RELATED TO UPPER JORDAN RIVER 99
6.1.1 THEFT NARRATIVE: ISRAEL IS STEALING LEBANESE WATER 99
6.1.2 IWL NARRATIVE: INTERNATIONAL WATER LAW IS THE BASIS FOR RESOLUTION OF THE WATER CONFLICT 100
6.1.3 AN EMERGING VIEW FROM LEBANON AND ISRAEL? SALE OF WATER TO ISRAEL OR 'PALESTINE' 101
6.2 THE ISRAELI WATER-SECURITY DISCOURSE 102
6.2.1 SCARCITY NARRATIVE: ISRAEL IS SHORT OF WATER RESOURCES 104
6.2.2 HYDRO-STRATEGIC NARRATIVE: THE UPPER JORDAN RIVER IS NECESSARY FOR STATE SECURITY 105
6.2.3 EFFECT OF THE ISRAELI DISCOURSE LINKING WATER AND SECURITY: FORECLOSING RESOLUTION 108

7 THE STRUGGLE FOR CONTROL OF THE UPPER JORDAN 110

7.1 SHIFTS IN CONTROL OVER AND USE OF THE UPPER JORDAN RIVER 110
7.1.1 SHIFTS IN (PHYSICAL) CONTROL OVER TERRITORY 110
7.1.2 SHIFTS IN CONTROL OF SURFACE WATER AND GROUNDWATER FLOWS 113
7.1.3 SHIFTS IN USE OF SURFACE WATER AND GROUNDWATER FLOWS 114
7.2 SHIFTS IN MOTIVES, STRATEGIES AND DISCOURSES 115
7.2.1 SYRIA – SHIFTS IN MOTIVES, STRATEGIES, NARRATIVES 117
7.2.2 LEBANON – SHIFTS IN MOTIVES, STRATEGIES, NARRATIVES 117
7.2.3 ISRAEL – SHIFTS IN MOTIVES, STRATEGIES, DISCOURSES 118
7.3 EVOLUTION OF HYDRO-HEGEMONY 120
7.3.1 RIPARIAN POSITION 121
7.3.2 EXPLOITATION POTENTIAL 121
7.3.3 POWER: GENERALS AND DIPLOMATS 122
7.3.4 STRATEGIES AND LIMITS OF ISRAELI HYDRO-HEGEMONY 124

8 THE HYDROPOLITICAL BASELINE 126

8.1 UPPER JORDAN RIVER FLOWS AND THEIR USE 126
8.2 INTERESTS AND POWER IN THE UPPER JORDAN RIVER 128
8.3 LESSONS FOR HYDROPOLITICS 130
8.4 THE FUTURE OF THE UPPER JORDAN RIVER CONFLICT 133

REFERENCES 137

ANNEXES 147
A PHOTOGRAPHS 147
B LEGISLATION OF RESPONSIBILITIES OF THE WATER SECTOR IN LEBANON AND ISRAEL 151
C BIOPHYSICAL FEATURES OF THE UPPER JORDAN RIVER 158
D DAMAGED RESERVOIRS AND OTHER WATER INFRASTRUCTURE IN LEBANON 2006 163

Figures

Figure 2.1 Sources of the Upper Jordan River 20
Figure 2.2 Sketch of the main tributaries of the Upper Jordan River. 21
Figure 2.3 Source of the Hasbani, from a woodcut image circa. 1870 by John MacGregor 22
Figure 2.4. Sketches showing shifting political borders of the Upper Jordan River 24
Figure 2.5 The first significant hydropolitical border shift – the 'Hula Concession' 25
Figure 2.6 Relative power asymmetry of riparian actors in the Jordan River Basin, as estimated in 2006 29
Figure 2.7 Institutional arrangement of the water sector in Lebanon, in relation to the Hasbani River catchment 31
Figure 2.8 Institutional arrangement of the water sector in Israel, in relation to the Lake of Tiberias (Kinneret) Basin 34
Figure 2.9 Responsibilities of various actors in the water sector in Israel 35
Figure 3.1 The Upper Jordan River catchment areas, composed of the Hasbani, Liddan, and Banias 38
Figure 3.2 Upper Jordan River surface water and topography 39
Figure 3.3 River flow gauging stations in the Lake of Tiberias Basin, including the Upper Jordan River basin 40
Figure 3.4 Hasbani River flows, measured at the Fardiss Bridge, 1968 – 1974, and 2002 – 2007 42
Figure 3.5 Daily flows of the Hasbani, Liddan, and Banias, 1965 – 1966. 43
Figure 3.6 Annual flows of the Hasbani, Liddan, and Banias, 1949 - 2004 45
Figure 3.7 Groundwater circulation in the Upper Jordan River Basin 47
Figure 3.8 Groundwater recharge rates of select aquifer basins in the Middle East 48
Figure 3.9 Agricultural land use in northern Israel. 52
Figure 3.10 Water use in the Lower Jordan River 54
Figure 4.1 Timeline of major military, political and hydro-political events along the Upper Jordan River 57
Figure 4.2 Transboundary Water Interaction between Lebanon and Israel, over the Upper Jordan River (application of the 'TWINS' tool) 58
Figure 4.3 Hiorth's suggested plan to divert the Litani River into the Upper Jordan River, 1938 63
Figure 4.4 Israeli Water "Project Concepts" considered in 1959 65
Figure 4.5 Visual representation of water resources under Israeli control following the territorial conquest of 1967 including in the "Upper Jordan Watershed" 68
Figure 4.6 The town of Ghajar, above the Wazzani Springs 79
Figure 5.1 Damages by IDF to housing and public water reservoirs during the 2006 war 86
Figure 5.2 Water reservoirs in Lebanon damaged during the 2006 Summer War, showing a range of the nature of the damages. 91
Figure 5.3 Wazzani Booster Station Reservoir suffering direct (and deliberate) damage, 2006 97
Figure 6.1 'Hydro-strategic' territory in the Upper Jordan River, indicated by the Maximum Withdrawal Zone' 107
Figure 7.1 Hydropolitical Baseline of the Upper Jordan River: Control and Use 111
Figure 7.2 Relative (physical) control of territory by Israel, Lebanon or Syria, in the Upper Jordan River basin. 112
Figure 7.3 Relative control over surface water and groundwater flo*ws* in the Upper Jordan River Basin, by Lebanon, Syria and Israel 114
Figure 7.4 Relative use of surface water and groundwater flows in the Upper Jordan River Basin, by Lebanon, Syria and Israel. 115
Figure 7.5 Hydropolitical Baseline of the Upper Jordan River: Discourse and Power. 116
Figure 7.6 Shifts over time in hydro-hegemony on the Upper Jordan River. 122

Tables

Table 2.1. Estimates of surface water abstractions or use of the entire Jordan River Basin, and of the Upper Jordan River Basin (2003) 30
Table 3.1 Hasbani River flow volumes measured at the Hasbani Spring, 2005-2008; and Fardiss Bridge, 1968 – 1974 41
Table 3.2 Annual flows of the Liddan, Banias, and Hasbani rivers, measured upstream of their confluence point, 1949 – 2004 44
Table 3.3 Streamflows of the Hasbani (Snir), Banias (Hermon), and Liddan (Dan) rivers, 1969 – 2004 49
Table 3.4 Land use in the Hasbani catchment 52
Table 3.5 Public wells and pumps in the Hasbani catchment 53
Table 4.1 The 'Johnston Allocations' of 1953 – stated and effective 66
Table 5.1 Classification of damages to water infrastructure and water sector development 82
Table 5.2 Gleick's classification of bases of (violent) water conflict. 82
Table 5.3 Incomplete list of violent conflict and war events related to water in Lebanon, Palestine and Israel, prior to 2006, and their classification 83
Table 5.4 Summary of damages from the 2006 war to water infrastructure, resources and institutions in Lebanon 87
Table 5.5 Estimate of costs of water sector damages during the 2006 Summer War, in Lebanon 89
Table 5.6 List of damages from the 2006 war in South Lebanon and Beirut, including agricultural fields rendered inaccessible by unexploded ordinances (UXOs) 96

Acronyms

AJTU	Al Jazeera Transparency Unit
CAS	Central Administration of Statistics (Lebanon)
CDR	Council for Development and Reconstruction (Lebanon)
CO	Commonwealth Office (UK)
CoS	Council of the South (Lebanon)
DO	Dominions Office (UK)
EC	European Commission
FAO	Food and Agriculture Organisation
FNA	French National Archives
OF	Foreign Office (UK)
FOEME	Friends of the Earth Middle East
GDHER	General Directorate of Hydraulic and Electrical Resources (Lebanon)
GDO	General Directorate of Oversight
GIZ	Gesellschaft fuer Internationale Zusammenarbeit
GOI	Government of Israel
GOL	Government of Lebanon
GSI	Geological Survey Israel
HSI	Hydraulic Survey of Israel
ICA	Israeli Civil Administration (of Judea and Samaria)
ICBS	Israel Central Bureau of Statistics
ICRC	International Committee of the Red Cross
IMEP	Israeli Ministry of Environmental Protection
IMFA	Israeli Ministry of Foreign Affairs
IRC	International Refugee Council
ISIIMM	Institutional and Social Innovations in Irrigation Mediterranean Management
IWL	International Water Law
IWMI	International Water Management Institute
JEC	Jaffa Electric Company
JVL	Jewish Virtual Library
LMoA	Lebanese Ministry of Agriculture
LMNI	Lebanese Ministry of National Infrastructure
LRA	Litani River Authority
MDM	Medecins du Monde
MEDA	Euro-Mediterean Partnership (MEsures D'Accompagnement)
MO	*Moyen Orient* newspaper
MEW	Ministry of Energy and Water (Lebanon)
NSU	Negotiation Support Unit
NWC	National Water Carrier (Israel)
PCIIWS	The Parliamentary Committee of Inquiry on the Israeli Water Sector
ROL	Republic of Lebanon
RWE	Regional Water Establishment
SLWE	South Lebanon Water Establishment
TWINS	Transboundary Water Interaction Nexus
UN ILC	United Nations International Law Commission
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNHRL	United Nations Humanitarian Response in Lebanon
UNMACC	Mines Action Coordination Center
UNRWA	United Nations Relief and Works Agency
US DOS	United States Department of State
USAID	United States Agency for International Development
UXO	Unexploded ordinance
WB	World Bank
WHO	World Health Organisation
WWTP	Waste Water Treatment Plant

Preface

This study could not have been completed without the generous assistance of several people. We extend warm appreciation especially to Todd Jarvis, Alexis Carles, Agathe Maupin and Doris Summer for the considerable time and spirit they volunteered. Appreciation is also due to the several people from all continents who helped us track down (or attempt to track down) missing data. The study has been greatly focussed and refined thanks to the thoughtful comments of internal reviewers Gilbert Achcar, Tony Allan, Hussein Amery and Ralf Klingbeil. Very special thanks are due to Imane Abd el Al, Antoine Salaame, Kamal Kara'a, Wajdi al Najem, Chadi Abdallah and all the members of AFIAL. Their level of professionalism is matched by only by their generosity and spirit of cooperation, and this has made the work a pleasure. While the study does not necessarily reflect their views, we believe there is nonetheless a general consensus amongst all who have contributed to the study, and a shared concern to confront the nefarious effects of the Jordan River conflict.

EXECUTIVE SUMMARY

This study establishes a baseline upon which future analysis of the Jordan River conflict may build, by investigating the hydropolitics of the river's upper reaches. It reviews the record of use and distribution of the transboundary flows, and finding these to be asymmetric in the extreme, investigates how the inequity has been achieved and maintained.

The study chooses a broad and innovative approach to shed clarity on the subject, and the very different types of data are interpreted through a range of theoretical frames. Inspired loosely by political ecology and political economy, the frames include hydro-politics, International Relations, discourse theory, and international law. The study rejects the 'environmental determinist' approach, to situate the contestation over the transboundary flows instead as shaped by the broader political context. Water is part and parcel of that context, and should not be ascribed too much (nor too little) political importance. The Upper Jordan River conflict should be understood, in other words, as shaping and being shaped by (but not driving) the conflict between the states and peoples of Lebanon, Syria and Israel (and, to a lesser extent, of Jordan, and the West Bank and Gaza).

The research team's fluency in Arabic, Hebrew, French and English has enabled it access to and interpretation of previously un-examined or under-examined data. This has led to exploration of the archives of the French and British authorities that ruled Lebanon, Syria and Palestine, reconciliation of both Lebanese and Israeli river flow data, exploration of Lebanese and Israeli newspapers, and unpublished reports by authorities on these sides of the Upper Jordan River.

The research scrutinises the location and flows of the main Hasbani, Liddan and Banias upper tributaries, confirming that the basin and recharge area of each are international. Six decades of flow measured just upstream of their confluence shows that the Liddan is by far the largest (about 240 million cubic metres per year (MCM/y)) and the most stable of the Upper Jordan River sources. The Hasbani and Banias flow about half as strong, and are highly variable throughout the year. Most of the flows of all the tributaries discharge from springs which are fed by groundwater from transboundary aquifers recharged by the snow and rains of the Israeli-occupied Syrian Golan, or by the slopes of Mount Hermon. These have been very roughly estimated here at 250 – 350 million cubic metres per year (MCM/y).

As the figure below shows, the struggle for use of and control over these flows began with the carving up of the land by British and French forces, following their conquest of the Ottoman empire. Zionist lobbying to include much of the Jordan River sources as part of British Mandate Palestine succeeded in 1921, though continued pressure in the following decades for the Litani River did not. The contestation turned much more physical after the 1948 *nakba* and the creation of the state of Israel, when the construction and destruction of grand water master plans and projects took centre stage of the inter-state wars. Israeli

control of the flows was assured following its military conquest of the Syrian Golan in 1967, and invasion of Lebanon in 1978 (and subsequent occupation until 2000). Since that time, Israel has used essentially all of the Upper Jordan Flows, Lebanon about 1%, and Syria none.

The distribution by Israel has been maintained even following its withdrawal from most of Lebanon in 2000. As it still occupies the Syrian Golan (including parts of Mount Hermon), the town of Ghajar and the Cheba'a Farms, Israel retains complete territorial control over the sources and surface recharge area of two of the three tributaries – the Liddan and the Banias.

Lebanon's construction of the Wazzani pumping station on the Hasbani River in 2002 suggests that Israel's relinquishment of the territory of the upper Hasbani led to a loss of control of the flows. The research finds that reaction of the Israeli side (threatening war, and prompting international mediation) has served to re-assert control of the flows, however, by deterring any future Lebanese development of the river. This leads to one the study's several implications for theory: that the control of upstream flows can be achieved without the need for control of the territory, as shown in the figure below.

Nonetheless, the flows of the Upper Jordan River are today not of critical importance to the survival of the state of Israel. The tributaries are the main source to the Lake of Tiberias, and provide about one-sixth of total freshwater produced in Israel (one-third, if evaporation is not counted). The flows are used for industrial agriculture to produce cash export crops in the Negev desert, as well as for domestic consumption. Considering this use of precious resources together with current Israeli levels of food imports and desalination capacity, there are more rationale alternatives. Thus, while the continued Israeli occupation of the Cheba'a Farms and Ghajar may be or have been partly about ensuring continued water flows, it should also be interpreted alongside the more important religious and military motives.

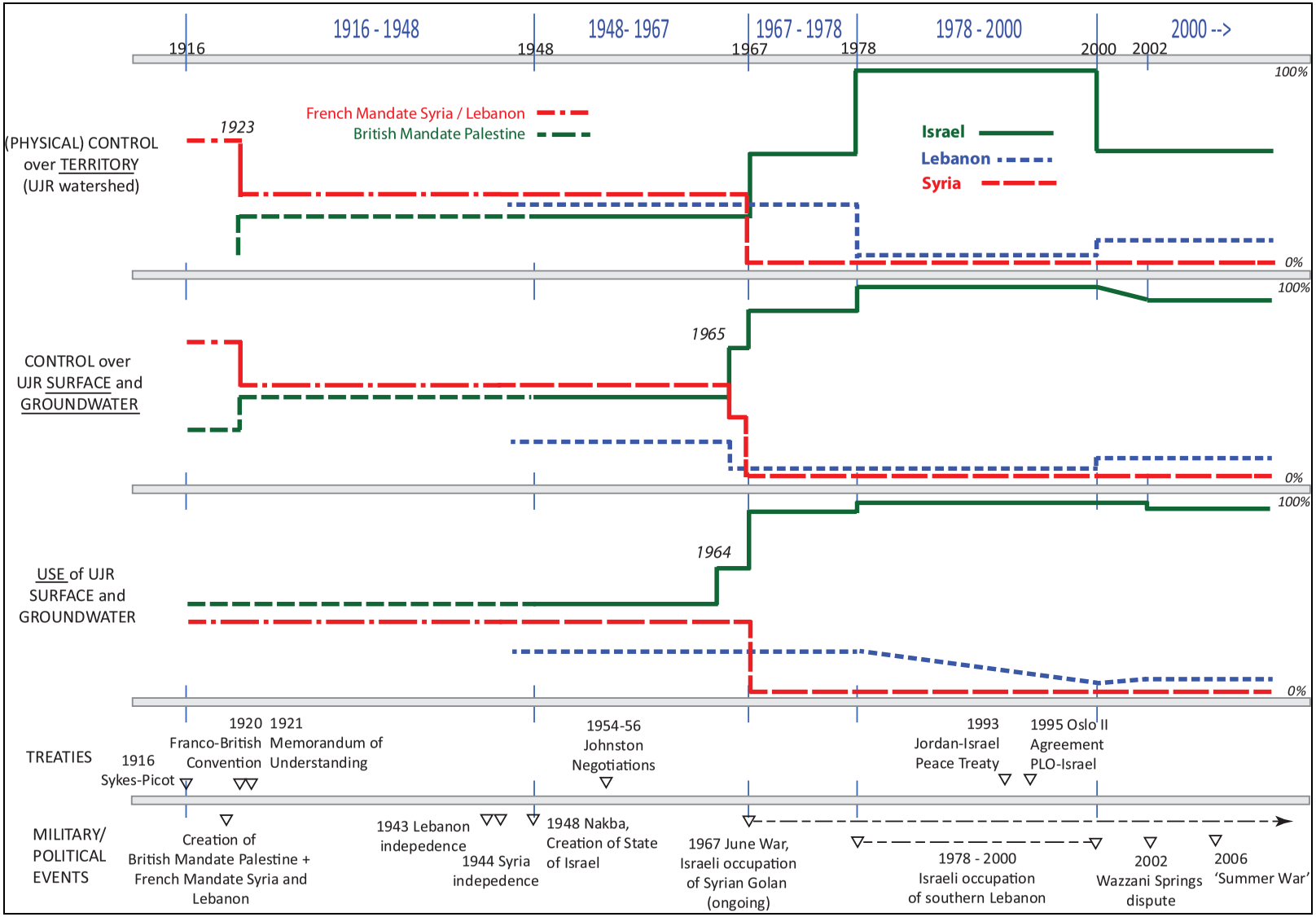
In the same way, the study concludes that control of the Litani was not one of the main motives of the Israeli invasions of Lebanon in 1978, 1982 and 2006. Water resources and water infrastructure certainly have been targets in these wars, however, and are routinely used as tools to wage them. Deliberate or indiscriminate Israeli damage of over 50 public water reservoirs in southern Lebanon in 2006 have proven not only violations of International Humanitarian Law, but effective means of clearing civilians from their homes, and of preventing their return. The 2006 war also served to re-enforce the 'hydro-hegemony' that Israel has maintained over the transboundary flows – by degrading and deterring any further Lebanese development of the Hasbani.

The great political, military and financial costs Israeli governments have incurred to achieve and maintain essentially exclusive use of the Upper Jordan flows is not matched by the

relatively slight importance of these to state security. The disconnect is explained in part through an investigation into the perceptions of the water conflict. Maintenance of the established order through violent acts (hard power) is found to be supplemented through a number of narratives and discourses (soft power). The most dominant of these latter is the Israeli discourse linking the transboundary flows with Israeli state security, on the basis of constructed narratives of scarcity and of strategic territory. The link appears firmly established across the Israeli political spectrum, and is found to have influenced international mediators during the 2002 Wazzani Springs dispute.

The efforts of the international diplomatic community during the Wazzani and earlier disputes are found to be more concerned at not upsetting the established order, than at addressing the root causes of conflict. By focussing on managing the water conflict, they have missed opportunities to begin to resolve it, thereby smoothing concerns on one side of the border while raising them on the other. Such efforts also yield to the temptation of incoherently dividing the Jordan River Basin into its upper and lower sub-basins. Diplomatic efforts focussed on the Jordan's lower reaches are ultimately compromised by ignoring the tensions over the source of the flows, while upstream activity cannot be (and evidently is not) disregarded by downstream riparians. This study itself succumbs to the artificial division by focussing on the Upper Jordan, but emphasises the importance of situating it within the entire Jordan River Basin.

Potential sources of future violent conflict identified may come about through transboundary pollution, extensive groundwater development, or plans to construct reservoirs. Efforts to predict any such outbreaks should first consider the broader political context, which will continue to shape, for instance, whether wastewater re-use and desalination technology will be used by either side to maintain or reduce the effects of the water conflict. In between the destructive bouts of war, the lower intensity chronic water conflict continues, with its effects felt chiefly in Lebanon. Should shifts in power or relations allow it, just resolution of the water conflict could be swift indeed. To that end, the study re-emphasises that tensions over the Upper Jordan River will not disappear unless analysis considers, and diplomatic efforts confront, the asymmetry in transboundary water use and distribution throughout the basin.



Hydropolitical Baseline of the Upper Jordan River

PART A. BACKGROUND

1. Introduction

1.1 Why the Upper Jordan?

The conflicts that have been fought within the basin of the river are the stuff both of legend and of current broadsheets. Rural communities living on the banks of the Jordan River have seen their land cut up on six occasions over the last century, from a single political entity into five separate states. Each change has been accompanied by violence, population transfers, and the construction of water infrastructure that has altered both use of and control over the flows.

The political changes have resulted in a number of extremes, especially in the basin's uppermost reaches in Lebanon, Syria and Israel, so far from Beirut, Damascus and Tel Aviv. The livelihoods of communities in Lebanon and Syria are compromised by Israel's near-exclusive use of and control over the flows. Since the 1967 Israeli occupation of the Syrian Golan, Syria cannot use any of the contribution to the Jordan River that occur from its Banias Springs. Following the exchange of prisoners between Lebanon and Israel in 2002 and 2006, the river is one of few remaining unresolved transboundary issues. The river is also central to all ongoing and potential political negotiations, though declared intentions to develop the river signal heightened tensions in the future.

The extent to which the political tensions and violent conflict between ideologies and over land in the Eastern Mediterranean are heightened by the struggle over the dwindling water resources is not clear. This has not prevented pundits from over-ascribing political importance to the Jordan River, and raising its profile in diplomatic, media and academic circles. An abundance of social and physical science has been applied to the flows, and the Jordan may very well be the most heavily-scrutinised rivers in the world.

Given the attention, it thus seems incredible that so little is understood about the social, economic and political aspects of the Jordan's upper reaches. The shallow understanding and data gaps are due to a number of factors. First, the bulk of donor initiatives, water infrastructure and academic and media reports have concentrated on the 'downstream' Lower Jordan River riparians (Jordan, Israel and the Palestinians of the West Bank). This has been particularly the case since the signing of the 1994 Israel-Jordan Peace Treaty and the 1995 Israel-PLO 'Oslo II' Agreement. The strategic upstream position and interests of Syria and Lebanon on the Upper Jordan River is thus over-shadowed, in most diplomatic, policy, and academic circles.

Second, there is little apparent official local or international interest in an examination of the reasons efforts to relieve the tensions over water issues are stalling or failing. Too little diplomatic attention is devoted to the causes of the near-war over Lebanon's Wazzani

Springs in 2002, the prominence of water issues in the on-again/off-again Syria-Israel talks over the Golan, and the un-concluded 2000 and 2008 Palestinian-Israeli water negotiations. As we shall see, this may be due to an international community more interested in managing water conflict, than in resolving it.

Third, the bulk of studies have been very narrowly focussed either on political or on physical components of the basin, and primarily the latter. No study to date has taken a comprehensive approach by incorporating hydrology and hydrogeology with international relations, economics and law. As such, the root causes of tensions – and opportunities to address them – have not been established, much less addressed.

Finally, the state of war that exists between Israel, Lebanon and Syria deflects, of course, most researchers from viewing the water conflict from various perspectives. The logistical research challenges are compounded by difficulties of sourcing (sometimes confidential) data from both sides of the border. Researchers have also tended to shy away from difficulties in dealing with the numerous languages involved (i.e. Arabic, Hebrew, French, and English).

The result is that no single document or set of documents can serve as a 'baseline' for hydropolitical analysis of the Upper Jordan River, nor as the foundation for any current or future scenario planning. This study aims to provide that foundation.

Purpose of the study

The purpose of this study is to deepen understanding of the root causes of the political conflict over the Upper Jordan River, seen as a component of the entire Jordan River Basin. The original research goals of this study were: 1) The establishment of a 'hydropolitical baseline' (upon which future hydropolitical analysis and policy may build), including: 1a) Record of resources, their use and control, and 1b) Analysis of methods of control; and 2) Evaluation of Water, War and Conflict, including: 2a) Evaluation of impact of war, and conflict, on water infrastructure and water resources; 2b) Characterisation of Lebanon-Israel relations over water, through time.

1.2 Basic hydropolitics

This study recognises that politics surrounding transboundary waters are generally subordinate to – and not determining of – the broader political context within which they play out. The study also takes as a departure point the inseparability of physical and social processes related to water, employing, for instance, an understanding that water scarcity is determined according to use and distribution, as well as by the biophysical terms of quantity and quality. In both senses, then, this study rejects the 'environmental deterministic' approach for an interdisciplinary analytical framework inspired by international political ecology and international political economy, elements of which are discussed following.

Power, and hydro-hegemony

The analytical approach of hydro-hegemony builds on International Relations and hydropolitical theory to recognise 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 and Warner 2006). The approach emphasises that expressions of power ('hard', or more often 'soft', power) and power asymmetry are key elements in determining outcomes of water conflicts, and the character of interaction between states over the flows. Basin 'hegemons' are 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, and can be used towards either integrative or distributive ends (Zeitoun*, et al.* 2011). Both forms of power are very actively in use in the Upper Jordan River, where the consequences of Israeli expressions of hard power complement less directed expressions of soft power. Israel's very well-entrenched position as basin hegemon is found to be contested verbally, as well as (if much more rarely and mildly) in practice.

Environmental Diplomacy and Peace-making

Foreign ministries are increasingly recognising the importance of 'water-diplomacy' as a key component of their foreign missions (Kjellen 2007). Such diplomacy was in full swing in the Upper Jordan River during the 1950s 'Johnston negotiations', and employed more recently in relation to the Wazzani Springs tributary to the Hasbani River. 'Environmental peace-making' efforts are prone to taking the environment as the starting point towards political resolution, or to resolve environmental conflicts without addressing the political situation. Significant efforts in this regard have been made on the Lower Jordan River by Friends of the Earth Middle East (FOEME 2010), and on the entire basin by the Strategic Foresight Group (SFG 2010). Tentative environmental diplomacy efforts have been made with the four 'Arab' states by the Issam Fares Institute (AUB) through the Arab Jordan River Initiative.

Discourse, narratives, and sanctioned discourse

'Discourse' is a term used to describe the ensemble of messages and ideas passed through media, stories, academia and official propaganda. Discourses may be constructed by actors in attempts to influence the social order, according to some International Relations theory. *Environmental* discourses are referred to by Maarten Hajer (1997) as 'storylines' or 'narratives' – what Dryzek (1997) understands as "shared ways of apprehending the world".

Accepting that discourses are formed and sanctioned in this manner is important to understanding the Hasbani water conflict for a number of reasons. As we will see in Section

6, Lebanese narratives in support of international water law or claiming Israeli theft of water butt against Israeli scarcity and hydro-strategic narratives. The dominate Israeli discourse linking water and security helps to interpret the disconnect between the public's understanding of the physical, social and economic importance of the Upper Jordan River flows, both in the past as well as in the future.

Equitability and International Water Law

International water law may be seen as a guideline to address or redress unfair sharing of international transboundary flows. The 1997 UN Watercourses Convention (UNGA 1997) codifies customary state practice on the issue, through elaboration of its three substantive principles: i) *no significant harm*; ii) *prior notification*; and – most importantly to the study at hand – iii) *equitable and reasonable use*. Inequitable use of the river since 1967 by downstream basin hegemon Israel has led to tensions with Lebanon, and to official reclamations by Lebanese authorities, who justify their actions and positions on the principle of 'equitable and reasonable use'.

1.3 Study limitations

The results of the study are bound by a number of limitations listed, including:

***Scale*:** The study focuses on the less-well known sources of the Jordan River, and not the entire Jordan River Basin. The basin should be regarded as a *whole*, however, for coherent understandings and application of water conflict resolution efforts, international water law, water use and ecological health. The implications of this study's narrow focus on the Upper Jordan River sources are put into the broader basin perspective, in Section 8, but the reader is requested to bear the broader picture in mind, throughout.

Mixed data – I: The study makes use of a substantial amount of qualitative and quantitative data that is interpreted through the separate disciplines of hydrology, hydrogeology, hydropolitics, law, international relations, etc. In order to communicate the data, analysis, and implications, both the social and physical scientific analysis refrains from a deeper exploration of issues than a uni-disciplinary study focussed on a single type of data may have provided.

Mixed data – II: The study has also drawn in roughly equal amounts on data in four different languages: Arabic, Hebrew, English, and French. Though team members are collectively fluent in each of these, the normal possible sources of error stemming from mis-interpretation exist.

Quality of numerical data: Every effort has been made to triangulate numerical data. The reliability of this data – especially the flow data of section 3 – nonetheless remains in

considerable doubt. Wherever possible, a range of estimates is provided, as this is seen as preferred over single-figure averages.

1.4 Study structure

The study is divided into *Background* and *Analysis* parts ('A' and 'B'). The following two sections (2 and 3) discuss the basic history, hydropolitics, institutions, use and flows of the Upper Jordan rivers, very little of which has been previously written-up in a single source. These sections serve as the foundation for the later analytical sections. The hydropolitical history is discussed in greater detail in Section 4, and classified according to disparate hydropolitical eras. It reveals that more recent events on the river are not novel, but predictable variations of past interests and forces. The direct link between water and war (as opposed to simply water and conflict) is discussed in detail in Section 5, with a focus on the war of July 2006. Section 6 identifies the most common narratives and discourse contending to shape perceptions of the conflict over the Upper Jordan River. Section 7 scrutinises the changes that have occurred over the hydropolitical eras – notably in terms of attempts to control surface water resources (or groundwater, or territory), and in terms of motives, strategies and discourses employed to gain the control. The evolution of Israeli hydro-hegemony within the basin is also discussed. The concluding section emphasises the findings of the study, grouped in relation to the resources themselves, the active power and interests, and the future of the water conflict.

2. Snapshot of the Upper Jordan

2.1 Sources of the Jordan

The river valleys and mountain peaks that characterise the Upper Jordan River Basin have co-evolved over millennia. The snow melting and rainfall running off the western slopes and foothills of the Eastern (or 'Anti-') Lebanon mountain range form the Hasbani, Liddan, el Asl and Banias[1] rivers, as shown in the 1921 French map of Figure 2.1. As will be seen later, these are also joined by the Ajoun stream. The Upper Jordan River begins at the confluence of the rivers, just upstream of the (now-drained) Huleh Marshes and Huleh Lake, as shown in Figure 2.2. The flows then travel into the Lake of Tiberias, and through the Lower Jordan River to the Dead Sea.

As we will see in the following section, the flow of the rivers is highly variable according to the rainy winter season and the dry summer seas. The Hasbani River doubles in size during the winter, for example, but it is still modest compared to the nearby Litani, and eclipsed by the flows of the Tigris or the Nile further afield. Together, the sources of the Jordan contribute the great majority of the inflow into the Lake of Tiberias, despite claims to the contrary[2] and so one-sixth of all Israeli freshwater produced (one-third, if evaporation is not counted), and one-eighth to one-quarter of total current water consumption (Zeitoun 2008: Fig 8.1). The Upper Jordan River is significant beyond the size of its flows in other ways, however.

From a geographical perspective, the Upper Jordan River tributaries transmit water and sediment from the impressive heights of Mount Hermon (Jabel el Sheikh) at over 2,000 metres above sea level, to the Dead Sea, at more than 400m below sea level (and the lowest body of water on earth).

[1] The Arabic names for the Upper Jordan River sources are used throughout. The Hasbani River (*Nahr Hasbani*) is most commonly referred to as such in the English literature, but referred to as the 'Snir' River by water authorities in Israel; the Liddan River (*Nahr Liddan*) is more commonly referred to in the English language literature as the 'Dan' River; the Banias River and el Asl stream are sometimes referred to in common as the Hermon River, because of their provenance from Mount Hermon; the Ajoun stream (not shown in Figure 2.1) is referred to in Arabic by Bromiley (1982: 1121) as the *Nahr Beregeith* – or 'Flea River' (see also discussion in MacGregor (2002[1870]: 162).

[2] In a list of provisions that make it "easier to specify what water is not shared", Brooks and Trottier (2010: 107) ignore the origin of most of the water in the Lake of Tiberias: "Apart from any provision for storing winter flows in the Yarmouk for the benefit of Jordan (or, perhaps in the future, of Syria), all water in the Tiberias Lake is Israeli".

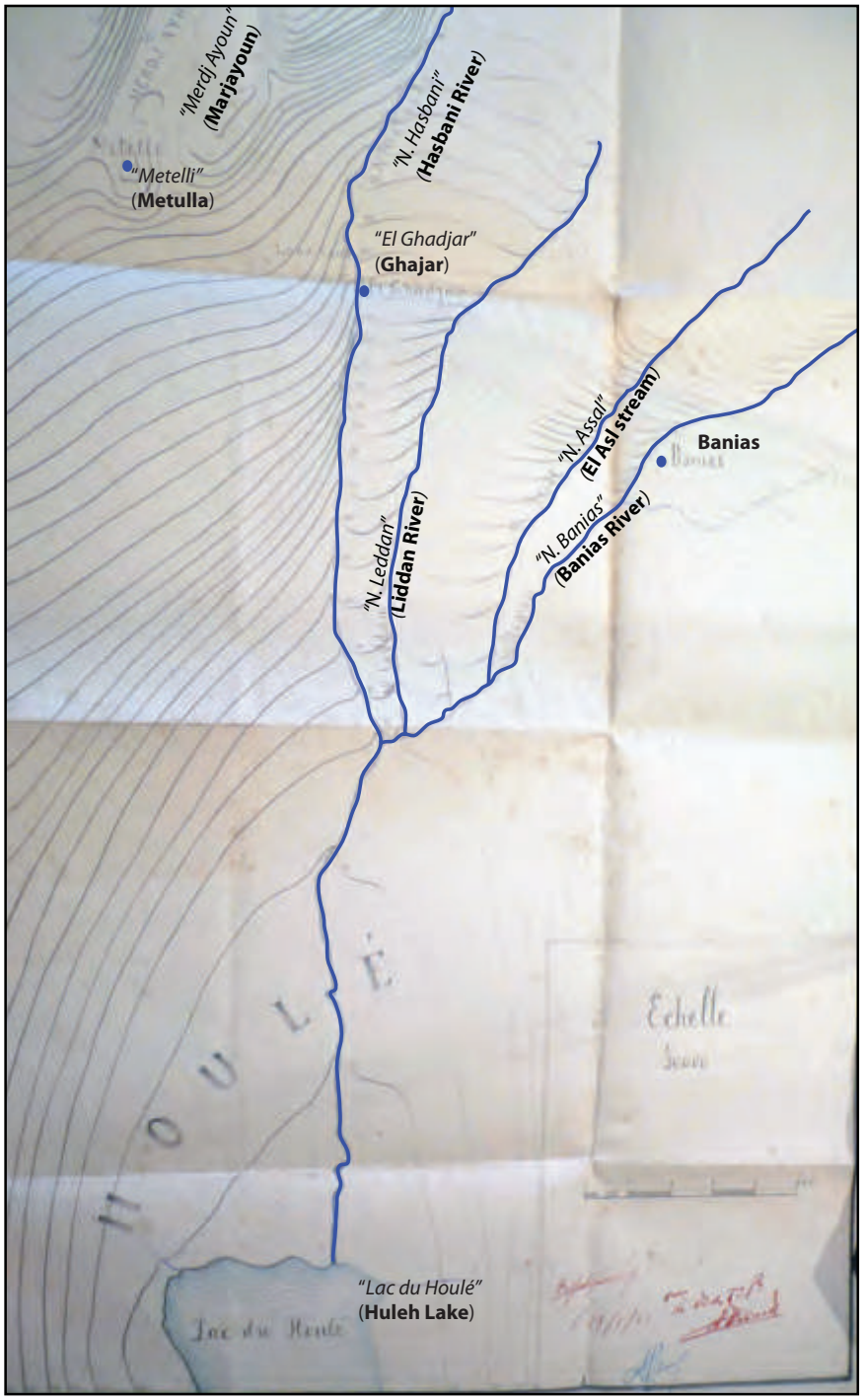


Figure 2.1 Sources of the Upper Jordan River. Adapted from a French Government reconnaissance mission to explore the border area (adapted from 'Etude generale de la frontiere probable vers Metelli', FNA 1921d).

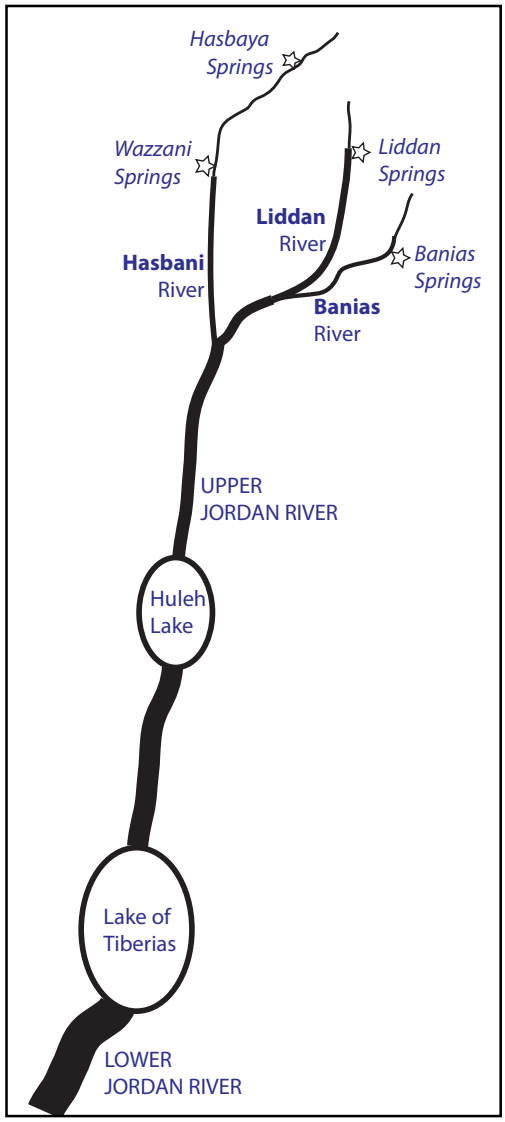


Figure 2.2 Sketch of the main tributaries of the Upper Jordan River.

The Liddan River is the largest of the three main tributaries, and rises as a spring just inside Israel's northernmost border. Though the surface catchment of the springs and runoff area is located within Lebanon (thus making of it an international river), the Liddan is more commonly referred to in English as the 'Dan', and it is sometimes stated to rise solely within Israel (e.g. Zeitoun 2008: Figure 3.1)

The Hasbani River rises as a spring in Hasbaya, Lebanon. It is referred to as the 'Young Jordan' and vividly described in a wholly orientalist description by travel-writer John MacGregor, who canoed from the source of the Jordan to the Lake of Tiberias in the late nineteenth century. His narratives and drawings (Figure 2.3) give an indication of the extent of human use of the river:

> "The Hasbani is winding in the glens below, but it is hidden until it sweeps around the foot of the hill where we stand… and bears about east from the bridge. Young Jordan is like the prettiest tiny stream in Scotland with white

hollowed rocks and weird caverns, but the gravel is prettier here than any in my own land; pebbles of yellow and bright blue banked in by fruitful loam of a deep rich red, and all so silent and unaffected. So it winds until steeper rocks gird the water, narrowing where wild beasts' paws have marked the sand" (MacGregor 2002 [1870]: 171).

Figure 2.3 Source of the Hasbani, from a woodcut image circa. 1870 by John MacGregor. The falls depicted here may be the site of the current Hasbaya pumping station (see also Photo A.1 and A.2 in Annex A, and cover photo) (MacGregor 2002 [1870]: 175).

The source of the Holy Jordan River is important to believers of all three monotheistic faiths. Millions of Christian pilgrims visit the place near the Lake of Tiberias, where it is suggested Jesus was baptised (though the uncontested site is actually much further downstream, near Jericho), and the site of commercialisation of 'Holy Waters' which began at the turn of the 20th century (IRJWC 1907: 41) continues today. Metullah on the hills of the shore of the Hasbani is considered the limits of the Holy Land by Israelite scholars[3] (FNA 1921d), while the Banias is said to have been visited by Abraham, for the *Covenant of the Pieces*.[4]

[3] Mixing the town of Hasbaya (spelled 'Chaspeya') with the Hasbani River, MacGregor (MacGregor 2002 [1870] : footnote p.174) cites Rabbi Schwartz: "The Jewish inhabitants of the town of Chaspeya carry their dead across the stream to Abel al Krum, because they have a tradition that the river Chaspeya formed the boundary line of Palestine, and they wish to inter the dead on the Holy Land. But this boundary lines was only so after the return from Babylon"

[4] MacGregor (2002 [1870]: footnote p. 198): "Stanley places [the holy site of] Baal Gat at Baalbeck [now in Lebanon]. Thomson seems to think that Rehob was at Banias ("The Land and the Book, vol. i. p.391). Schwartz tells us (p. 202) that "About three mill [sic] north of Banias, there is a mount, on which there is an

The religious significance of Banias is an important feature of Upper Jordan River hydropolitics. The source – located in the Israeli-occupied Syrian Golan – is controlled by Israeli military, and off-limits to non-Jews without state permission. We will see how the presence of Jewish believers at Metullah re-defined the boundary of pre-1948 Palestine, and consider how the hydrological and religious significance of Banias currently serves to define the boundary of an enlarged Israel (which includes the Golan).

The Upper Jordan River flows have also sustained numerous peoples and armies, including possibly the Phoenicians on the Dead Sea near the end of their empire, and the "only sea battle between the Jews and the Romans" near the mouth of the Lake of Tiberias (MacGregor 2002 [1870]: 316, 370). The flows of the Banias were furthermore crucial in siting the *Qala'at al Subeiba* (Nimrod Castle) as protection of Damascus against the Sixth Crusade by al Aziz Uthman (nephew of Salah Eddin).

2.2 No 'Normal' Borders

Residents of the Upper Jordan River basin have seen an unending set of borders laid upon them by colonial politicians and their geographer scribes. The resultant shifting and contested borders are a result of collisions and collusions between commercial, religious and national interests. Water resources either played or are perceived to play a role in each shift – a debate that is returned to at length in Section 4.

The Upper Jordan River tributaries have co-evolved along political lines at break-neck speed over the last century. As shown in the series of images of Figure 2.4, the rivers flowed completely within the Ottoman Empire for centuries until mid-way through the First World War in 1916. They continued flowing, of course, as the territorial mandates of the European powers France and Britain laid down their borders following the defeat of the Turks. When Lebanon and Syria gained independence from France in 1943 and 1946, the Hasbani and Liddan flowed for a decade between Lebanon, Syria and British Mandate Palestine. Following the *nakba* of 1948 and the creation of the State of Israel, the rivers interwove together the conflictual constellation of Lebanon, Syria and Israel. The borders have continued to shift with the expansion and partial retraction of the Israeli state in 1967 and 2000. The Israeli occupation of the Golan ever since 1967 has ensured the confluence of the Hasbani, Liddan, and Banias remains under its full control. During the Israeli invasion and subsequent occupation of southern Lebanon from 1978 until its retreat in 2000, this full control was extended beyond the source of the Hasbani itself.

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old building having several cupolas. There is a tradition that the 'covenant between the pieces' with Abraham (Gen, xv, 9) was made on this spot: The Arabs call is Meshhad al Tir, i.e. the covenant or testimony of the bird (turtle-dove?), in reference to the 'bird' referred to, ibid v. 10."

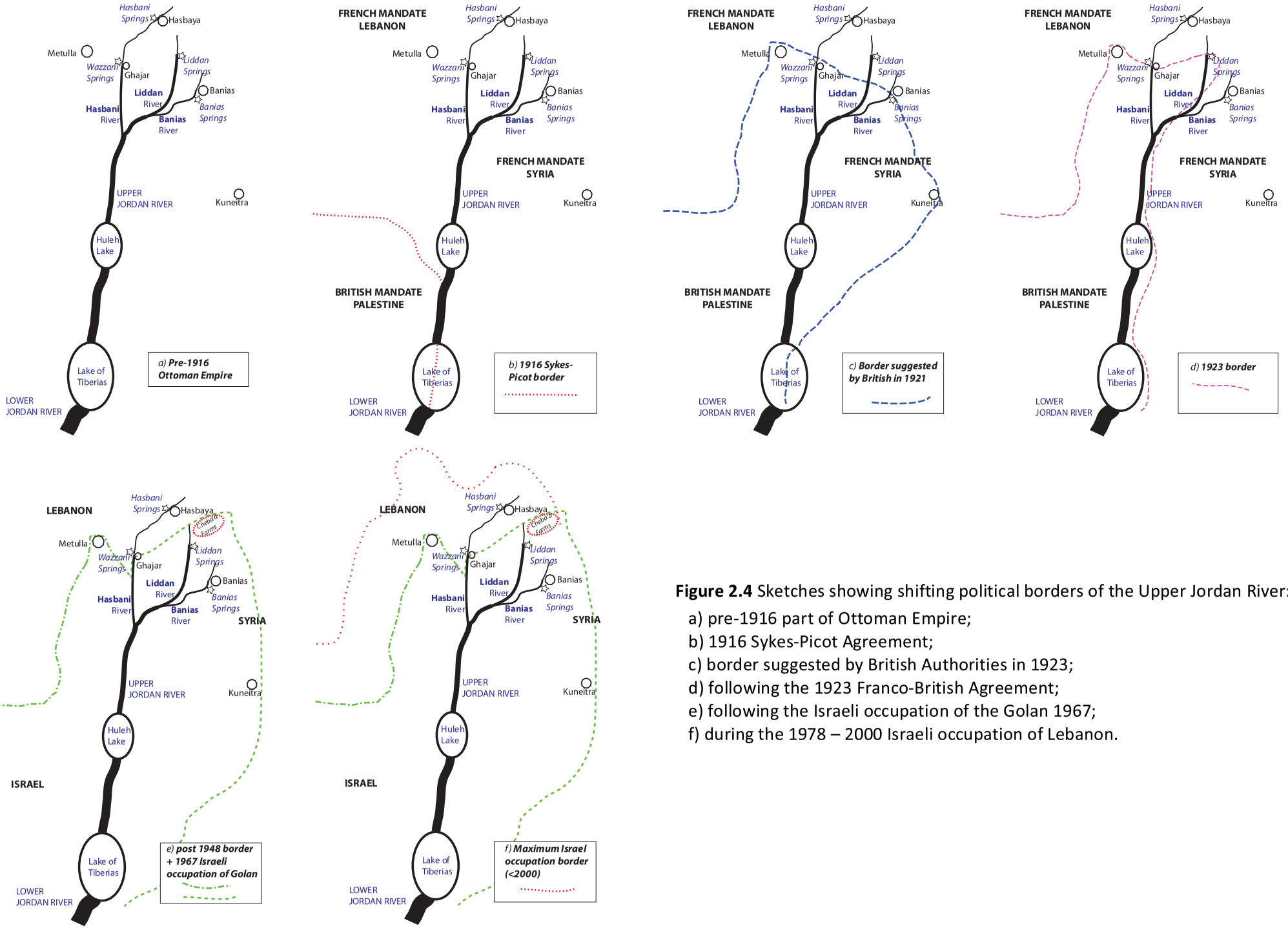

Figure 2.4 Sketches showing shifting political borders of the Upper Jordan River:

a) pre-1916 part of Ottoman Empire;
b) 1916 Sykes-Picot Agreement;
c) border suggested by British Authorities in 1923;
d) following the 1923 Franco-British Agreement;
e) following the Israeli occupation of the Golan 1967;
f) during the 1978 – 2000 Israeli occupation of Lebanon.

Each shift in borders has resulted in (but not been primarily driven by) re-allocation and use of the Upper Jordan River flows. The Lebanon-Palestine border was the subject of significant (if inadequate) attention by French and British cartographers. Under the secret and hastily-prepared British-French Sykes-Picot agreement in 1916, the Huleh marshes were to be controlled by the French mandate. The colonial powers agreed under the terms of the 1920 Franco-British Convention, however, to retract French Mandate Lebanon's southern border (FNA 1920), in what became the first significant hydropolitical border shift, as shown in Figure 2.5, and commonly referred to as the 'Hula Concession' (see also Schmida (1984).

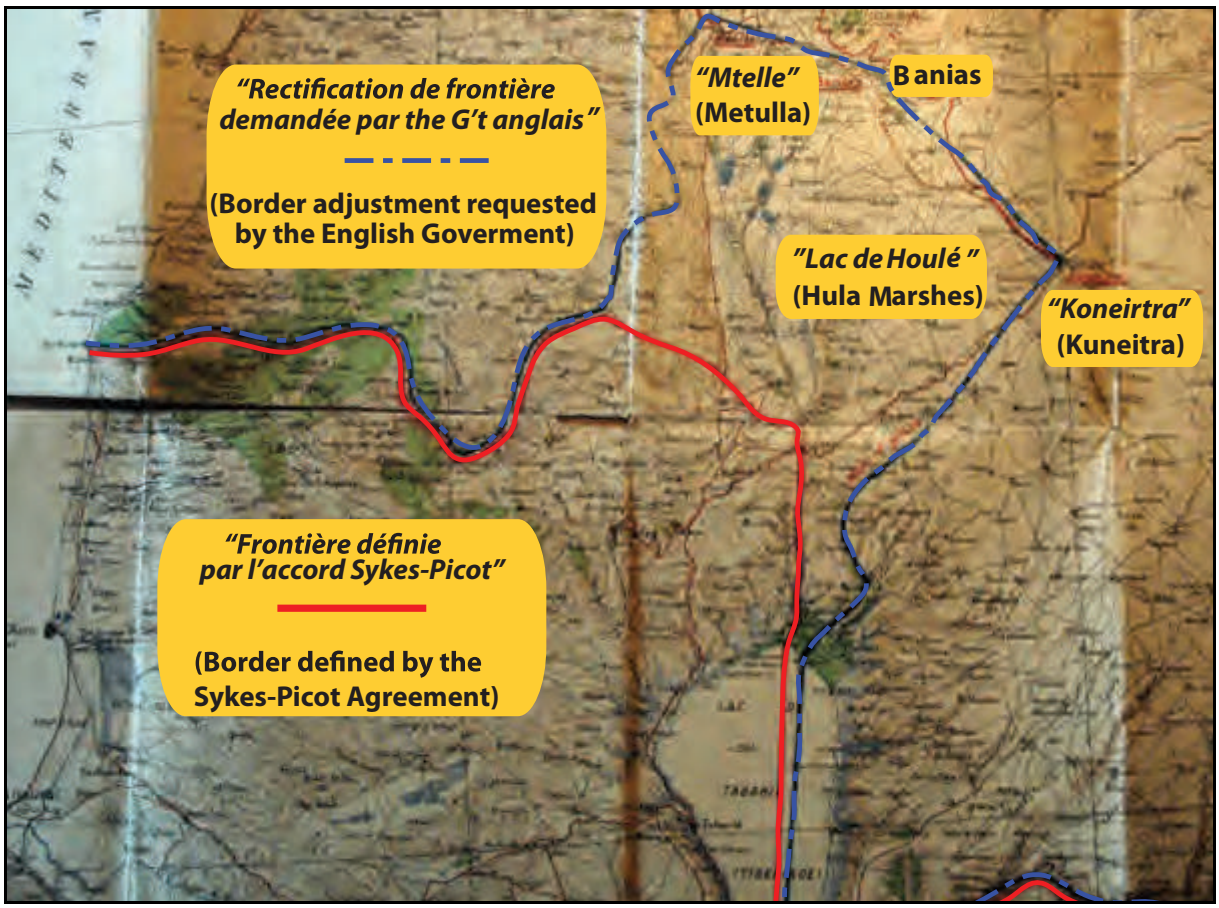

Figure 2.5 The first significant hydropolitical border shift – the 'Hula Concession' (after FNA 1922). The border agreed at the 1916 Sykes-Picot accord (in red) was adjusted after the Franco-British Convention of 1920 (shown in dashed blue) such that Metullah, the Huleh Marshes, and all of Tiberias (up to the 10m beyond the high-water mark, unlike what is shown here) were ceded by the French to British Mandate Palestine.

The case for expansion of Palestine at this time was made by the British authorities and Zionist businessmen on the grounds of a) inclusion of the Jewish community in Metullah (labelled 'Mtelle' in Figure 2.5), at the northern extent of biblical Israel; b) clear route for completion of the Hejaz (Mecca-Basra-Haifa) railway, and c) greater water resources – the Hula Marshes – to serve increases in population through expected European Jewish

migration to Palestine (see e.g. FNA 1921e, FNA 1922). The concern of one French envoy to the British push to include Metullah on the basis of including more Jewish communities in Palestine was succinctly expressed (but otherwise consigned to a footnote in the archives):

> "Le motif invoqué par l'Angleterre pour faire attribuer le Houlé à la Palestine (existence d'une colonie juive à Metellah) manque de logique et marque d'autres projets que celui de rattacher à l'Etat sioniste un des meilleurs parties de la Syrie qui par [sic] plus au point de vue ethnique qu'au point de vue géographique ne fait partie de la Palestine. La colonie juive de Metulla est dotée d'une superficie de terre cultivable d'environ 550 Ha, dont une très faible partie, 80 à 90 Ha, est sur les côteaux situés au Nord de Houlé et est rattachée au territoire palestinien par la Convention du 23 Décembre; le reste est situé dans le Merdayoun [Marjayoun] qui demeure en territoire syrien" (FNA 1921e: 6).

The Chief of Public Works of French Mandate Palestine expressed similar concerns over the motives and potential human effects of the artificial border:

> "Comme il ressort des considérations ci-dessus en admettant la frontière Metelli, El Ghadjar, Banias, nous séparons les 2/3 des propriétaires du Houlé de leurs terres, nous créons une frontière entre leurs maisons et leurs propriétés, nous contraignons pour une village israelite venu par hasard à Metelli, une masse de population musulmane et chrétienne à faire partie de la nouvelle patrie créee [sic] pour les Israélites. En plus on admettra une frontière tout ce qu'il y a de moins naturelle… *On ne pourra certainement pas obtenir une frontière normale*." (FNA 1921d: 5 (emphasis added)).

As the French concern over the dispossession of two-thirds of the inhabitants from their land indicated, a 'normal border' ('*frontière normale*') was decidedly not to develop. Criticism of the borders created by the 1920 Convention notwithstanding, definition of the rest of the Lebanon-Palestine border was left to French and British geographers. French and British archives detail the interesting and extensive debate, discussion and surveying that went into the effort (e.g. FNA 1922, FNA 1940, see also Blanford 2009), and which concluded with the 3 February 1922 'Paulet-Newcombe' agreement. A number of border issues (such as the 'seven villages' located in Palestine that were later agreed as Lebanese in 1995) remained unresolved at the time of the colonial withdrawals from their mandates (from Lebanon in 1943, Syria in 1946, and Palestine in 1947).

Following the aborted British attempt to implement a Partition Plan between Jewish and Arab communities in Palestine in 1947, the Lebanon-Syria-Israel border was to change drastically once again. The ensuing 1947 war between Palestinian Arab residents and Zionist forces led to the *Nakba*, and the eviction and dispossession of hundreds of thousands of Palestinian people. The declaration of the establishment of a state of Israel in 1948 led to a war fought between Zionist forces and the armies of Syria, Lebanon, Jordan, Iraq and Egypt.

The border created by the French-British efforts held until Israel's victory in the 1967 war, resulting in its territorial expansion to include the West Bank and Gaza, the Egyptian Sinai, and the Syrian Golan Heights.

The borders of the Upper Jordan River Basin were modified again a decade later, with Israel's invasion in 1978 followed by invasion and occupation from 1982 until year 2000. Israel did settle its territorial dispute with Egypt in 1979, signed a peace treaty with Jordan in 1994, and reached a political agreement with the PLO in 1995 concerning parts of Occupied West Bank and Gaza. Negotiations in 1982 between Israel and the Lebanese state under Amin Gemayel's presidency led to the 17 May 1983 agreement, and there is some speculation (but no proof) that transboundary waters were on the table. Indirect negotiations between Syrian and Israeli officials began in the late 1990s and 2000s have had the 1923 border and the 10metre high-water mark at their centre (Daoudy 2008, Hof 2009).

2.3 Interests and hegemony in the Upper Jordan River

Issues

The Lebanon-Israel border remains a source of tension in 2011, with routine and sometimes violent border disputes.[5] Most notably from a hydropolitical perspective, these include the 2002 dispute over the Wazzani springs and the 2006 Summer War (which are discussed at length in Sections 4 and 5). There are currently fewer unresolved issues between Lebanon, Syria and Israel than at any other point in history, though those that remain all concern water flows:

- Israeli occupation of the Syrian Golan, including Mount Hermon and the town and spring of Banias;
- Israeli occupation of the Cheba'a Farms, from which groundwater recharge and surface water runoff feed the transboundary groundwater flows into Israel and the springs of Banias and Liddan;
- Israeli occupation of the Lebanese town of Ghajar, on the Eastern bank of the Hasbani River, opposite the Wazzani springs; and
- Inequitable allocation and use of the transboundary water flows, including the Hasbani, the Liddan and the Banias rivers, and transboundary groundwater flows.

Lebanon interests

The Hasbani river flows in Lebanon for roughly 22km, from its main source (the Hasbani Springs) in Hasbaya to the Israeli border. The surface catchment area of the Hasbani Basin covers roughly 670 km2 in total, or about 6% of Lebanon (Abdallah*, et al.* 2006) and counts roughly 135,000 residents (MOSA-UNDP 2007). As Allès (2007: 99) notes from the Hasbani-

[5] Most recently, for example, the killing of twelve Lebanese and Palestinian protestors by the IDF at Maroun el-Ras, 15 May 2011.

Wazzani basin plan (MEDA 2003), the 1978-2000 period of Israeli invasions and occupation of southern Lebanon has impacted settlement in the area, and the 2007 population is estimated at roughly one-third of what would be expected with unhampered growth. The land within the basin is very fertile, though agricultural development is a fraction of the normal level of development in Lebanon. It is perhaps in the geopolitical domain that the Hasbani gains importance in Lebanon, however. The construction of a Lebanese pumping station for drinking water to the un-served villages in 2002 nearly sparked violent conflict between Lebanon and Israel (the 'Wazzani dispute'). A significant amount of water infrastructure was damaged during the 2006 war, and the Hasbani continues to figure in the discourse of Lebanese officials across the spectrum.

Syria interests

The great bulk of water that Syria withdraws from the Jordan River basin are taken from the Yarmouk River tributary, which flows into the Lower Jordan. Though official Syrian use of the Upper Jordan ceased with Israel's capture of the Golan Heights in 1967, it is important to the livelihoods of the Syrian residents there, as well as for being wrapped-up in the broader Syrian-Israeli conflict and negotiations over the Occupied Golan (see e.g. Daoudy 2008, Hof 2009).

Israel interests

The 1967 Israeli military victory served partly to establish a water use pattern that continues until the present day. While population estimates within the Upper Jordan basin are not available, the estimated population in the entire Tiberias watershed (which includes the Golan) is 200,000 (ICBS 2011). Israeli residents use the Upper Jordan River flows partially for irrigation of crops locally and on the Golan (ICBS 2004: Table 27, Markel 2004). The bulk of the flows into Tiberias are abstracted by the National Water Carrier and distributed along demand centres outside of the Basin throughout the length of Israel into the Negev Desert. This consumption equates to roughly the whole flow of the Upper Jordan River measured at its confluence point, and over one-third of all Israeli freshwater consumption. These flows are used for domestic purposes, or are destined for industrial agriculture in the desert, from where they are exported (as virtual water, in the form of crops) to Europe (seePeraino and Chen 2008), consumed locally, or sold to Palestinians in the West Bank and Gaza.

The Upper Jordan River is also a geopolitically strategic resource for Israel, in the same manner that it is for Lebanon and Syria. As we will see, the waters are part and parcel of a deeply held Israeli discourse related to state security. The traditional Israeli security requirements are counted by a security analyst "as belonging to the "operational sphere" (they concern defence of the Galilee), while "the need to protect the sources of the water is a strategic need" (emphasis by the author)" (Schiff 1994b in Libiszewki 1995).

Hydro-hegemony in Upper Jordan River

With the evolving occupation of southern Lebanon from 1978 – 2000, and ongoing occupation of the Syrian Golan Heights and the West Bank, and siege of Gaza, Israel is clearly the military power of the riparian states. Israel has also used softer forms of power – notably bargaining power and ideational power – to very effective ends in terms of water distribution (Zeitoun 2008: Ch. 7). As shown in Figure 2.6, this advantage in power along with an advantage of water 'exploitation potential' makes Israel the 'basin hegemon', despite its midstream position.

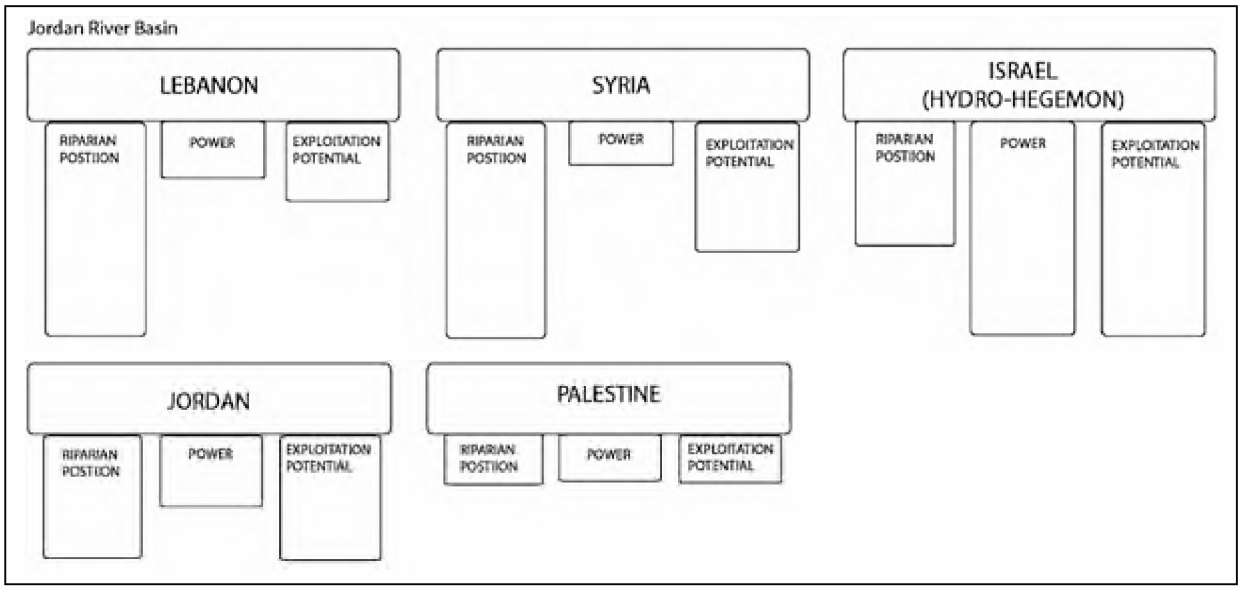

Figure 2.6 Relative power asymmetry of riparian actors in the Jordan River Basin – as estimated in 2006. An updated figure (for the Upper Jordan riparians only) is provided in Figure 7.6. The evaluation of Syria here is noted as contested (Zeitoun and Warner 2006).

The current use and abstraction rates reflect the asymmetry in power – as noted in Table 2.1. The asymmetry is extreme. Syria has been cut off completely from Upper Jordan River flows. Israeli use of the flows is 30 to 65 times greater than Lebanese use. Of course, the clear Israeli hegemony should be considered alongside needs and access to other (e.g. Lower Jordan River) sources. And, as we will see in Section 7.3, this hegemony is both more entrenched and challenged than the numbers suggest.

	Abstractions from / use of the **entire Jordan River** Basin	Abstractions from / use of the **Upper Jordan River** Basin
Lebanon	11*	8
Israel	550 – 800	440 –520* [- 360 upper limit n/i evaporation]
Syria	200 – 260	0
Jordan	290 [270 n/i evaporation]	0
Palestinians	0	0

** This study's calculation – see Section 3.5.*

Table 2.1 Estimates of surface water abstractions or use of the entire Jordan River Basin, and of the Upper Jordan River Basin (2003). Phillips, *et al*. (2007b: Table 5), IWMI (Courcier*, et al.* 2005: Table 10). See also Trondalen (2008: 47) (which is based on Soffer 1994 and Klein 1998).

2.4 Institutional Arrangements of Water Resources Management

The institutional administration of water in in Lebanon and Israel are remarkably different. The water resource management administration in Israel is streamlined and a centralised decision-making process is clearly defined. The Lebanese water sector, in contrast, is more directly shaped by a diversity of influential stake holders with different interests and a very complex multi-actor decision making process, that recurrently comes to halt with every internal political stalemate and crisis. The water resources management administration is also split among a number of Ministries and state institutions, with poor communication and lacking coordination.

2.4.1 Water institutions in Lebanon

The character of the water sector administration in Lebanon in part reflects the state's development. National-level water resources development was proposed in the 1930s by Albert Naccache and later by Ibrahim Abdel Al. Today's administration is still recovering from the civil war, and is undergoing a thorough administrative reform process. The ministries and the regional water authorities are unequally staffed, and both are generally lacking hydrologists and engineers, not to mention social scientists. As such, both infrastructure development and data collection continues to be somewhat dependent on foreign donors.

The institutional arrangement of the water sector in Lebanon was re-structured through Law 221 in 2000, as shown in Figure 2.7, and is described in brief following (and at greater length, in Annex B). The numerous influences at different scales (local, national, regional and international) can be seen to affect management decisions, both domestically and in regards to transboundary flows.

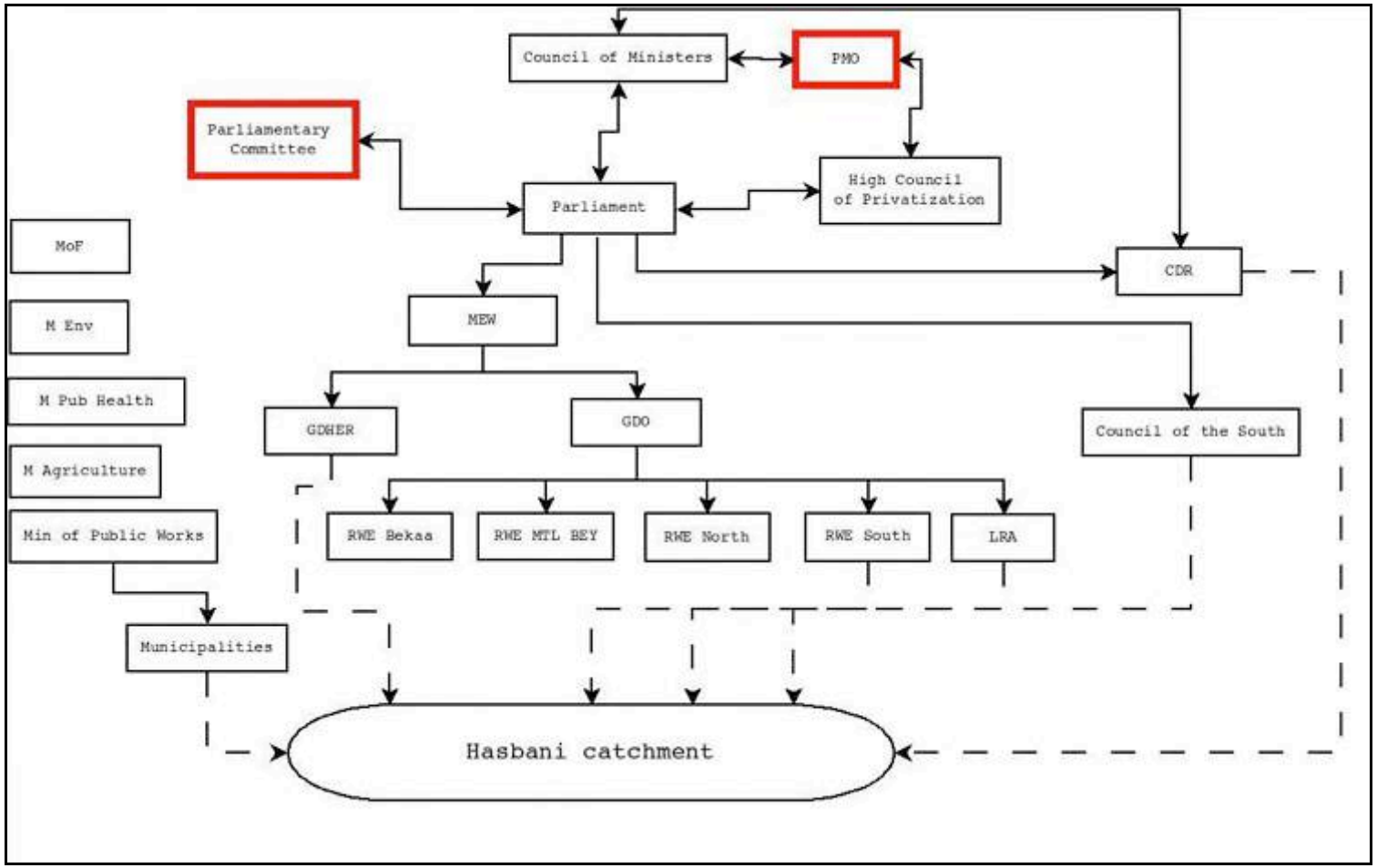

Figure 2.7 Institutional arrangement of the water sector in Lebanon, in relation to the Hasbani River catchment. Boxes marked in **bold** indicate the most actors the most influential if transboundary decision making. Single arrows denote a strictly hierarchical relationship, while double arrows denote relationships that are more strongly subject to negotiations

Transboundary water issues are discussed by the Parliamentary Committee, but decision-making responsibility lies with the Prime Minister's Office, and the issues are dealt with ad-hoc, as they arise. National policy on transboundary waters, and treaties reached with Syria over transboundary waters (the El Assi / Orontes or Nahr al Kebir) have been managed in part by the Ministry of Energy and Water (MEW) (Comair 2009).

The MEW heads the General Directorate for Hydraulic and Energy Resources (GDHER) and the General Directorate of Oversight (GDO). The GDHER is responsible for devising the national Water Resources Management strategy. According to Law 221, the GDHER is to focus on policy making and regulation and large projects such as dams, though capital projects are to be largely devolved to the 4 Regional water establishments. The reform process for the water sector is in full swing the legal text to organize the tasks of the MEW according to law 221 has not yet been developed (GOL MEW Draft Water Sector Strategy 2011).

The General Directorate of Oversight supervises the four regional water establishments (RWE) and the Litani River Authority (LRA). It has a tutelage relationship with each, meaning that it evaluates their business and financial plans, but does not interfere in their operations. While generally under-funded and poorly staffed, the RWE's wield increasing decision-making power.

It is the 'RWE South' that is responsible for the development of water infrastructure related to domestic water supply and waste water treatment in the south and the Hasbani catchment. The RWE South is responsible for the implementation and maintenance of infrastructure, and thus plans, for instance, to rehabilitate the Wazzani Pumping Station (which was in fact initiated by the Council of the South). Though it receives technical assistance from the GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) and the United States Agency for International Development (USAID), its ability to develop the infrastructure is limited due to a chronic lack of funds from either the central government or from operating revenues.

The Litani River Authority also plays an important role in the south of Lebanon. As the river basin authority for the Litani, the LRA is responsible for the development and management of irrigation schemes. It is also tasked with measuring river discharges throughout the country – and thus for the Hasbani.

The Council for Development and Reconstruction (CDR) has been and remains the most important administrative body related to infrastructure development. Established in 1977 with the goal to take charge of the reconstruction in a first lapse of fighting during the civil war, it was revamped by following the war's end in 1989. The CDR played the role of a super ministry because the line ministries (the MEW, in the case of the water sector), lacked the capacity at the time to take charge of reconstruction. The CDR implements the wastewater

master plans, and continues to take on numerous tasks that are otherwise the responsibility of the ministries.

The CDR is also the administrative body through which almost all foreign funds, loans or grants, for infrastructure projects are channelled. Dam projects – such as the Ibl al Saqi dam proposed on the Hasbani River – are the contested responsibility of the MEW/GDHER and CDR, as well as subject to the whims and conditions of external donor funding.

There is a myriad of international actors in the water sector in Lebanon, each with varying interests, budgets, and spheres of influence. The organisations focussed on 'development' have been complemented since the 2006 war by those specialised in relief and reconstruction. In the south of the country, the ensemble includes bilateral agencies (e.g. the US State Department, USAID, GIZ), NGOs and UN organisations (Oxfam, International Committee of the Red Cross, UNDP, Islamic Relief), lending banks (World Bank, Asia Development Bank), to name only a few. USAID in particular is active with the RWE South, having engaged a consultant for the administrative reform project of the Litani River Authority, and others for administrative support and technical assistance project related to the RWE South, as well as financing the construction of some 20 wastewater treatment plants in the area.

2.4.2 Water institutions in Israel

As we will see in greater detail in Section 4, the water administration in Israel has developed from numerous sources within a unifying Zionist ideology. Notwithstanding noted shortcomings (PCIIWS 2002, Zaslavsky 2002, Feitelson*, et al.* 2007, NIC 2010), it has developed a clear division of responsibilities and tasks, an evident capacity to regulate and plan, and generally advanced technological and scientific capacity.

The persistent efforts of agricultural and state development during the British Mandate period was driven by agricultural and political Zionists, and European businessmen. Upon the establishment of the state of Israel, a 'command and control' hierarchal type of management was established, and assisted by British and later US and EU material and financial support. Rural development played a pivotal role to secure the foundation of Israel, and water played a significant role throughout. The 1959 Water Law established water resources as a national public good, with the state retaining sole ownership of them.

Throughout the years, there has been a strong conflict of interest at the heart of Israeli water policy: with water consumption and demand exceeding water production capabilities, Israel has had to resort to alternative sources such as desalination and waste water reuse. The obvious pressure on water resources also triggered reform to the sector. As Fischhendler (2008: 92) notes, "Despite the exceptional degree of centralization and comprehensiveness of the water management system in Israel, the rate of abstractions

since the 1970s has been consistently greater than that of replenishment, except for a few exceptionally rainy years".

The Ministry of Agriculture was until 1996 the dominant decision maker in the sector. As reflected in Figure 2.8, the Ministry of National Infrastructure (MNI) leads on proposing the national water policy for Cabinet approval, as well as for proposing options for Israel's external water relations. The recently-established *Israel Water Authority* (former Israel Water Commission) is the central authority within the MNI tasked with planning for and regulating the water sector.

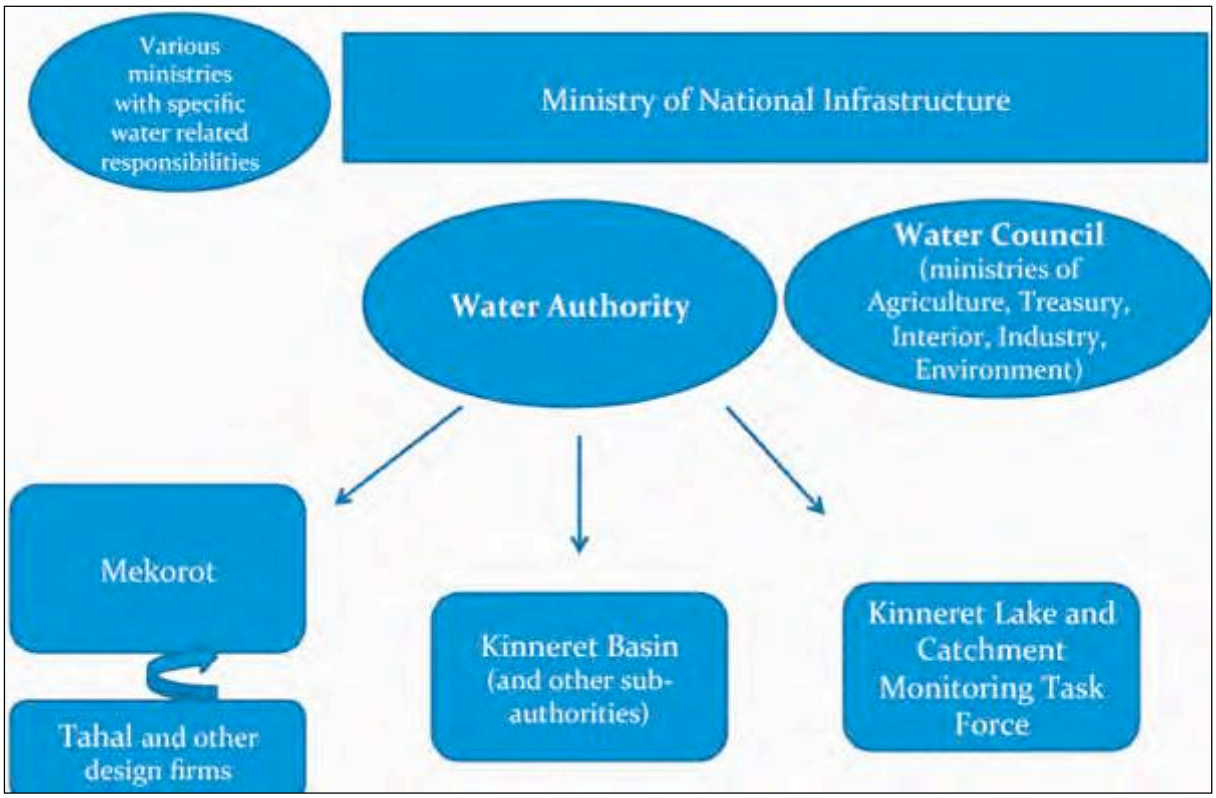

Figure 2.8 Institutional arrangement of the water sector in Israel, in relation to the Lake of Tiberias (Kinneret) Basin. A break-down of the arrangements is provided in Annex B.

Several other ministries retain specific responsibilities in the sector which allow them to exert influence over decision-making in the water sector. These are enumerated in Figure 2.9, and include the still-influential ministries of Agriculture (for agricultural allocations and pricing), Environmental Protection (for water quality standards), Health (for drinking water quality), Finance (tariffs and investments) and the Ministry of the Interior (for urban water supply).

	Water Production	Water Allocation	Transmission and Distribution	Water Quality	Pricing and Regulation
Water Authority	✓	✓			✓
Water Board					✓
Mekerot	✓		✓	✓	
Municipalities and Water Corporations	✓		✓		
Private Water Associations	✓				
Ministry of Agriculture	✓	✓			✓
Ministry of Defence	✓				
Ministry of Finance	✓				✓
Ministry of Interior					✓
Ministry of Infrastructure		✓			✓
Ministry of Health				✓	
Environmental Protection Agency				✓	
Foreign Ministry		✓			
Local Authorities/ Water and Sewage		✓			
Finance Committee of the Knesset					✓

Figure 2.9 Responsibilities of various actors in the water sector in Israel (Mekorot 2011).

Three administrative bodies answerable to the Israel Water Authority are also relevant in the water sector: Mekerot, its advisory body Tahal, and the *Kinneret* (Tiberias) *Basin sub-authority*. Mekerot and the Kinneret Basin Sub-authority are responsible for water management related in the occupied Golan and southern Lebanon, while the Kinneret Basin sub-authority is responsible for the supervision and monitoring of the Lake of Tiberias. Mekerot is a not-for-profit governmental corporation created in 1937 – prior to the creation of the Israeli state. Officially, it is responsible for the delivery of water throughout the country (and in the occupied West Bank and Gaza, from 1967-1995), primarily through the National Water Carrier. In many ways, Mekerot is considered to have undue influence, and according to some accounts "effectively acts as a National Water Authority" (Beaumont 2005: 145). With the policy change of the government towards a more market based management, and Mekerot today is limited to the operation of the National Water Carrier and consultancy services. As is the case in Lebanon, decision-making over transboundary flows is much more *ad-hoc*, and typically occurs outside of the water institutions, with e.g. the ministry of foreign affairs.

3. Upper Jordan Flows and Use

The climate in the Upper Jordan River basin is typically Mediterranean: wet winters with intense rains and storms are followed by hot and dry summers. The rainy season generally runs from late October until April-May, though its timing and duration varies considerably. Rainfall is also highly variable between years, as seen in Figure C.1 (Annex C), and average annual precipitation in the Hasbani basin is estimated at 900 to 950 mm. The precipitation falls as rain or snow, and flows over or through the geology, as described in greater detail following.

3.1 Basins and Surface Water

The Upper Jordan River Basin is part of the Lake of Tiberias Basin, and composed of three main sub-basins: the Hasbani River Basin; the Liddan River Basin; and the Banias River Basin. The catchment areas for the sub-basins (as well as for the much smaller Ajoun Stream fed by the Dardana Spring) are shown in Figures 3.1 and 3.2.

With a surface area of 670 km^2 (including the Marj el Khowkh area[6]) (Abdallah*, et al.* 2006), the Hasbani sub-basin is one of the largest river basins in the country. It crosses the Israeli border at its southern edge, while it follows the border with Syria along the crest of Mt Hermon (Jebel el Sheik) on its eastern side. The Hasbani basin borders on both the Banias and Liddan basins along (though not entirely aligned with) the provisional blue line of the occupied Cheba'a Farms. On its western side, the basin borders on the Litani Basin, and on the Marj el Khowkh plain, in the southwest.

The Hasbani originates near the town of Hasbaya at the Hasbani Springs, which discharge groundwater which fell as rain or snow in the north of the basin. From Hasbaya, the Hasbani runs for about 22 kilometres until reaching the town of Ghajar, at which point its flow is substantially increased by another spring – the Wazzani. The larger river then forms the current line of separation between Lebanon and the Israeli-occupied Lebanese Cheba'a Farms for roughly 3 kilometres, to join the Banias and Liddan at the confluence of the Upper Jordan in Israel. As seen in Figure 3.2, the Hasbani is also fed from the seasonal el Cheba'ani and smaller seasonal streams draining snowmelt and surface water from Mount Hermon.

The Banias River Basin covers about 150 km^2 on the southern flank of Mt Hermon. It is formed by a number of sub-catchments feeding seasonal streams and springs, of which the Banias is the most important. The al-'Asl Stream (also known as Wadi al 'Asl, or Sion) is the Banias' most northern seasonal source, and fed by a spring at 1,000m above sea level

[6] The Marj ak Khowkh plain is often considered part of the Hasbani Basin, and included in surface area estimates. Klein (1998) estimates the basin size without the plain at at 629km2. Rain falling on the plain in Lebanon in fact generates the Ajoun Stream, which joins the Hasbani just south of the border in Israel (see Fig 3.1).

(Hartman 2008). The north-western flank of the wadi is the hillside of Mount Hermon – a large part of which is the Cheba'a Farms.

The Liddan basin is the smallest of the three main basins (24km^2 (Klein 1998)), though provides by far the largest and most reliable flows. It is fed primarily by the Liddan ('Dan') Springs, which are located immediately south of the 1949 armistice line within Israel. As will be explored, the strong discharge of the springs is not matched by the small catchment area, suggesting that the largest part of the recharge area of the springs is located within Lebanon and possibly also Syria (including, but not limited to, the Cheba'a Farms). This is in contrast to the view that the Liddan originates from an aquifer with essentially no surface recharge area (Brielmann 2008: Table 5; Arlosoroff 2011 pers.comm). As we shall see in Section 4.5, the surface water runoff and groundwater recharge for each of the main springs and tributaries is of considerable hydro-political (and geo-political) importance.

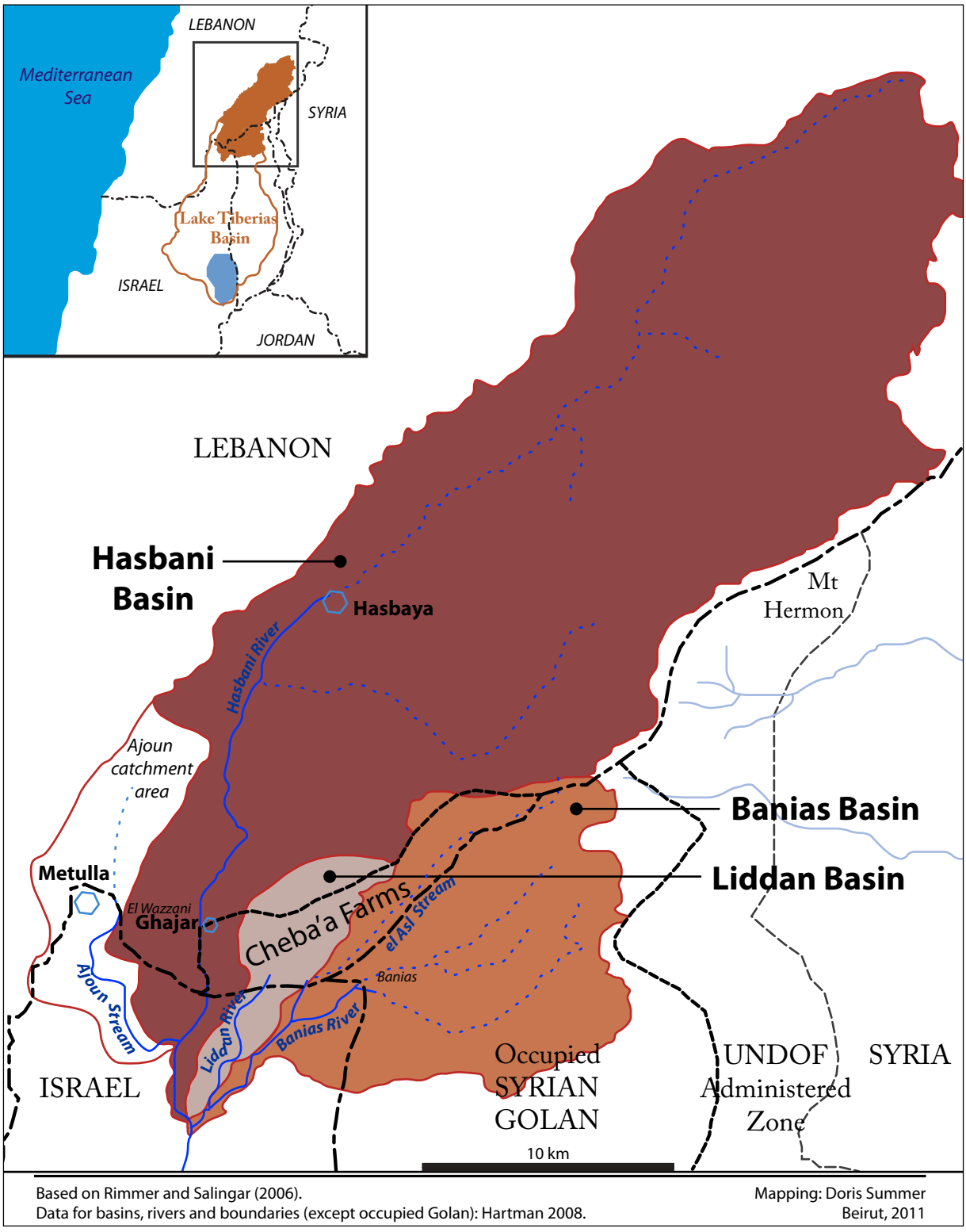

Figure 3.1 The Upper Jordan River catchment areas – composed of the Hasbani, Liddan, and Banias. Adapted from Rimmer and Salingar (2006).

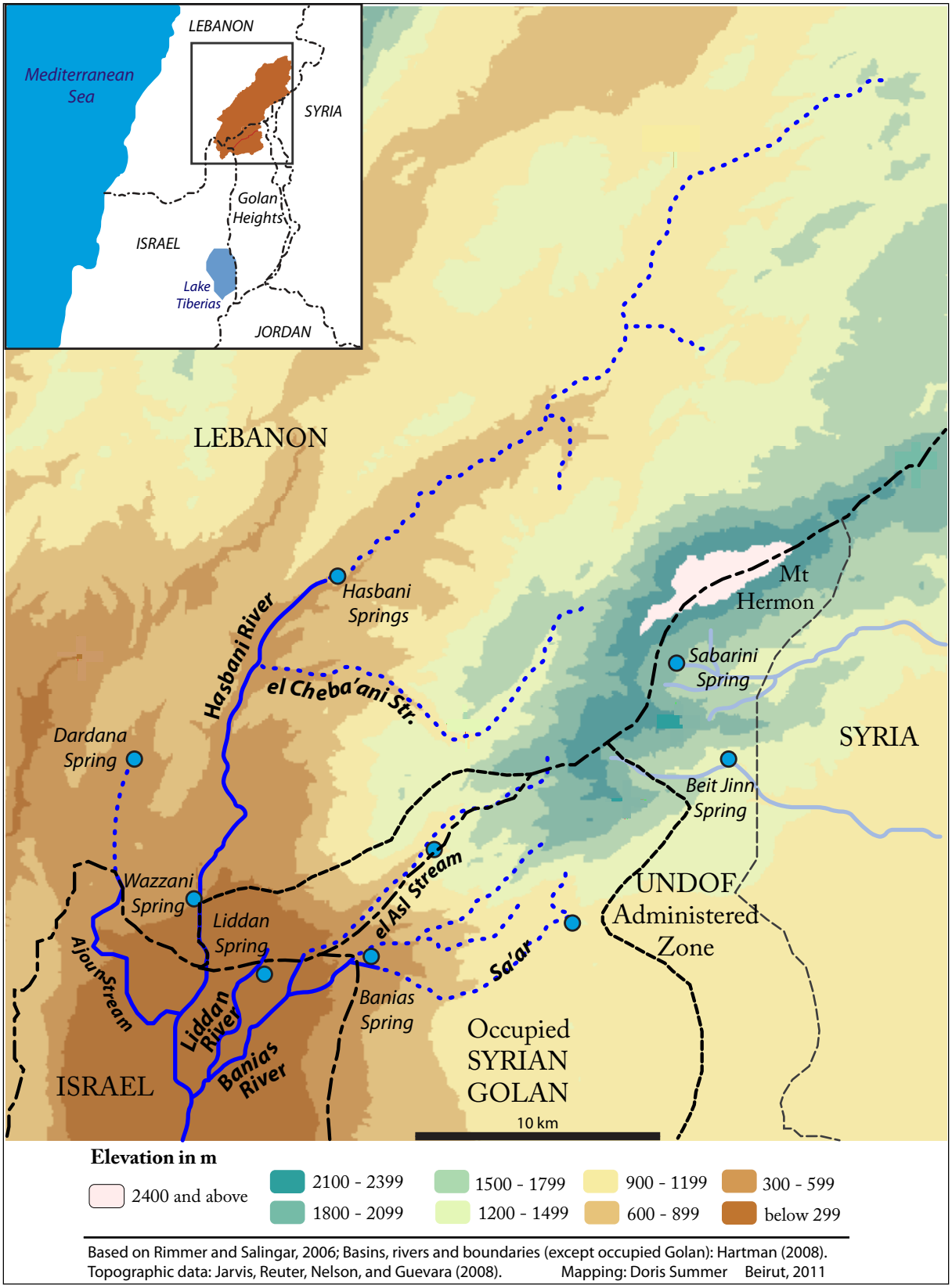

Figure 3.2 Upper Jordan River surface water and topography. Adapted from Rimmer and Salingar (2006).

3.2 Hydrology

Measurement of the flows deriving from the hilly topography, variable rains, and complex geology have generally been kept independently on both sides of the border, through the gauging stations shown in Figure 3.3.

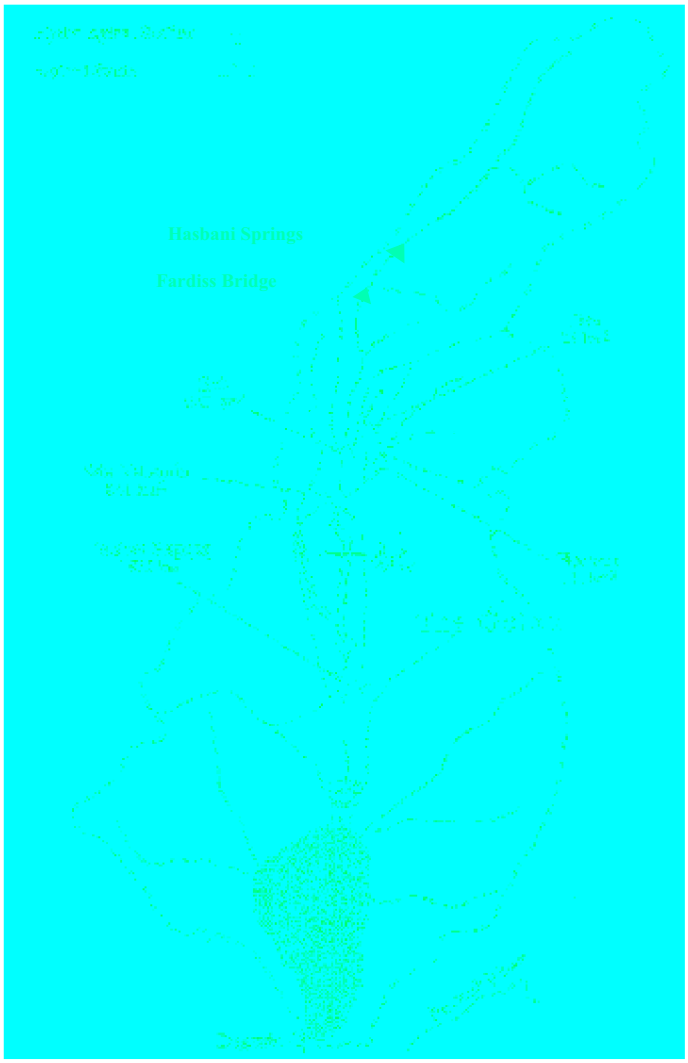

Figure 3.3 River flow gauging stations in the Lake of Tiberias Basin, including the Upper Jordan River basin. After Klein (1998: Fig 1); based on Rimmer et. al. (2005) and LRA (2011), and field observations.

3.2.1 Flows measured in Lebanon

As no record-keeping was possible during the period of Israeli invasion and occupation, Hasbani flow records in Lebanon are available from 1968 – 1974, and from 2002 onwards,[7] as shown in Table 3.1 and Figure 3.4. While the gauging station at the Hasbani Springs is new

[7] The study has searched for but found no evidence of the Israeli army or authorities taking or maintaining flow records within Lebanon during this period. This is despite the demonstrated interest in the flows, and the occupation of the hydro-electric plant-room further upstream.

and placed just downstream of the spring, the station at the Fardiss Bridge (where the el Cheba'ani joins the Hasbani) was placed in the late 1960s (see Photos A.3 and A.4, Annex A), and is considered somewhat unreliable. Flow calculations based on readings of the simple depth gauge are prone to error from changes in the river cross-section due to settlement of sediment and other changes to the river bottom. Furthermore, the data for the time period once gauging resumed after the withdrawal (year 2002-2003) is considered inaccurate, and attributable to issues with instrument calibration (al Najem, pers. comm. 2011), though relatively high flows are also recorded for that year, in Israel (Table 3.2). The apparent inconsistency between the gauging station data for year 2007 – 2008 (the Hasbani gauge measured 30.5 MCM while the while the gauge downstream at Fardiss records only 19.8 MCM) is attributed partly to local abstractions, but mainly to seepage into the aquifer, as explained in Section 3.3.

Monthly and Annual Volumes in MCM (Hasbani springs station).													
Year	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Annual
													Volume
05-06	1.037	0.605	0.864	1.123	3.110	6.134	4.666	11.146	3.369	2.506	1.552	0.862	36.974
06-07	0.778	0.674	0.795	0.570	1.192	7.966	5.841	6.515	3.836	1.624	1.192	1.087	32.070
07-08	0.713	0.623	0.735	1.559	1.167	6.740	6.583	3.943	1.803	1.875	2.072	2.640	30.453

Monthly and Annual Volumes in MCM (Fardiss Bridge).													
Year	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Annual
													Volume
68-69	0.389	0.445	0.451	28.687	51.170	26.720	17.741	9.482	4.317	3.142	2.677	1.547	146.768
69-70	1.102	0.923	0.713	1.221	6.935	5.175	17.876	5.107	2.477	1.814	0.933	0.335	44.611
71-72	0.630	0.633	0.593	2.507	6.606	11.098	4.556	4.419	3.495	2.029	1.185	0.600	38.351
72-73	0.425	0.370	0.215	0.276	0.720	1.575	8.054	1.941	0.924	0.293	0.088	0.027	14.908
73-74	0.013	0.013	0.448	1.216	11.415	11.985	17.763	10.231	3.747	1.791	0.576	0.244	59.442
02-03	0.822	1.853	4.202	37.073	8.745	100.545	82.620	10.566	5.408	0.709	1.178	1.318	255.039
03-04	1.322	1.338	1.232	1.863	21.194	24.938	7.191	2.358	1.377	1.072	0.773	0.680	65.338
04-05	0.358	0.303	0.760	0.844	3.114	14.776	8.733	3.451	1.988	0.999	0.741	0.782	36.849
05-06	0.323	0.226	0.590	1.074	2.651	9.489	5.050	5.068	2.155	1.346	0.966	0.277	29.215
06-07	0.248	0.683	0.697	0.833	2.548	8.789	9.826	4.828	3.192	1.028	0.389	0.113	33.174
07-08	0.022	0.000	0.000	0.432	1.426	9.461	5.184	1.728	1.166	0.173	0.130	0.086	19.808

Table 3.1 Hasbani River flow volumes measured at the Hasbani Spring, 2005-2008; and Fardiss Bridge, 1968 – 1974 (LRA 2011). Note the spike in year 2002-2003 is not considered accurate, and attributed to issues with calibration of the gauging equipment.

Based on his analysis of precipitation records, al Najem has estimated average annual flow *downstream* of the Fardiss Bridge station and upstream of the Wazzani Springs at approximately 135 MCM/y (al Najem 2011).

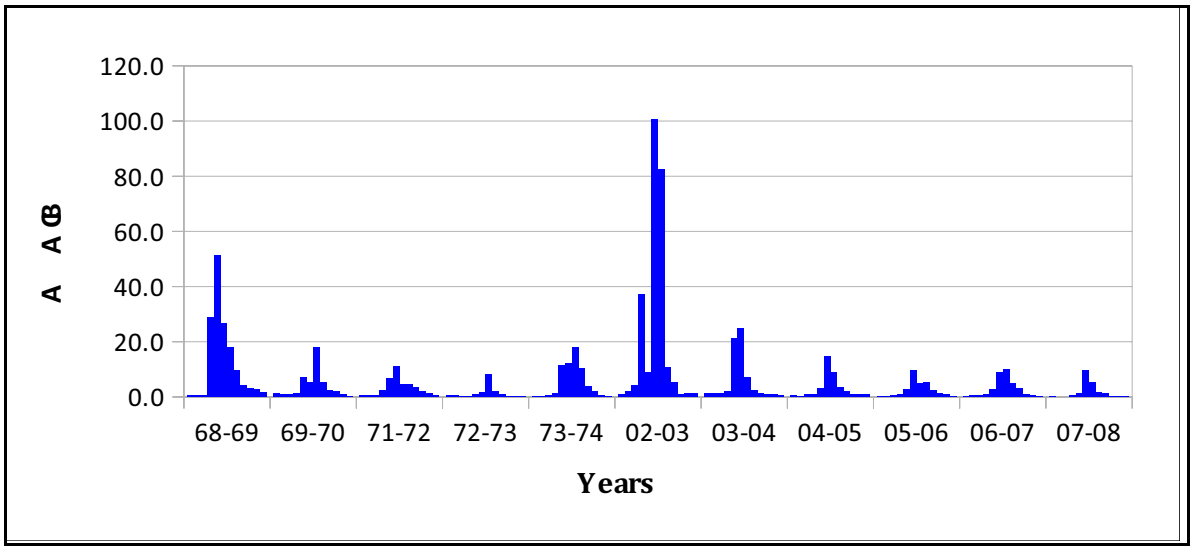

Figure 3.4 Hasbani River flows, measured at the Fardiss Bridge, 1968 – 1974, and 2002 – 2007, showing the high inter-annual and intra-annual variability (LRA 2011). Note the spike in year 2002-2003 is not considered accurate, and attributed to issues with calibration of the gauging equipment.

3.2.2 Flows measured in Israel

Flow monitoring records of the Lake of Tiberias have been kept by the Hydrological Service of Israel (HSI) have been kept since 1949, and are now gauged through nine different points (see e.g. Givati and Lynn 2011). The striking difference in intra-annual variability between the three main tributaries is shown clearly in Figure 3.5.

The spikes of the discharge curves of the Hasbani and Banias reflect the rivers' responsiveness to rainfall, while the steady core reflect groundwater-fed 'base flows'. In a similar way, the smooth discharge curve of the Liddan further demonstrates the importance of groundwater to that river, as annual changes are shown to have little influence. The steady flow of the Liddan holds for *inter*-annual variability, as Table 3.2 and Figure 3.6 show. The average flow measured just upstream of the confluence of the 3 main Upper Jordan River tributaries during the period 1949-2004 for the Hasbani is 123 MCM/y, Liddan - 241 MCM/y, and the Banias - 114 MCM/y. The average flow of the Upper Jordan River at the confluence of the three rivers is thus taken as 480 MCM/y. The annual discharge of the Liddan is much more stable than those of the Banias and the Hasbani, rarely exceeding a deviation of 10% below or above its average. By contrast, the Banias regularly deviates from its average annual flow by 30%. The most extreme variations are observed on the Hasbani, which regularly deviates by up to 40% from its average annual flow.

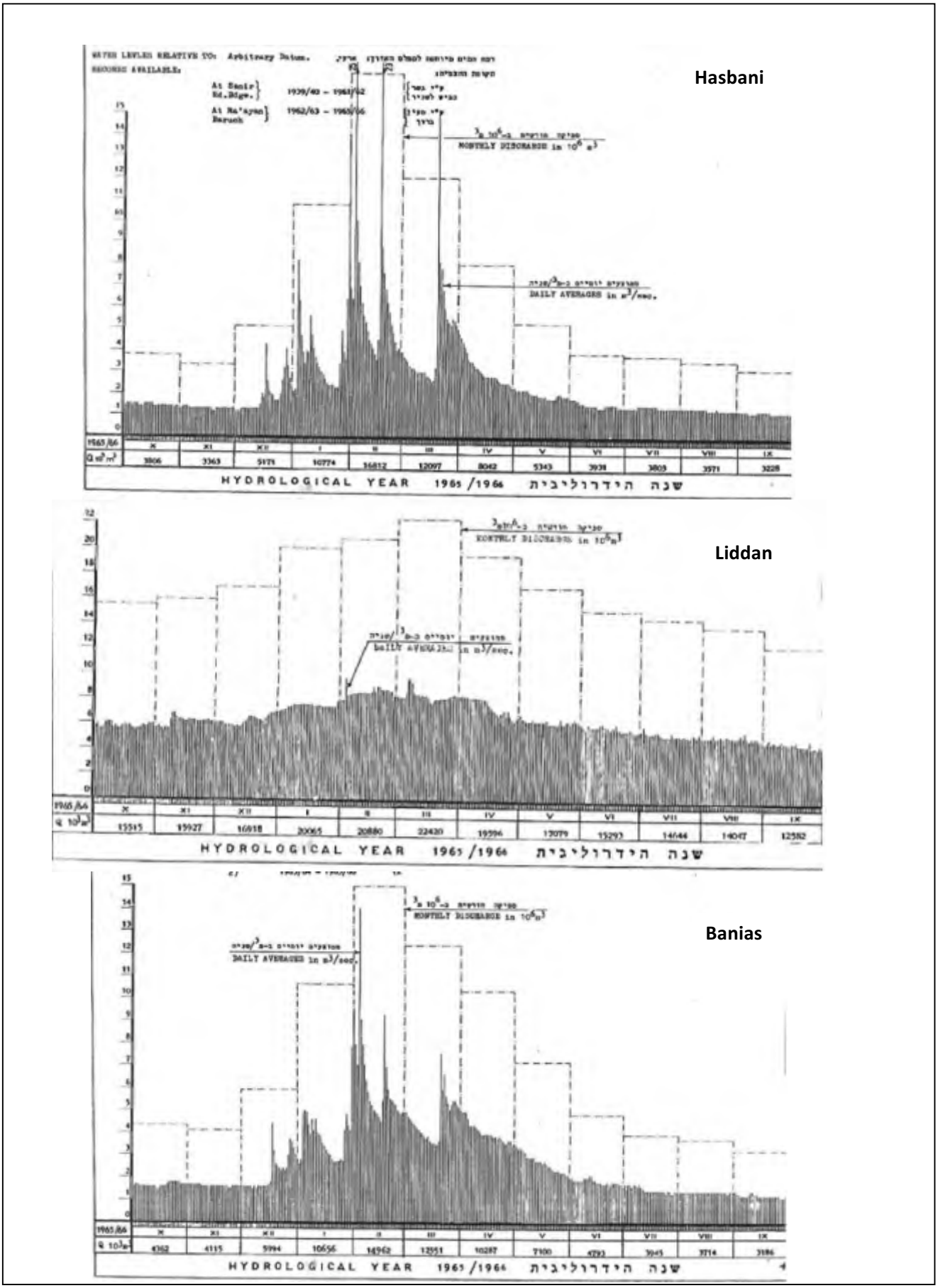

Figure 3.5 Daily flows of the Hasbani (top), Liddan (centre), and Banias (bottom), 1965 – 1966 (HSI 1966).

Year	Hasbani		Liddan		Banias	
	Flow	*% dev'n from avg*	*Flow*	*% dev'n from avg*	*Flow*	*% dev'n from avg*
49-50	121	*-1.9*	285	*18.3*	134	*17.3*
50-51	52	*-57.9*	208	*-13.6*	63	*-44.9*
51-52	161	*30.5*	232	*-3.7*	178	*55.8*
53-52	192	*55.6*	267	*10.8*	163	*42.7*
53-54	N/A	--	288	*19.6*	190	*66.3*
54-55	53	*-57.0*	241	*0.1*	75	*-34.3*
55-56	140	*13.5*	235	*-2.4*	185	*61.9*
56-57	160	*29.7*	240	*-0.4*	113	*-1.1*
57-58	169	*37.0*	231	*-4.1*	126	*10.3*
58-59	120	*-2.7*	203	*-15.7*	91	*-20.3*
59-60	99	*-19.8*	173	*-28.2*	79	*-30.8*
60-61	120	*-2.7*	N/A	--	90	*-21.2*
61-62	171	*38.6*	217	*-9.9*	114	*-0.2*
62-63	168	*36.2*	258	*7.1*	161	*40.9*
63-64	160	*29.7*	231	*-4.1*	135	*18.2*
64-65	128	*3.7*	227	*-5.8*	141	*23.4*
65-66	80	*-35.2*	253	*5.0*	86	*-24.7*
66-67	201	*62.9*	258	*7.1*	142	*24.3*
67-68	159	*28.9*	290	*20.4*	124	*8.5*
68-69	304	*146.4*	284	*17.9*	217	*90.0*
69-70	124	*0.5*	275	*14.2*	114	*-0.2*
70-71	169	*37.0*	259	*7.5*	134	*17.3*
71-72	94	*-23.8*	263	*9.2*	97	*-15.1*
72-73	47	*-61.9*	126	*-47.7*	58	*-49.2*
73-74	105	*-14.9*	158	*-34.4*	117	*2.4*
74-75	82	*-33.5*	163	*-32.3*	102	*-10.7*
75-76	121	*-1.9*	274	*13.8*	127	*11.2*
76-77	147	*19.1*	296	*22.9*	125	*9.4*
77-78	166	*34.5*	312	*29.5*	136	*19.1*
78-79	40	*-67.6*	231	*-4.1*	60	*-47.5*
79-80	162	*31.3*	267	*10.8*	138	*20.8*
80-81	183	*48.3*	291	*20.8*	146	*27.8*
81-82	70	*-43.3*	278	*15.4*	84	*-26.5*
82-83	146	*18.3*	276	*14.6*	106	*-7.2*
83-84	92	*-25.4*	276	*14.6*	92	*-19.5*
84-85	95	*-23.0*	262	*8.8*	84	*-26.5*
85-86	61	*-50.6*	208	*-13.6*	64	*-44.0*
86-87	206	*67.0*	276	*14.6*	159	*39.2*
87-88	168	*36.2*	292	*21.2*	142	*24.3*
88-89	51	*-58.7*	218	*-9.5*	63	*-44.9*
89-90	37	*-70.0*	160	*-33.6*	52	*-54.5*
90-91	43	*-65.2*	177	*-26.5*	62	*-45.7*
91-92	255	*106.7*	284	*17.9*	210	*83.8*
92-93	156	*26.4*	302	*25.4*	147	*28.7*
93-94	74	*-40.0*	257	*6.7*	81	*-29.1*
94-95	118	*-4.4*	267	*10.8*	123	*7.7*
95-96	80	*-35.2*	254	*5.5*	96	*-16.0*
96-97	85	*-31.1*	253	*5.0*	86	*-24.7*
97-98	118	*-4.4*	269	*11.7*	108	*-5.5*
98-99	38	*-69.2*	220	*-8.7*	48	*-58.0*
99-00	47	*-61.9*	189	*-21.5*	79	*-30.8*
00-01	30	*-75.7*	161	*-33.2*	48	*-58.0*
01-02	61	*-50.6*	202	*-16.1*	83	*-27.3*
02-03	286	*131.8*	188	*-21.9*	178	*55.8*
03-04	148	*19.9*	202	*-16.1*	127	*11.2*
Avg	**123**	***40.4***	**241**	***15.1***	**114**	***29.8***

Table 3.2 Annual flows of the Liddan, Banias, and Hasbani rivers, measured upstream of their confluence point, 1949 – 2004 (HSI 1977, HSI 2004), and Klein (1998)) for 1977-1992.

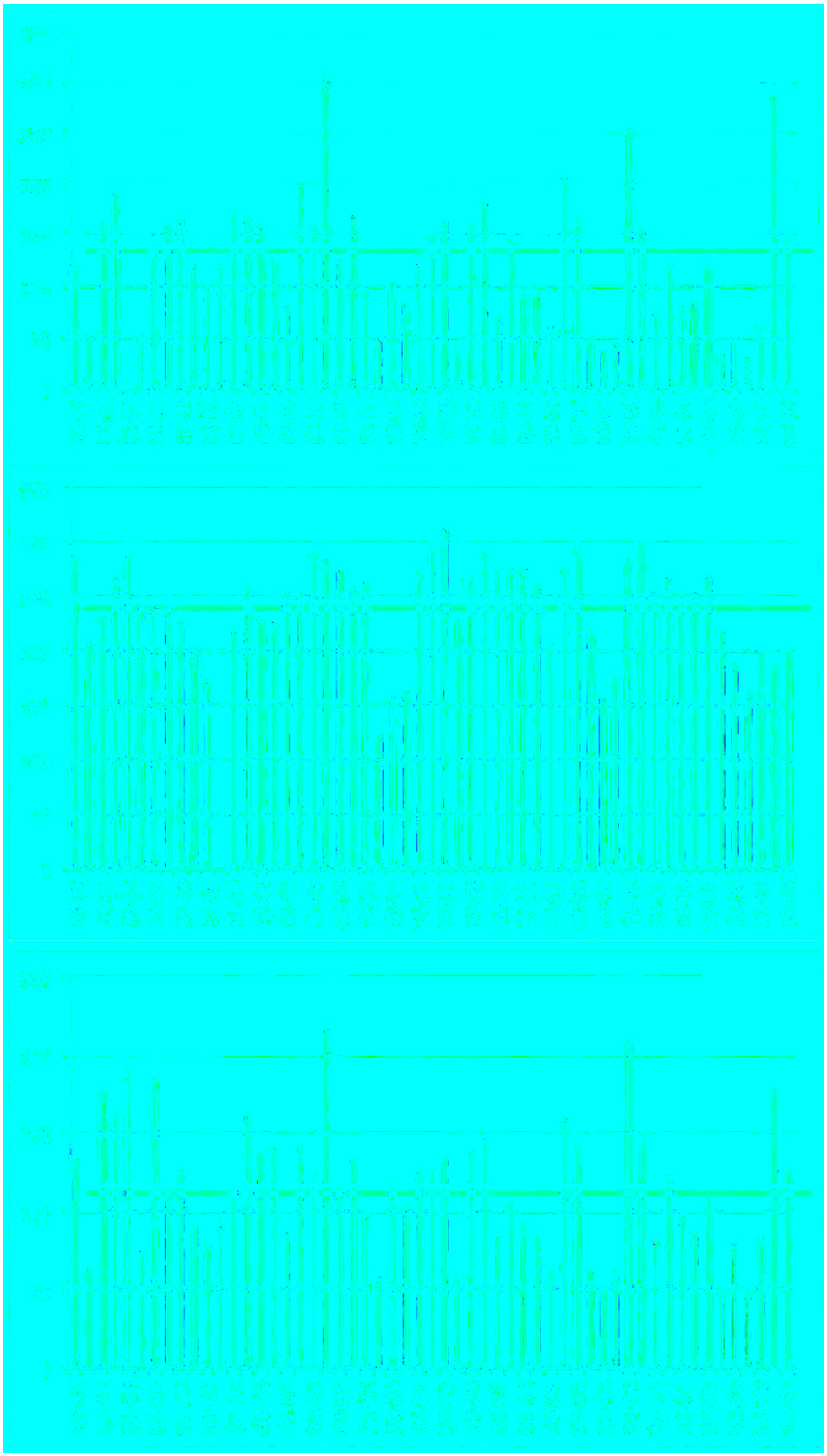

Figure 3.6 Annual flows of the Hasbani (143 MCM/y +/- 43%), Liddan (241 MCM/y +/- 10%), and Banias (114 MCM/y +/- 30%), 1949 - 2004. HSI Yearbooks 1949-1977 1959-2004, and 1992-2004, and Klein (1998) for 1977-1992.

The high seasonal and inter-annual variability assigns different values to each of the tributaries, from a water resources management perspective. Mandated to deliver an assured supply, water resource managers would clearly prioritise the much greater and much more steady flows of the Liddan. The Banias and Hasbani flows may be seen as 'surplus' flows that are welcome during wet years, but which could not be relied upon. The steady base flow portion of the Hasbani (which is provided by the Wazzani springs, not upstream – Figure 3.5) would be a secondary reliable source.

3.2.3 Surface water quality

Data on surface or groundwater quality in Lebanon has not been consistently collected or filed in Lebanon, and in Israel is very difficult to come by. Hasbani River water quality is impacted by a number of sources. First, from the acidic residues of olive oil production that are dumped in the mainstream, typically in late October and November. Where intensive agriculture is practised, run-off is also contaminated with fertilizers and pesticides. Domestic wastewater is a third potential source of pollution, owing to a lack of a wastewater collection network and inadequately drained household septic tanks. The very sparsely populated and farmed areas over the Liddan and Banias basins tend to ensure relatively good water quality there, while the water quality of Tiberias is affected by saline springs.

The UNDP (2007) and UNEP (2007) reports conducted in the wake of the 2006 war give an indication of the poor water quality throughout Lebanon. The low population density and level of industrial activity may account for the lack of major biological or heavy metal contamination noted downstream in Israel. A greater potential concern is the pollution of ground water, where hotspots close to water wells affect the quality of the domestic water supply.

3.3 Hydrogeology, Springs and Groundwater Flows

The Upper Jordan River basin lies fully within the Syrian arc fold system that extends from northern Egypt to northern Syria and Turkey. The anticline forms Mount Hermon and the surrounding recharge areas and consists mostly of Jurassic limestone of a thickness of 2,000 – 2,700m (Brielmann 2008). Exposed to the west of Hermon, the aquifer provides quick infiltration, and is a primary source of the Upper Jordan River flows.

Further south, the Huleh depression lies between two major faults: the Qiryat Shemona master fault and the Jordan River fault. The western Qiryat Shemona fault splits into the Yammouneh and Roum faults which tend north and north-westward, respectively. The Jordan River fault turns northeast and splits into the Sion-Rachaya and Serjaya faults As Brielmann (2008: 50) notes, the former of these "parallels the axis of the Hermon anticline, divides the Hermon Massif into two main blocks: the western Sion shoulder and the central and eastern Hermon Range, the latter comprising the Sirion and Hermon ridges".

The aquifer is composed primarily of Karst limestone, through which rainfall enters directly (when the geology is completely exposed) or through the overlying soil layer, as seen in the schematic of Figure 3.7. As is the case with all Karstic aquifers, the hydrogeology is complex, and composed of subterranean channels (enclosed or semi-enclosed) and diffuse flow matrices through which the groundwater flows. The discharge of the aquifer feeds the Hasbani, Liddan and Banias, and numerous other smaller springs (see Figure C.3, Annex C).

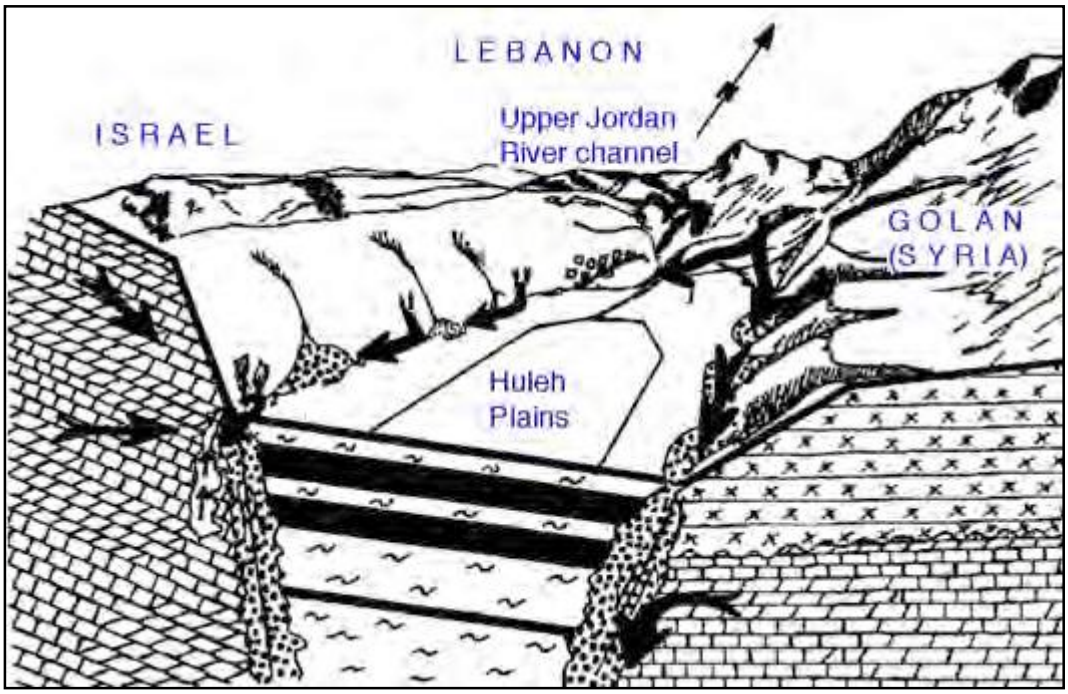

Figure 3.7 Groundwater circulation in the Upper Jordan River Basin. Arrows indicate direction of groundwater flow or spring discharge. "Brick signature = carbonates, circles = gravel/sands, waves = clay/silt, black bars = peat, arrows = direction of water movement" (Kafri and Lang 1979, from Brielmann 2008: Fig. 10) (labels added).

The complex geology makes detailed hydrogeological modelling – and thus predictions of and assumptions about groundwater flows – very difficult. The flows have been interpreted by a number of analysts (e.g. Gil'ad and Bonne 1990, Rimmer 2006, Rimmer and Salingar 2006, Brielmann 2008, Hartmann 2008), who have initiated a process that will serve to clarify the hidden resource. A more detailed hydrogeological mapping and interpretation of borehole information of the area would serve to develop an improved hydrogeological model, and allow improved quantitative estimates of flows and storage volumes – and be of great benefit to this study's hydropolitical baseline.

As Figure 3.8 shows, the groundwater recharge rate into the entire Lake of Tiberias ('Kinneret') basin stands at about 500 - 550 MCM/y. The volume is by far the highest in the region, and much greater even than the highly-coveted and much fought-over Western "Mountain" Aquifer Basin straddling Israel and the West Bank. The recharge area of the Lake of Tiberias basin includes more than just the Upper Jordan River basin (i.e. the saline

recharge from the Easter Lower Galilee), however, and so to be of relevance to this study, must be 'unpacked'.

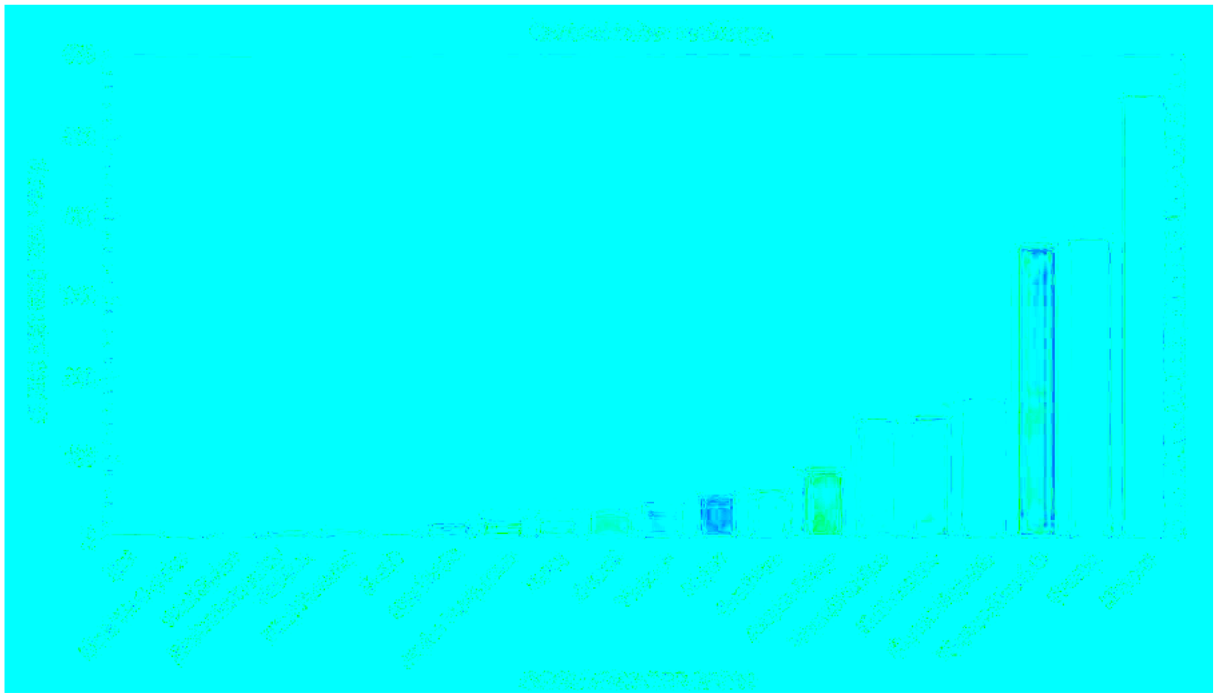

Figure 3.8 Groundwater recharge rates of select aquifer basins in the Middle East, showing Kinneret (Lake of Tiberias) Basin as by far the largest at about 550 MCM/y (EXACT 2005).

To identify the precipitation – stream flow relations that originate from the karstic region of Mount Hermon, Rimmer and Salingar (2008) employ a system approach grouping the available data of precipitation, evaporation and surface flow. The authors attributed the higher responsiveness of the Hasbani and Banias springs to their much larger surface catchment areas, as well as to differences in elevation between the springs; the hydraulic head at the spring is accordingly larger and longer lasting.[8] The authors further suggest that the springs are outlets from the same or hydraulically connected aquifer(s) originating in Mount Hermon.

Hydro-chemical and water isotope analysis serves to further differentiate the behaviour of these springs. Brielmann (2008: 108) confirms earlier research that suggests that "the Sion-Rachaya fault divides the southern Hermon into an eastern and western recharge area" respectively feeding the Banias on one side and the Liddan and Hasbani on the other.

[8] The authors highlight a number of limitations with their analysis (related mainly with incomplete information due to lack of data availability and data sharing), and affirm the previously-discussed disconnect between basin size and river flow: "Finally, the location of different aquifers in the region, and the recharge area of the three main tributaries of the Jordan River are unknown. Moreover, from the ratios of surface to baseflow, it is clear that these recharge areas are not correlated with the size of the geographic surface water catchments" (Rimmer and Salingar 2006: 526).

Uncertainty remains, however, as to where the flows split and whether the recharge areas are connected further north.

As Table 3.3 shows, the contribution to the Upper Jordan River flows of the Hasbani, Liddan and Banias springs are estimated at 64, 249 and 80 MCM/y, respectively. The total groundwater contribution – nearly 400 MCM/y – is about 80% of the total surface water flow, measured just upstream of the confluence of the rivers (which we have seen is about 480 MCM/y)[9].

Table 2 Statistical analysis of daily streamflow (10^3 m^3) in the three major tributaries of the Upper Jordan River for the period from 1/10/1969 to 31/10/2004

Station no. (IHS)		Snir	Hermon	Dan
		30122	30128	30131
Quantiles (10^3 m^3)				
100.0%	Maximum	9244.8	5890.1	1070.3
99.5%		2824.9	1412.3	950.7
97.5%		1556.3	923.2	914.0
90.0%		786.7	604.8	867.2
75.0%	Quartile	347.3	382.0	814.8
50.0%	Median	147.0	198.7	714.4
25.0%	Quartile	103.0	126.1	588.9
10.0%		78.6	97.0	452.5
2.5%		55.3	70.0	348.8
0.5%		44.1	62.2	289.5
0.0%	Minimum	6.0	45.8	277.3
Moments (10^3 m^3)				
Mean		324.37	291.47	690.10
Std deviation		448.84	255.21	156.10
Std error of mean		3.96	2.25	1.38
Upper 95% mean		332.14	295.89	692.81
Lower 95% mean		316.59	287.05	687.39
N		12,813	12,815	12,734
Annual streamflow (10^6 m^3)		118	106	252
Annual baseflow (10^6 m^3)		64	80	249
Annual surface flow (10^6 m^3)		54	26	3

Table 3.3 Streamflows of the Hasbani (Snir), Banias (Hermon), and Liddan (Dan) rivers, 1969 – 2004. Note annual base and surface flows. Rimmer and Salingar (2006: Table 2).

3.3.1 Transboundary Groundwater

The location of the recharge area of the flows is of as much significance to the hydropolitical study at hand as is any estimate of their volume. Because of the complex relationship between runoff, recharge area, and springs, however, the precise location of some of the sources of the Upper Jordan River is difficult to determine. As Rimmer and Salingar (2006: 526) point out, "large springs may immerge into streams in various locations and contribute large base flow, which is not related to the size of the geographic surface catchments". Brielmann (2008: 18) suggests that the *subsurface* catchment area for the Liddan is about

[9] And this also corroborates the earlier estimates of Gil'ad and Bonne (1990: 1).

1320 km2, noting that "recharge to the Dan stream generates from a big part of the Anti-Lebanon/Hermon range (actually laying in Lebanon and Syria)",[10] though the lack of rainfall data compromises the accuracy of the figure. By way of comparison, the author estimates the *subsurface* catchment area of the Banias at only about 520km2,[11] while a hydro-chemical estimate for the Hasbani has not yet been undertaken.

As such, the recharge areas for all of the major springs in the Upper Jordan River are transboundary. The groundwater flowing across the Israeli border from Lebanon has been estimated from 170 MCM/y (Merheb 2010: 40) to 200-210 MCM/y (Comair 2009: 242). Yet the hydro-chemical modelling and analysis suggests that the bulk of the base flow of the Liddan River (241-249 MCM/y) derives from Lebanon and Syria. Given the likely hydraulic inter-connectedness of the catchment areas, it further seems probable that groundwater originating in Lebanon also feeds the base-flows of the Banias (80 MCM/y) (from Table 3.3), and of course the Wazzani (64 MCM/y). Thus the total Lebanon-Israel transboundary groundwater flows could be very roughly estimated at a large percentage of the entire base flows - say 250 to 350 MCM/y (which is close to estimates made by Najem (2011, pers.comm)). The figure is subject, of course, to significant uncertainty, given the absence of reliable precipitation data, the extent of the groundwater recharge area, flow and percolation coefficients.

3.3.2 A side note on Litani-Hasbani hydrogeological connections

There has been much speculation but very little informed debate about the hydraulic link between the Litani and Hasbani rivers through the geology of the mountain range that separates them. The hydropolitical implication of the existence of such a link is that the Litani River itself would be considered part of the Jordan River Basin, and hence an international transboundary (not strictly a Lebanese) river. This study has not sought to contribute to the debate, but has broached it tangentially. It has found no hydrogeological essays to establish the assertion, either by the Lebanese authorities or by the Israeli army during their 22 year occupation of the area.

The possibility of a hydraulic link was first asserted by Kolars (1992: 25), who suggests unaccounted Litani flows be attributed to unaccounted for Wazzani flows. The possibility is also asserted in Medzini and Wolf (2004) through a cursory exploration of an association between Hasbani flows and the water levels of Lake of Qara'oun.

The idea of a hydraulic connection is refuted by Rimmer (2011, pers.comm.), who asserts both that the Hermon basin alone is large enough to supply the measured flows of the

[10] The rough location of the origin of the groundwater flows is confirmed by Rimmer (2011, pers.comm). Similarly, Kolars (1992: 24) asserts that the Dan receives "practically all of its flows [which he counts at 239 MCM/y] from unknown areas outside of its basin".

[11] Comair estimates the exposed karst area at 400km2, of which 330km2 are within Lebanese territories (Comair 2009,p. 243).

Hasbani, and that the Litani cannot in any case be a contributing river since its flows are below the level of the Hasbani, at the nearest relative region.[12] Establishing an accurate reading of the topic is of significant geopolitical importance, and would require both a detailed hydrogeological investigation as well as a legal analysis of any such implications (particularly in light of the 2008 Draft Aquifer Articles, as discussed in Section 8).

3.4 Land use

The level of poverty in the Hasbani region is amongst the highest in Lebanon. Long-existing socio-economic imbalances between Hasbani and the economic centre (Beirut) or coastal areas have only been entrenched by the Israeli invasion and occupation period. A nation-wide survey of living standards emphasises the continued dis-connect between the region and the rest of the country, noting that there has been "no marked change in the education field, nor in the index of income-related indicators, where the deprivation percentage remained stable at 62% of households. In essence, this region seems to resist social or economic mobility, and is unaffected by what impacts the other regions, negatively and positively. It is a sub-region that is stable, with high levels of deprivation"[13] (MOSA-UNDP 2007: 58).

Estimates of the Lebanese population living within the Hasbani region (which includes the Marj el Khowkh) in Lebanon varies from 95,000 to 170,000 (UNDP 1995, in GOL 2002) with the most reliable estimate likely 135,000[14] (MEDA 2003, CAS 2004). The large variability in the estimated population size reflects not only poor data quality, but the high mobility of the residents. As jobs are scarce in the area, employment-related seasonal migration is common. Individuals and entire families often spend the week or winter working in larger coastal cities and return on weekends or during the summer months. This compares with the roughly 1.1 M residents of the Lake of Tiberias district in Israel, who are generally less transient.

As Table 3.4 (and the landuse map (Figure C.4 in Annex C) show, olives are the main crop, and grow alongside legumes and vegetables. The main irrigated crops are watermelon and melon, as well as cucumbers, tomatoes, squash and eggplants, strawberries and alfalfa. About 60% of local production of melons is planned to derive from the service area of the projected Ibl al Saqi Dam. Winter rainfed farming includes potatoes, wheat, barley, and lentils (ROL 2008, Merheb 2010). An estimated 30,000 goats and 3,000 cows are held in the area, while fruit orchards (peach, nectarine) are less common than in the rest of Lebanon

[12] The elevation of the Litani River at its bend near Deir Mimas is about 235 m ASL, while the elevation of the Hasbani near the Lebanon-Israel border is about 290m ASL.

[13] For a discussion of Lebanese political economy, regional development and the South, see Gates (1998), Soueid and Sanbar (2000), Picard (2002), Allès (2007) Verdeil et. al. (2007) .

[14] Results are derived from average household size from the MOSA and number of primary housing unit, cazas Rachaya, Marjayoun, Hasbaya.

(LMoA 1999, Verdeil*, et al.* 2007, ROL 2008). In Israel, most of the Upper Jordan River Basin is planted with plantations or field crops, as seen in Figure 3.9.

Land use class		Area (hectares)	% of basin area
Urban Areas		2500	3.6
Non irrigated agricultural land	**Olives**	7250	11
	Vineyards	1200	1.8
Irrigated agricultural land	**Field Crops**	8350	12.5
	Fruit trees	800	1.2
Wood land	**Coniferous**	400	0.5
	Deciduous	4000	4.7
Grassland		43200	64
Bare land		425	0.7

Table 3.4 Land use in the Hasbani catchment (Merheb 2010).

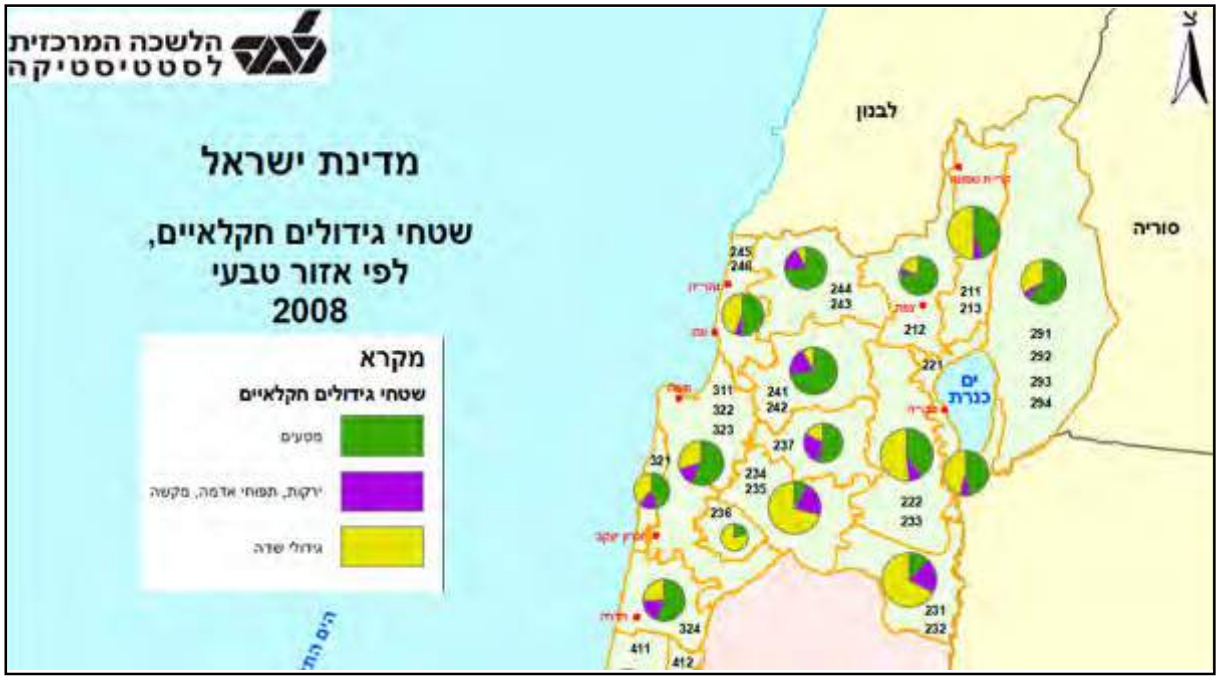

Figure 3.9 Agricultural land use in northern Israel (original: 'Agricultural crop areas by natural region') (ICBS 2008). Green = plantations; yellow = field crops; purple = vegetable, potato and melon. Not shown are orchards, fish ponds, and cattle grazing areas (Markel and Shamir 2001).

3.5 Water abstractions

3.5.1 Water abstraction and use in Lebanon

The Hasbani catchment region is served by 9 public wells estimated to withdraw approximately 3.7 MCM/y, generally for domestic supply to the villages – as shown in Table 3.5.

Locality	Discharge capacity (m3/hr)	Hours pumping per day	Annual withdrawal (MCM)
Ain Arab	18	24	0.16
Halta	54	24	0.47
Kfarhamam	61	24	0.54
El-Meri	14	24	0.12
Ibl-el-Saqi	180	24	1.57
El-Bireh	50	5	0.09
Rachaya	50	20	0.37
Marj-es-Samah	35	12	0.15
Kfeir	33	6	0.07
Total			***3.7***

Table 3.5 Public wells and pumps in the Hasbani catchment (after Merheb 2010).

A number of private unlicensed wells also provide water for irrigation and domestic purposes. There were an estimated 27 in 2007 for the southern part of the Hasbani catchment area. Eight of these were located in 2008, pumping date from two of which were collected – at 3 litres/second (0.1 MCM/y), and 5 litres/second (0.2 MCM/y) respectively (ROL 2008). As with other parts of Lebanon, information on abstraction rates from illegal wells is wanting, and any estimate of their actual abstractions cannot be considered very accurate.[15] If 40 wells were pumping 12 hours per day for half the year (no need during the wet winter months) at 4.5 litres per second, the total abstractions through private unlicensed wells would be roughly 1.4 MCM/y. Total groundwater abstractions in the basin are thus estimated at 4.4 MCM/y (3.7 + 1.4 MCM/y). This compares with Comair's (2009: 255) total abstractions of 6.9 MCM/y (2.7 for domestic use and 4.2 for irrigation), which likely includes surface water abstractions.

An additional estimated 4 MCM/y is withdrawn from the Wazzani pumping station (as we shall see in greater detail). The very rough higher-end estimate of total abstractions in Lebanon from the Hasbani Basin is **approximately 11 MCM/y** (6.9 + 4 MCM/y). The estimate

[15] The number of unlicensed wells in the whole of Lebanon is estimated between 33,000 (CAS 2004) and 43,000 (MoEW 2011), while the number of licensed wells is believed to be about 17,000.

is roughly one-third of the proposed 'Johnston Allocation' of 35 MCM/y (see Table 4.1), and one-quarter of the 50-55 MCM/y projected as the future Lebanese share.

3.5.2 Water abstraction and use in Israel

Though river monitoring is much more extensive in Israel than in Lebanon, data on abstraction rates is neither public nor readily available. Surface water abstractions from the Lake of Tiberias via the National Water Carrier (NWC) range from 345 (HSI 2004: 288) to 500[16] MCM/y (UNEP 2003: 11), with an average of about 340 MCM/y between 1969 - 1990 (HSI 2008) (see abstraction data – Table C.1, Annex C).

Relating the abstractions from the Lake of Tiberias with abstractions solely from the Upper Jordan River also requires considering other inflow sources (such as natural springs, local runoff, and diverted water from the Yarmouk River), as well as evaporation and local abstractions from the Lake. The foundational IWMI study on the Lower Jordan River – see Figure 3.10 – shows 100 MCM/y used for local ('North') irrigation,[17] and evaporation at 285 MCM/y (for which the relative share from the Upper Jordan is roughly 160 MCM/y).[18]

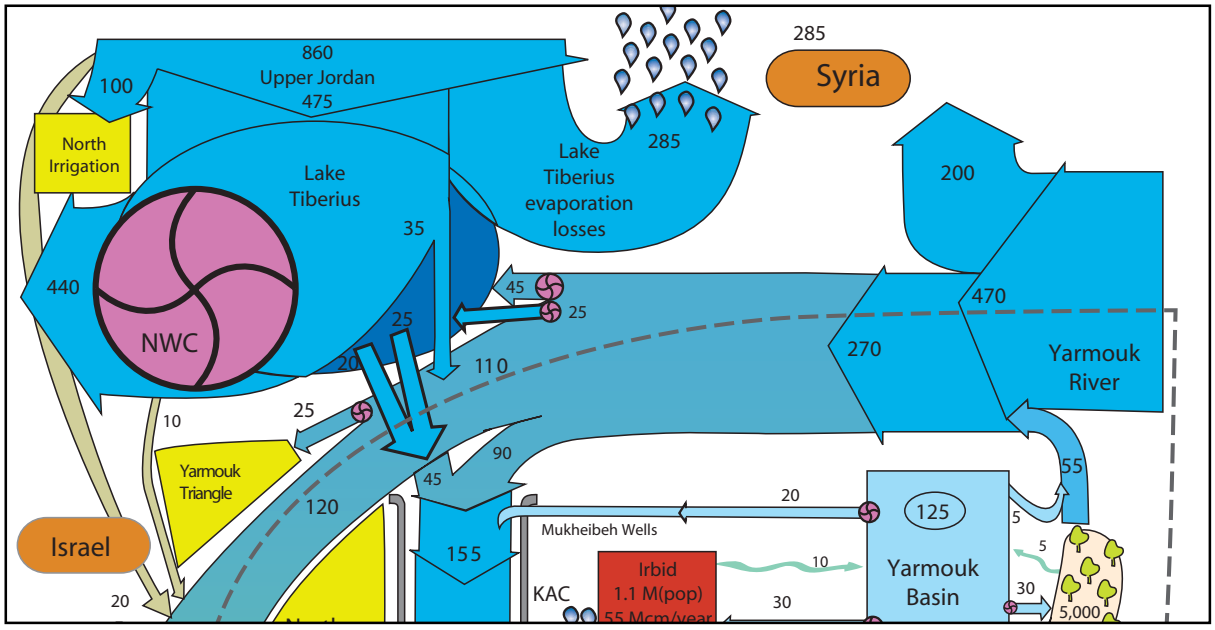

Figure 3.10 Water use in the Lower Jordan River. The top of the image indicates Upper Jordan River flows and use. Total flows at the confluence of the Upper Jordan River are shown as 475 MCM/y. ['NWC' is the National Water Carrier completed by Israel in 1964. All flows MCM/y.] (Courcier, *et al.* 2005).

[16] Other estimates : 400 (Markel 2004a) to 460 MCM/y (Jridi 2002: 24).

[17] Also estimated at 50 (Markel 2004a) to 140 MCM/y (Brielmann: Fig 2), 30-95 MCM/y of which is estimated to be used in the Golan (ICBS 2004: Table 27, HSI 2008).

[18] The stated 285 MCM/y lost to evaporation from the Lake is based on a total inflow into the Lake of 860 MCM/y. The estimated evaporation from Upper Jordan River flows only is in relation to their magnitude (of 480 MCM/y), i.e. 157 rounded up to 160 MCM/y.

Groundwater abstractions within the entire Lake of Tiberias Basin (including the Golan) from 1999 – 2001 are estimated by the Government of Israel to range from 57 to 69 MCM/y (GOI MNI 2002). A gross lower-end estimate of total water use in Israel from the Upper Jordan River Basin would add a fraction of the groundwater abstractions (say 40 MCM/y) to the inflow contribution of the Upper Jordan River (480 MCM/y [19]). Total water abstracted in Israel from the Upper Jordan River basin is thus very roughly estimated at **520 MCM/y**, of which approximately 160 is 'lost' to evaporation. This is considerably higher than the 'Johnston Allocation' figure normally understood as the Israeli share (400 MCM/y) but less than the effective Johnston Allocation[20] (616 MCM/y – see Table 4.1)), and compares with the estimated 11 MCM/y abstracted in Lebanon.

Though the estimates of abstraction are not very accurate, they do give a good idea of the asymmetry in use and control when considered in relation to each other. Israel uses roughly 65 times more of the Upper Jordan River flows than Lebanon (or 33 times more, if evaporation is not included), and Syria uses essentially none. As we will see in Section 7, this established order of distribution of the transboundary flows is maintained through a number of narratives, threats and other forms of control.

3.5.3 Historic debt - Water under the bridge?

The 'prior use' argument is often invoked as reason not to enter discussions that might lead to re-allocation of the flows towards a more equitable distribution (Anon 2011, pers.comm-c, Arlosoroff 2011, pers.comm., Shuval 2011, pers.comm.). Israeli residents have become dependent on the use of the flows, the rationale posits, and re-allocation would lead to a zero-sum outcome (less water) for Israel.

The argument loses strength however, when considering that a) a large proportion of the flows are in fact destined for food production in the Negev desert, and then for export (and thus are not basic human needs), and b) the claim from Lebanon based on the same argument should be taken into account. That is, negotiations for re-allocation of the water should consider water used by Lebanon prior to the establishment of the state of Israel, as well as water that was prevented from being used by Lebanon, because of Israeli control. This second part of the Lebanese 'prior use' argument may be considered the 'historic debt'.

As we will see, Israeli control over the Hasbani was consolidated following the attacks on attempted river diversion works, in 1965. Use of the river in Lebanon was curtailed soon after, and dropped during the occupation period until 2000, and has risen since then only marginally. A 'historic debt' may be evaluated, starting from the basis that Lebanon has used

[19] The contribution of the three main Upper Jordan River tributaries is shown in Figure 3.10 as 475 MCM/y, which is close to this study's estimate of 480 MCM/y (Section 3.2.2).

[20] As we will see, the 'Johnston Allocations' refer to surface water only, whereas the figures here discuss both surface water and groundwater.

approximately 180 MCM since 1967, while Israel has used about 21,000 MCM[21] (not including groundwater, but including evaporation) (see Section 7.1).

Attributing a financial value to these flows is a matter of reconciling water unit costs, interest rates and opportunity cost, all of which vary according to interpretations and imagined alternative scenarios. Comair (2009: 238) for example, estimates the value of the water captured by Israel at about $1 billion (based on calculations on an annual runoff equivalent of 28 MCM, the Johnston allocations, a unit price of $0.3/m3 and an interest rate of 4%). Farajallah and Makdasi (2008) estimate the cost of lost water during the occupation from 1978 to 2000 at $434 million (including Lebanese abstractions from the Hasbani as well as opportunity cost due to the lack of agricultural development possibilities), while economic opportunity and shadow costs are considered in Fisher et al. (2005). The debt need not be seen strictly in financial terms, however, and any negotiated resolution of the conflict would consider a 'basket' of options to be considered, including historic rights (e.g. Frederiksen 2005), restored bio-diversity, water treatment, and other 'ecosystem services'.

[21] Based on the very rough calculations over 44 years, for Lebanon of 4.2 MCM/y and for Israel of 480 MCM/y.

PART B. ANALYSIS

4. Hydropolitical History of the Upper Jordan

This section combines French and British colonial and Israeli archive documents with more recent literature to reveal the forces that have driven the struggle over the Upper Jordan River.[22] The water conflict is found to be shaped to a large part by the boundaries that are still contested, and is characterised by a mix of imperial, religious, ideological, and business interests.

While analysts of transboundary water conflicts have pointed out how in almost every international transboundary basin, 'cooperation and conflict co-exist' (see e.g. Wolf (2002), and especially Mirumachi (2007)), the interaction over the upper reaches of the Jordan River is clearly much more one of conflict, however, than of cooperation. This is not for lack of effort from external parties, as shown by the progression of official talks that have attempted to resolve the water conflict – Figure 4.1. Behind the record of failed treaty milestones is a story of diplomatic wrangling and political and military struggle that began immediately following Britain and France's conquest of the territory from Turkey during World War 1.

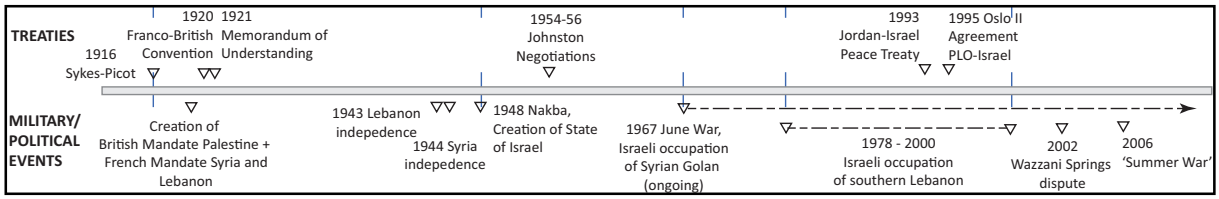

Figure 4.1 Timeline of major military, political and hydro-political events along the Upper Jordan River.

Application of Mirumachi's TWINS tool in Figure 4.2 demonstrates the lack of cooperation quite clearly. The emphasis on the lower left-hand ('high conflict – low cooperation') portion of the diagram is distinct from any of the other multiple cases to which the tool has been applied (from the Orange-Senqu, Mekong, Ganges, Amu Darya etc).

[22] Turkish, Lebanese and Syrian archives have not been searched.

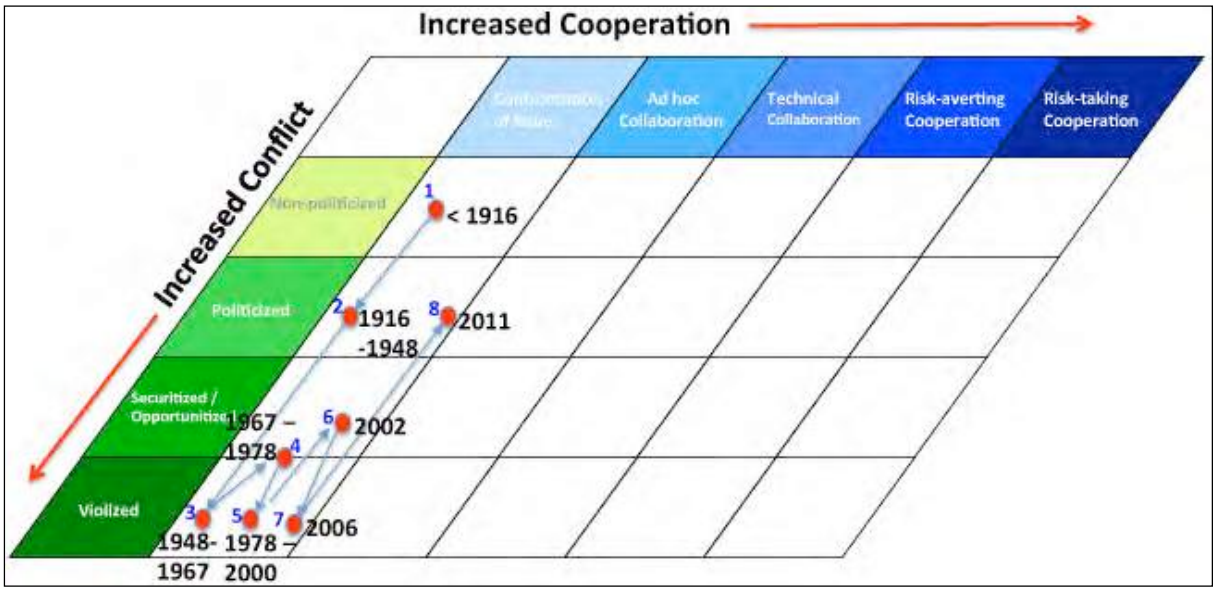

Figure 4.2 Transboundary Water Interaction between Lebanon and Israel, over the Upper Jordan River (application of the 'TWINS' tool).

The turning points in the water conflict are the direct result of politics and war, where ideologies are infused through both violent and subtle ends. The struggle over control of the transboundary flows was part-and-parcel of the history, and did have its influence on the broader political context, however. This co-evolution of the struggles is examined in detail following.

4.1 Ottoman Empire (< 1916)

An idea of the extent of development that had occurred during the Ottoman period is provided by a French study conducted in support of the 1921 British-French negotiations over water. The report counted:

- Six water mills, located on the Hasbani mainstream (named or located: near Souk al Khan; Maria - just upstream of Ghajar; Moutran; Hadj Khalil; and Souk, near the canal of the Emir);
- Three irrigations canals (one downstream of Ghajar, and two upstream – one of which was estimated at 5km long and irrigating an estimated 600 dunums with 3,000 m3 per day in summer [1.1 MCM/y] on the "right side of the Hasbani"); and
- Associated dams and impoundments for the above, including mention of use of an "ancient" reservoir that local people were unaware of who had built. (FNA 1921d).

Two of the recommendations arising from the report are furthermore relevant to the study at hand: *the construction of a pumping station at the Wazzani springs*, and that there is no hydraulic scope for a dam between Hasbaya and the Wazzani Springs. As we will see in Section 4.5, the Lebanese government's construction of the pumping station eight decades later sparked a war of words, and has probably served to prevent construction of the dam in question (referred to as the 'Ibl al Saqi' dam, for its proposed location).

The Ottoman authorities also made a number of concessions related to the waters. These include the 'Mavrommatis Concession', allegedly issued to Greek citizen Euripides Mavrommatis in 1914, for use of parts of the Jordan and Yarmouk rivers for hydro-electric and other purposes (see CO 1926, CO 1927). There is also evidence of an Ottoman concession for touristic development of the saline springs that flow into Tiberias, to Suleiman Bey Nassif and Dr Fakhoury (and later Mr Joseph and Mr Gesundheit) (CO 1928). Interestingly, there was a further concession obtained by Michel Sursock (of Beirut) to drain the Huleh marshes for a period starting in 1914 (FNA 1921e: 10) (and which, of course, was never carried out due to the start of the First World War).

The most notable water-related concession issued by the Ottoman authorities was the 'Rutenberg Concession'. It was issued to the Jaffa Electric Company (JEC), which was owned by Pinhas Rutenberg, and later became the Palestine Electrical Corporation. The concession was re-negotiated by Mr Rutenberg and the British authorities in 1928 to give the JEC the right to develop the waters of the al-Auja River (a tributary to the Yarmouk) for hydroelectric power (DO 1927).

As we will see, the businessman Pinhas Rutenberg was to take on several roles over the decades, and was very early on acting as British diplomat lobbying the French authorities to extend the border of Palestine to include the Upper Jordan River tributaries and the Litani.

4.2 British and French Empires (1919 – 1948)

4.2.1 Zionist lobbying for expanded borders of Palestine during and after World War 1

Dinar (2003: 190) uses the term "psychological scarcity" to refer to Zionist (and Israeli) ideas of physical water scarcity and their relation to national security. Early manifestations of such ideas of scarcity are evident through Zionist lobbying to extend the borders of Palestine. The lobbying was carried out both through individuals and institutions, and began soon after conclusion of the 1916 Sykes-Picot border arrangement, which had placed the Huleh Marshes under French Syrian control (as we have seen in Figure 2.5).

Wolf (1998: 227) describes the behind-the-scenes influence in 1919 of the 'agronomist-spy' Aaron Aaronson, for instance. A letter from the Foreign Office to French representative M. Vantissart sent one month prior to conclusion of the 1920 Franco-British Convention is also telling, in this regard. The British authorities request some control over the Yarmouk River (which flows completely within Syria) and the Litani River (which flows completely within Lebanon), citing pressure from "the World Zionist Organization and [its head, Chaim] Weizmann" (FO 1920). Background detail is given through the words of Weizmann himself, in a letter sent to British Prime Minister Lloyd George:

> "The whole economic future of Palestine is dependent on its water supply for irrigation and electric power, and the water supply must be from the slopes of Mount Hermon, from the headwaters of the Jordan and the Litani River … [We]

> consider it essential that the northern frontier of Palestine should include the Litani, for a distance of about 25 miles above the bend, and the western and southern slopes of Mount Hermon." (UN 1992, in Frederiksen (2003: 71))

The archive records show that the French authorities do not honour the British request, explaining later that they do not want to jeopardize French government support for British efforts in support of a "Jewish Homeland" (FO 1920). Such lobbying was not entirely unsuccessful for the Zionist organisations, however: it did result in the 'Huleh Concession' at the 1920 Franco-British Convention, and thus the territorial acquisition of the Huleh Marshes and confluence of the Upper Jordan River by British Mandate Palestine (see Figure 2.5). Article 8 (of 9) of the 1920 British-French Convention in fact lays out the first proposed Jordan River transboundary water agreement:[23]

> "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 Yarmouk and of their tributaries, after satisfaction of the needs of the territories under the French mandate.
>
> 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 a result of this examination these questions shall be referred to the French and British Governments for decision.
>
> To the extent which the contemplated works are to benefit Palestine the administration of Palestine shall defray the expenses of the construction of all canals, weirs, dams, tunnels, pipelines and reservoirs or other works of similar nature, or measures taken with the object of re-afforestation and the management of forests." (FNA 1920).

A number of studies were commissioned by the French (and, presumably, the British) following the 1920 Convention to explore in greater detail the extent and local use of the Upper Jordan River flows in greater detail (e.g. FNA 1921e, FNA 1921d, FNA 1921b, FNA 1922). The 'common examination' called for by the Convention led to a Memorandum of Understanding ('Entente de principe') dated 19 November 1921, which stated:

- 50% of Yarmouk Basin flows are allocated to Palestine (and that the flow would be estimated by estimating rainfall throughout the basin by a coefficient of 0.6);

[23] A list of agreements related to the Upper Jordan River is available in Trondalen (2009: 19).

- to agree to construction works in the Yarmouk valley and some tributaries downstream of Wadi Ajami, to facilitate economically viable irrigation in the Palestinian side of the Jordan River Valley, with French reservations that *some of these locations are partly in Syrian territory*, posing a potential territorial issue; and
- to *disagree* over allocations of the Upper Jordan River, given that the borders there had not been agreed to yet. (FNA 1921a (translated and paraphrased, emphasis added))

The MOU is stunning in that there is no clear agreement over two of the three issues it tackles. In fact the sole issue that was agreed to was later contested by Syrian Public Works officials.[24] The MOU was nonetheless signed; on behalf of France by E. Achaud and Assaf Younes, and on behalf of Great Britain by General Grant and – significantly – Pinhas Rutenberg, the businessman of the Rutenberg Concession. The MOU was not, however, ratified by either government, even following attempts to re-negotiate it in 1932 (FO 1937: 4).

The French officials conducting their river studies throughout this period repeatedly warn their authorities of the effects on Syrian livestock herders of British plans to drain the Huleh marshes – and that their British counterparts would continue to lobby the French government for partial use of the Litani River.

4.2.2 Zionist lobbying for expanded borders in French Mandate Lebanon

Confidential documents written and provided by Lieutenant Colonel Paulet (the French representative concluding the 1922 'Paulet-Newcombe' border arrangement) reveal several of his issues of concern, following a scouting trip to the Upper Jordan River he undertook with General Grant and Mr Rutenberg,[25] prior to signing of the 1921 MOU. Paulet notes, for instance, that the town of Ghajar is of importance to Lebanon, as the Wazzani that feeds it is a reliable source ("donnant en toutes saisons" (FNA 1921c)). The bulk of Paulet's concern is focussed on British/Zionist designs on the Litani River, however.

Paulet's account to his authorities barely conceals his anger at repeated efforts by Rutenberg to push for territorial expansion of Palestine beyond what the 1920 Franco-British Convention has already ceded. Evidently surprised to see the layperson representing the British government, he rejects Rutenberg's calls to include the "land they are currently in" into Palestine. Rutenberg's request is then picked up by General Grant, but once again rejected by Paulet. Paulet remarks that it is understandable that Rutenberg lead the British

[24] In a letter dated 6 November 1934, the Syrian clerk of Public Works asserts that the 0.6 co-efficient is not realistic ("tout a fait fantaisiste"), being over-estimated by a factor of 6, and that the MOU compromised French development efforts in Syria (FNA 1934).

[25] Mr Rutenberg is referred to as 'Rotenberg' in the correspondance.

delegation because of his better French language skills, but he also notes the hidden meaning: “it’s Rutenberg who pulls all the strings and who steers the process to his own interests” (“c’est lui [Gutenberg] qui tient tout les fils et que mène l’affaire à sa guise”) (FNA 1921c). Foiled, Gutenberg offers a payment of 5,000 pounds Stirling on behalf of the British government to allow construction of a bridge over the Hasbani River and a dam on the Litani at Marjayoun. Paulet snubs the bribe, and recounts later requests by a Mr Harrington to visit the Litani basin with him (in Paulet’s opinion with a view to completing the Samack-Rayack railway).

4.2.3 Zionist pressure for expanded borders in British Mandate Palestine[26]

British authorities were also under pressure to increase available water resources, meanwhile. Failing to limit increasing Jewish immigration to Palestine, the authorities devised the 1937 Peel Commission plan – a division of Mandate Palestine into ‘Jewish’ and ‘Arab’ territories (a version of this was later proposed at the United Nations, sparking the 1947 war). Aware that there would be population transfers of both groups (primarily the Arabs), and under sustained pressure from multiple Zionist sources (see The Link 1984), the British Authorities began to conduct investigations of the ‘absorptive capacity’ of the land which was to receive the Arabs they planned to displace. The Partition Commission in Jerusalem requests an investigation of the irrigation potential in the Jordan River Valley by H.G. Ionides which he completes in 1938 (not to be confused with the 1939 ‘Ionides Report’, though by the same author) (FO 1937), while the British Government requests a broader study of Southern Palestine and the Jordan Valley by D.G. Harris (CO 1937b). If, the Secretary of State asserts on the back of the Harris report, “a substantial amount of land could be made available for the resettlement of Arabs living in the Jewish area [of the proposed Peel Commission plan], the most strenuous efforts should be made to obtain an agreement for the exchange of land and population” (CO 1937a (emphasis in original)). The 1938 report by Ionides finds considerable scope for exactly this in the Jordan River Valley (though Harris later questions his method (FO 1937)).

Unconvinced by efforts to demonstrate the land’s ability to absorb European Jewish immigrants (and for a number of other factors), the British Authorities were nonetheless to feel pressure to expand the borders of their mandate once again. Some of that lobbying came in 1938, when Albert Hiorth campaigned Winston Churchill and other British authorities to fulfil “biblical prophecies” (CO 1938a). His ideas included irrigation of the Jordan River Valley (along the lines suggested in the 1938 Ionides Report), and his father’s plan for a hydroelectric scheme diverting part of the “useless floods” of the Litani into the Jordan, shown in Figure 4.3.

[26] The British Government’s failure to effectively resist Zionist lobbying in the water sector should be interprted within even greater pressures in other sectors – see e.g. Newsinger (2002)

F. Hiorth's plan for turning the useless floods of the Orontes river through a small tunnel into the Jordan Valley. The dam (see finger — point) and the tunnel, the whole scheme — to be paid by the power generated — easily 5 — 10 000 HP

Figure 4.3 Hiorth's suggested plan to divert the Litani River into the Upper Jordan River, 1938 (Hiorth 1938: 29). The original caption reads "F. Hiorth's plan for turning the useless floods of the Orontes river through a small tunnel into the Jordan Valley. The dam (see finger – point) and the tunnel, the whole scheme – to be paid by the power generated – easily 5 – 10 000 HP". (It is in fact the Litani (not the Orontes) River that is both indicated and intended).

Meanwhile, Mekerot (described as "the national water company for Jewish Palestine") issued a report in 1944 that clearly called for "desirable frontier-adjustments" to include all of the Upper Jordan River headwaters (see Wolf 1998: Fig 5). Diversion of the Litani was also being promoted by Sir Louis Dane, a former 'Settlement Officer' in Peshawar, British India. In a series of correspondence from 1939 and 1940, Dane argues to replicate the lessons of the Swat Valley, where "irrigation solved the problem" of a state disloyal to Britain, by allowing "educated Hindus" to buy the land of "uneducated Muslims". In the heat of the Second World War (dated 9 March 1940), Dane attempts to seize an opportunity to push the British to lobby the French to include the Litani within Palestine, re-iterating a point he made in 1939: "I ventured to suggest that it was in times of Stress that faulty Border arrangements

could best be rectified… Can not advantage be taken of the present opportunity to examine and settle this Litani question"[27] (CO 1938a).

The Litani diversion proposals by Hiorth and Dane were discredited by the British authorities on political grounds. Ultimately of course, the border was not adjusted a second time, and the Litani was not diverted. The idea of Litani diversion to Israel persists until the present, however, and is currently re-surfacing as a conceivable commercial venture in both Lebanon and Israel (see Section 6.1).

4.3 Battles Over the Upper Jordan (1948 – 1978)

The hydropolitics of the Jordan River in the period after 1948 are some of the most intensive in the history of the world. As the period is discussed in some detail elsewhere,[28] its treatment in this study is limited, and dependent primarily on previous analysis.

4.3.1 A battle of plans

A flurry of basin-wide water plans developed as a result of the British abandonment, Arab state loss and Zionist conquest of Palestine (see Phillips*, et al.* 2007a: Figure 1). In dealing with the displacement of several hundred thousand Palestinians, the Arab League, the Kingdom of Jordan, and the UN Reliefs and Works Agency (UNRWA) all commissioned studies similar to the much earlier Ionides Report (e.g. MacDonald & Partners 1951, Arab Plan 1954, UNRWA 1954). None of these plans were to see the light of day, however.

Supporting Zionist (and later Israeli) development and expansion interests, were early plans by Lowdermilk and then Hays and Savage, where use of the Litani was called for (though not carried out) (Hays 1948: 16). The Cotton Plan suggests the Israeli National Water Carrier, a major work project that was planned in 1959 by the Tahal (1959), and executed finally in 1964. It is of note that the 1959 Tahal plan suggests as one option "an integrated regional power and irrigation development of Litani and Jordan River resources, whose realization depends on international agreement" (Tahal 1959: 8), as shown in Figure 4.4. The preferred location of the intake structure (at the B'nat Yacov (B'nei Yacov, or Jacob's Daughter's) bride) was directly across the narrow river from Syria, and attempts to construct it were thwarted by the Syrian army.

[27] Naomi Klein (2007) discusses the systematic seizing of such opportunities as 'the shock doctrine'.

[28] The hydropolitical period of 1948 – 1967 is well-told, ie. in The Link (1984), Medzini (2001), el Musa (1996), Frederiksen (2003).

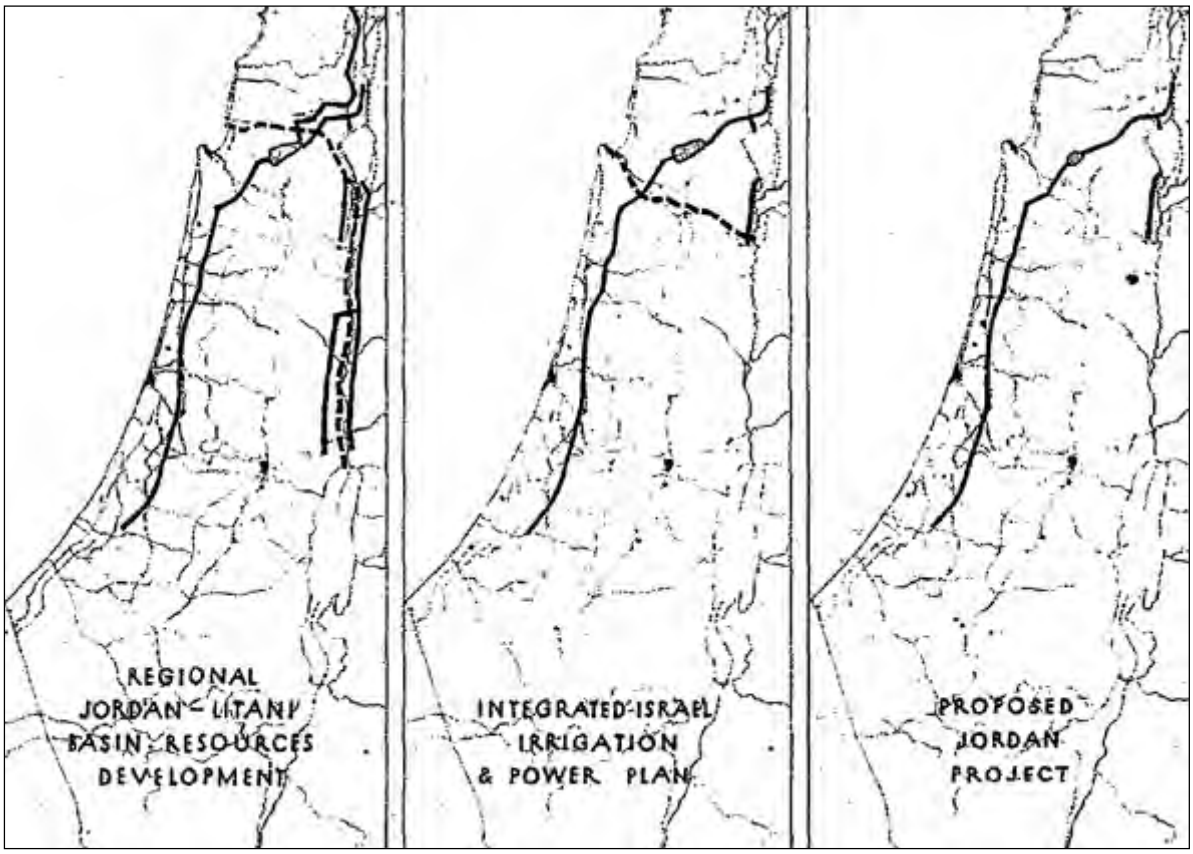

Figure 4.4 Israeli Water "Project Concepts" considered in 1959 (Tahal 1959: Figure 2). The proposed project on the left suggests "integrated regional power and irrigation development" (Tahal 1959: 8) based partly on Litani River flows, but was not implemented. The project on the right was eventually implemented as the National Water Carrier, but with the intake structure moved to the shore of the Lake of Tiberias.

Lebanese plans for use of the Litani were developing separately, in the meantime. The engineer Ibrahim Abd el Al began to study and traverse the length of the river in the early 1930s. By 1948 he had produced a comprehensive four-part study of the Litani, entitled *Le Litani, étude hydrologique* (Abd el Al 2004 [1948]). The study is remarkable in its foresight, and elements of it have been or are planned to be built as part of the Lebanese master plan for the south, including the 'Canal 900' (which was built before the war in the 1970s, and extended In the mid-1990s (Gedeon 2006: 39), and the 'Canal 800', which is still planned for irrigation of southern Lebanon. "Just as Egypt is the gift of the Nile", Abd el Al has asserted, demonstrating the symbolic importance of the river in the country, "so is Lebanon the gift of the Litani".

4.3.2 The Johnston negotiations

The tensions from Israel's earlier attempt to divert the Upper Jordan River at the B'nat Yacoub Bridge (and the Syrian reaction to it) in 1953 resulted in US President Eisenhower cutting off financial assistance to Israel (The Link 1984: 6). It also led to the dispatch to the

region of Eric Johnston as the hydro-diplomat responsible for what came to be known as the 'Johnston negotiations'. Following extensive lobbying and diplomacy (which are recounted in dozens of journal articles, and hundreds of documents), the Johnston negotiations proposed the allocations shown in Table 4.1.

	Stated Johnston Allocations* (indicated in original format; 'mcms' = million cubic metres per year)	**Effective Johnston Allocations****
Lebanon	**35** mcms from the Hasbani	**35**
Syria	20 mcms from the Banias 22 mcms from the Jordan 90 mcms from the Yarmouk **132** mcms total	**132**
Jordan	377 mcms from the Yarmouk 100 mcms from the Jordan 243 mcms from the side wadis of the Jordan **720** mcms total	**477**
Israel	**25** mcms from the Yarmouk [+ remainder, often interpreted as **400**]	**616**

* (US DOS 1964: 2). ** (Phillips*, et al.* 2007a)

Table 4.1 The 'Johnston Allocations' of 1953 –stated and effective. * [MCM/y]

The Johnston Allocations were determined based on irrigation *needs*, and suggested 132 MCM/y for Syria, 35 MCM/y for Lebanon, and an unspecified quantity for Israel. The unacknowledged agreement between Israeli and US authorities is confirmed in a briefing paper prepared by the US Department of State in 1964 (on the eve of inauguration of Israel's National Water Carrier), which states "It was understood that, once the above withdrawals and deliveries were assured, other waters of the Jordan River, or approximately 40% of the total, would be available for Israel's use" (US DOS 1964: 2). This percentage is generally interpreted to mean a total of about 400 MCM/y (e.g. Wolf 1998: 245, Waslekar 2011: Figure 1-l). In a careful re-reading of the Johnston negotiations from recently de-classified documents in the Library of Congress, Phillips et al. (2007a) demonstrate that unofficial communications between the Johnston and the Israeli delegations to the talks led to a mutual understanding that the final volume to Israel remain unstated. Because of return flows that were not counted, the unstated effective allocation to Israel is estimated at 616 MCM/y, which is roughly 35% more acknowledged. The Johnston Allocations were rejected by the Arab League, and accepted by the Israeli side.

The break-down of the talks meant no change to the distribution of flows. Israel completed construction of the National Water Carrier (with its intake structure moved to the more secure but much lower (and therefore much more costly, because of pumping effort to overcome the difference in elevation) shore on the Lake of Tiberias in 1964. This prompted the first ever act of sabotage by the newly-created Palestine Liberation Organisation (on 1 January 1965 (JVL 2006)). Syrian attempts to divert the Hasbani away from the intake structure later that year were thwarted by Israeli Air Force attacks (Medzini 2001: 109), within a fracturing Union of Arab Republics (Syria-Egypt). Military skirmishes continued until within one year of the 1967 war, including over border arrangements directly associated with access to the Liddan Springs (Medzini 2001: 131), despite US promises of arms for Israel in exchange for ceasing with the attacks (US Embassy 1965).

An interesting aside fall-out of the flurry of activity is the re-appearance of the Rutenberg Concession. Lawyers representing Rutenberg's' Palestine Electric Corporation petition the British Government in 1955, citing concerns over the previously-mentioned UNRWA plans (1954) to develop the waters for the use of the displaced Palestinian refugees. The lawyers recall an interpretation of the 1920 Franco-British Convention suggesting rights of use over the "parts of the River Jordan … [and] the River Yarmouk and its affluent outside the boundaries under the control of the High Commission" – the original wording (FO 1953). Considering the British had abandoned control of Palestine seven years prior to the claim, the attempt may have had less to do with actual control over the flows than it did to achieve a cash settlement. It is of no little interest furthermore, to consider that the chairman of the Palestine Electric Corporation at this time was (now Lord) Herbert Samuel, who in a wholly different role as the first British High Commissioner had negotiated the 1921 arrangement still being argued over (Mathew 2011). Such mixing of politics and business is to be expected, but has rarely been so clear.

4.3.3 Water and the 1967 Six-Day War

The debate about the role of water as a motive in the 1967 June war lingers. Those asserting that the "Six Day War was caused largely by competition for the waters of the River Jordan" (Bulloch and Darwish 1993: 34), for instance, quote former Chief of Staff of the Northern Command of the IDF Ariel Sharon:

> "We could not have sat there much longer just watching the [Arab] canal make headway. Exactly when the government would have moved against the Syrians, or in what context they could have done so, I do not know. But with their assault in November, Syria started off a round of fighting that *gave us the opportunity to put an end* to their project. People generally regard 5 June 1967 as the day the Six-Day War began. This is the official date. But in reality the Six-Day War started two and a half years earlier, on the day Israel decided to act against the diversion (initiated by upstream Arab states) of the Jordan." (Bulloch and Darwish 1993: 50 (emphasis added))

Analysis of the 'hydraulic imperative' of the war has been well-treated,[29] and is not ventured into in much greater detail here. This study's exploration of motives suggests cautioning against over-playing the role of water in the war. Though the National Water Carrier was already built by the time the war erupted, it certainly was still very directly exposed to attack from Syria and Lebanon. Shifting the discussion from academic debates about the motives of the territorial conquest to an exploration of its effects, Sharif el Musa notes that:

> "the fact that Israel has benefited enormously from the water it seized in 1967 does not necessarily make the "water imperative" in this instance plausible. The outcome of the June 1967 war was by no means as certain at the time as it appears in retrospect, just as the fact that Israel benefited tremendously from cheap Palestinian labour does not suggest that it would have fought a war for it." (el Musa 1997: 218)

The same logic might be said to apply to the Jordan River headwaters: control of the transboundary flows may have been more of an outcome than motive of the 1967 war – a very beneficial outcome indeed. The territorial conquest once again radically altered the region's hydropolitical map, as shown in Figure 4.5. It gave Israel physical control over the entire Western, North-eastern and Eastern Aquifer Basins (transboundary to the West Bank), as well as both shores of the Upper Jordan River, part of the headwaters of the Hasbani, most of the headwaters of the Liddan, and all of the headwaters of the Banias.

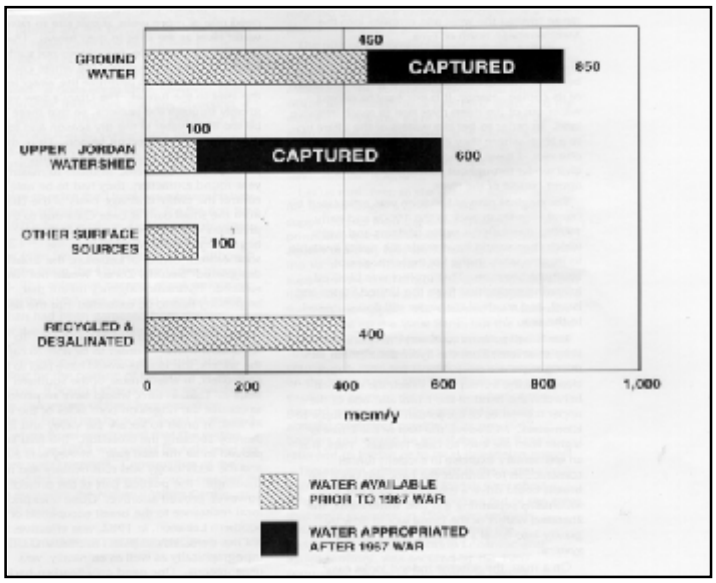

Figure 4.5 Visual representation of water resources under Israeli control following the territorial conquest of 1967 including in the "Upper Jordan Watershed" (numbers on original may mislead) (Kiser 2000: Table 5 (based on Stauffer 1996)).

[29] See e.g. Wolf (1998, 2000), Wolf and Medzini (2004), Amery and Wolf (2000), Frederiksen (2003, 2009), el Musa (1996, 1997).

The 1967 territorial conquest marked the beginning of what Feitelson (2000: 350) calls the "Israeli Hegemony Era", an era defined to a large extent by power relations: "The outcome of the six–day war changed both the hydro-strategic relationship of Israel and her neighbours, and the power balance between them. …This change in Israeli hydro-strategic situation and its evident military superiority effectively prevented the Arab side from challenging Israel's water plans or use."

The defeat may also have encouraged a further retreat of the Lebanese state from southern Lebanon (which had already started in 1965 following the Israeli destruction of the Hasbani Litani diversion project), and thus the development of its water sector (see e.g. Soueid 1998, Allès 2007)). It is in this sense that Sharon's earlier statement provides insight: though control of water resources may rarely if ever be the main cause of war, military action certainly serves to enable that control. As we will see in our discussion of the effects of the bluster surrounding the Wazzani incident, even the *threat* of war can serve to maintain control over transboundary waters.

4.4 Occupation of Southern Lebanon / Operation Litani (1978 -2000)

The tumultuous hydropolitical history was to take another dramatic turn in 1978, when Israel invaded Lebanon in an offensive labelled 'Operation Litani'.

The stated aim of the invasion was to create a physical zone that would distance the (mainly Palestine Liberation Organisation) resistance from Israel's northern border. There is also reason to question the hydrological motives of the invasion, however. Particularly in light of the name of the offensive, and the very clear plans and pressure to divert the Litani of the earlier decades. While the Litani was not diverted or used in any major way by the Israeli army (see Box), the effect of the occupation of Lebanon (and continued occupation of the Syrian Golan) on regional water use and hydropolitics was to prove much more enduring.

4.4.1 Debilitation of the agricultural sector

The 1978 invasion led to the deployment of UNIFIL troops, and an indirect Israeli occupation of the area by its Lebanese proxy militia – the South Lebanese Army (SLA). The second Israeli invasion, and its direct occupation, of Lebanon from 1982 onwards obliged the Israeli army to take more direct control over the area.

Perhaps the most enduring effect of the occupation on use of the transboundary waters was the essentially complete halting of Lebanese water sector development. This included the degradation of any kind of development of water-related activities and livelihoods, especially those related to agriculture. Development that was undertaken in the area by the Israeli army was first and foremost in support of the SLA. As such, the efforts re-enforced the economic dependence of the local population upon the occupying forces, in a way not dis-similar to what Sara Roy (1995) calls 'de-development' (in her case, in relation to Gaza).

Products from southern Lebanon were prevented from reaching the markets in Beirut and the rest of the country, and were not allowed to enter Israel. Meanwhile, Israeli exports to the occupied zone undercut the cost of Lebanese goods by 40-75% (El Ezzi 1990, Allès 2007).

El Ezzi (1990: 152) suggests that "it was precisely by the destruction of the productive sectors/structures of the Lebanese economy that it would be integrated into the Israeli economy." With time and the opening of some Israeli-controlled border points for seasonal workers, the economic dependency was consolidated. The agriculture-based economy became further debilitated following the targeted destruction of orchards, agricultural lands and irrigation infrastructure. The overall loss of crops in southern Lebanon has been estimated at 75%, with the citrus and apples harvest reduced by 95% (El Ezzi 1990 p. 152). Citing analysis of Lebanese Agricultural Census of 1999 (LMoA 1999), Allès shows that only about 60% of usable agricultural area was being exploited, while some 20-30% had been abandoned.

Though the export ban to the rest of Lebanon was lifted, the agricultural sector was to be hit by competition from more profitable activities engendered by the occupation. Earning a greater income was possible through working for the better-paid South Lebanon Army, or by catering to the needs of the UNIFIL troops. The illicit drug trade, smuggling operations on the Syrian border, and numerous other profitable venues also drew southern Lebanese residents away from agricultural production (Allès 2007: 52), thereby preventing a rapid recovery of the sector following the Israeli withdrawal.

The Israeli authorities also prevented the development of irrigated agriculture by denying some farmers access to the rivers. Preferential treatment was given to some Lebanese residents and SLA members, however, including in terms of use of the river, as reward for cooperation or at least in order to create enmity between the population (Schmida 1984).

The ability of the occupying forces to exploit the waters of southern Lebanon during the occupation period were nonetheless compromised to a certain degree. Plans by the Israeli water-provider Mekerot to deliver 5 to 10 MCM/y for irrigation of land in southern Lebanon and Israel were apparently thwarted, for example, by the Lebanese head of the SLA. Wolf (1995: 46) relates an interview with an Israeli officer who dealt extensively with Major General Sa'ad Haddad, quoting the officer citing the General's insistence on the integrity of Lebanese soil, saying "We will cooperate with you, but there are two subjects which are taboo – our land and our water". The understanding reached between the occupier and its Lebanese proxy militia is confirmed by the Israeli commander Ephraim Sneh: "The truth is there is a plan of the Upper Galilee people to take the Wazzani spring water, which is 500m inside Lebanon's territory into pipes, so that the water reaching Israeli territory anyway will be clean spring water rather than contaminated by sediment. I prevented this plan, since it concerned a Lebanese territory, and thus could have led us and Haddad to an unpleasant political situation" (Sneh 1984: 1).

In any case, the debilitation of the Lebanese agricultural sector during the occupation period did have the effect of guaranteeing continued essentially unobstructed flow of the Hasbani into Israel.

4.4.2 Box: Israeli diversion of the Litani?

The 1978 Israeli invasion of Lebanon – termed 'Operation Litani' – and Israeli occupation of southern Lebanon until 2000 brought most of the Litani River under Israeli control. It also engendered flurries of speculation about Israel's intentions towards the Litani River. Lebanese newspapers and politicians repeatedly accused Israel of working on a diversion scheme or even having already begun to extract water (see Stork 1983, Amery 1993, Amery 2000). Journalist John Cooley's (1984) article in *Foreign Affairs* magazine alleged Israeli siphoning of groundwater fed by the Litani in the Marjayoun plain (as Sneh mentioned, above). This was followed by the 1995 publication by Lebanese newspaper *an-Nahar* showing a map of an Israeli diversion tunnel at its bend westward just below the Beaufort Castle across from Deir Mimas (see below).

The suggested Litani diversion structure (an-Nahar, 21 Feb 1995, from Amery (2000: Figure 5.2))

Cooley also notes that Israeli army engineers seized all hydrological charts and technical documents about the Litani and its hydroelectric installations in 1982 – a fact confirmed by the current hydro-electrical plant operators who were present at the time (Anon 2008, pers.comm-a, Anon 2011, pers.comm-a: see also Amery 1999). Israel's former Technology Minister (Yuval Neeman) is reported to have stated that seismic soundings and surveys had been undertaken near the Litani's bend westward, possibly to determine the optimum route for a diversion tunnel (Cooley 1984: 23f.). Comair (2009) reports of a secret clause in the 17 May 1983 Agreement between the Amin Gemayel Government of Lebanon and Israel, though this is not substantiated. Amery (1990) discusses to a newspaper article in which former Lebanese Foreign Affairs Minister (Elie Salem) had warned MPs during a discussion in parliament that Israel had threatened to divert the Litani if the Agreement was not signed.

The Agreement was of course never signed, however, and there is no evidence that the Litani was diverted. Salem today asserts no knowledge or awareness of transboundary waters in the Lebanese-Israeli negotiations (Salem 2011, pers. comm.). Similarly, in his response to the Cooley article, former Israeli commander Ephraim Sneh distances himself from Neeman (Sneh 1984).

UNIFIL troops commissioned to investigate the alleged diversion on several occasions found no evidence (Hottinger 1992: 156). From his time as an IDF soldier occupying the area in 1982, Aaron Wolf (2011, pers.comm.) recalls that even basic gauging stations were not set up on the Litani (or the Hasbani, for that matter), furthermore suggesting no attempts at diversion. Physical reconnaisance by the authors of this study and many others following the Israeli withdrawal in 2000 confirms that no such diversion works exist, or ever existed.

The misunderstandings about Israeli diversion of the Litani are interpreted in Section 6 as a Lebanese narratives constructed in relation to transboundary waters. They also do not contradict Israeli intentions towards control of the river, which (as we have seen earlier) have been prevalent since the end of World War I. Separation of motive from action is again important to the analysis, here. The flow of the Litani has been diminishing in its lower course in the last decades due to Lebanese diversions upstream, both for irrigation and power generation. The remaining usable flow near the preferred diversion site has high extremely high intra-annual variability and was roughly 223 MCM/y between 2000 - 2009[30] (measured at the Khardaleh Bridge (LRA 2011)), considered insignificant compared to the volumes secured from the capture of the Golan and the West Bank in 1967.[31]

[30] The flow downstream of the Qara'oun dam has been cited as 125 MCM/y (Kolars 1992: 19) to 480 MCM/y (Amery 1993: 234). Litani River Authority stream gauging data shows the average flow was 700 MCM/y from 1939 to 1958 (the year the dam was constructed), 493 MCM/y from 1960 to 1974 (the start of the war, after which data collection stopped until 2000), and 223 MCM/y from 2000 – 2009.

[31] Cooley (1984: 24) offers insight here: "Neeman relates that when Sharon, his political ally, returned from the Lebanon campaign, Neeman asked, "What do you think about the Litani?" "The Litani?" Sharon allegedly responded, "Have you seen the Litani? It's only a trickle, it's not worth the taking".

Considered alongside the significant financial investment that would have been required to channel or tunnel the water into Israel (what Sneh (1984) terms 'not cost effective'), the diversion made little sense not only from a political point of view, but also economically and hydrologically.

As such, Israeli governments were never in a position to undertake large withdrawals or diversion of Litani flows. Sneh asserts the opposite, in fact – that Israel implemented a project that "consisted of pulling water from the bore in Shomera in Galilee and transferred them to Shiite and Christian villages in the area of Southern Lebanon"[32] (Sneh 1984: 2). The quantities that were taken for Israeli military or local village use by way of trucks and small pumps (see above) retain symbolic importance, to others: "Although the quantities taken by Israel may [have been] relatively unimportant, the act of extraction cannot be dismissed as trivial. Whatever the actual amount, it is sovereign Lebanese water that is being taken in violation of Lebanon's right under international law" (Nasrallah 1991: 11). In any case there are voices calling for an economic arrangement for diversion of the Litani River, that is – Lebanese sale of the flows to Israel – as discussed in Section 6.

4.5 Continued Border Tensions (2000 – onwards)

With the year 2000 Israeli retreat from southern Lebanon, the Lebanese government became once again an upstream riparian actor on the Jordan River. The Israeli forces did not withdraw completely, however, and still occupy the Cheba'a Farms and the northern part of the town of Ghajar. Tensions over water and the border have never fully eased: the Wazzani dispute in 2002 was followed by the 2006 'Summer War', the damages to which are explored in much greater detail in Section 5. Thus, while the Government of Lebanon has regained physical control over the upper parts of the Hasbani until the Wazzani springs, hegemony in the basin and effective control remain with the Government Israel.

4.5.1 The 2002 Wazzani Dispute[33]

Very soon after the Israeli withdrawal, the Lebanese government engaged in a reconstruction and development programme for southern Lebanon, as part of an attempt to re-integrate it into the Lebanese political system. This led to the re-establishment of old patronage networks, and a return to internal divisions. The reconstruction efforts of the Council of the South (see Figure 2.7) may thus be seen as an important component in the

[32] The assertion is supported by a former Israeli civil servant active in the negotiations (Anon 2011, pers.comm-c), who states about 0.5 MCM/y were delivered from Israel to between 3 and 5 Lebanese villages until 2004.

[33] This section builds on the work of Maternowski (2006), Deconinck (2006) and Zeitoun (2007). It is substantiated through interviews with actors from all parties who were directly involved in the arbitration, two of whom have requested to remain off-record.

competition for constituencies and the establishment of legitimacy, in the face of the growing popularity of Hezbollah.

The programme planned and executed several well-drilling and wastewater projects in the programme in the Hasbani catchment area, including very small withdrawals from the Hasbani River. The Wazzani pumping station (which was originally proposed in 1920, to recall from Section 4.1) was the largest, and to become the most famous, of these. It was designed to supply 13 villages (roughly 63,000 residents) with a drinking water supply network from the Wazzani spring, just across the river from the (still) Israeli-occupied town of Ghajar. The design pumping capacity of the project was 12,000 m3/day (GOL 2002), which is roughly 4.4 MCM/y if a 24-hr pumping regime were upheld.[34]

Securitisation of the Wazzani and Hasbani

Lebanon's pursuit of the project initiated an international incident far out of proportion with the modest volumes of water involved. The US, EU and UN were involved in conflict mediation of a project involving less than 1% of Israeli abstractions from the Lake of Tiberias, and still well within Lebanon's 'share' proposed by the Johnston Plan of 35 MCM/y surface water abstractions (which Israel had agreed to in 1955).

Following his interaction with Israeli commanders at the very start of the project, the senior advisor and spokesman of the UNIFIL forces asserts that there was no intent from the Israeli army to enter into armed conflict. Timur Goskel recounts how the IDF representative made it very clear that it was not willing to risk a war over a sixteen inch [sic] pipe. The meetings with the Israelis (which occurred in September 2002) reassured UNIFIL, which considered the matter settled (Goskel 2011, pers. comm.).

Soon after the UNIFIL-IDF meeting, talk of an international crisis and unofficial threats from Israel spread rapidly throughout the media. Israeli Prime Minister Sharon declared that execution of the project would constitute a *casus belli*, Israeli Air Force jets overflew the site (Deconinck 2006), and Foreign Minister Shimon Peres asserted "We do not want a flare-up, but we will not give up water" (Sedan 2002).

The Israeli reaction seems to have come as a surprise to those who initiated the project. As part of former Lebanese Prime Minister Hariri's committee of experts in the following negotiations, W. Charaf'eddine states for instance that: "We did not expect Israel's reaction to be so heavy. We did not expect the project to create such a crisis. In fact Israel created the crisis; they made a big fuss out of it." (Maternowski 2006: 62). Nonetheless, pronouncements by political leaders from across the spectrum on both sides resonated throughout the media (Deconinck 2006).

[34] Some estimates (e.g. Comair 2009: 228) put the estimate at 7 MCM/y, though investigations suggest this is the maximum design capacity (i.e. with both the main and stand-by pumps operating), not the normal operations design capacity.

Zeitoun (2007: Fig 4.5) shows how a cacophony of official statements, opinion and speculation on the Israel side elevated a non-issue to one that was highly politicised, and then 'securitised' to the point that Israel's very existence as a state was considered or portrayed as at risk. A similar graduation of concern occurred on the Lebanese side, as Lebanese Prime Minister Hariri was intent not to lose "the diplomatic war in the face of Israeli threats" (Al Kifah Al Arabi 2002), and was able to position himself as the strong man facing of the enemy. Israeli suggestions that Lebanon use the Litani (instead of the Wazzani) to supply the villages with water were met with clear objection. "My answer since day one has been that the Litani has its own use," Hariri is quoted to have said, in order to "hold on to our right according to international law no more no less" (Al Kifah Al Arabi 2002).

Diplomacy efforts were undertaken by the US (through envoy Charles Lawson), by the UN (through Terje Rod Larsen and Stephan de Mistura), and by the EU (through Water Mazziti).[35] After several weeks of shuttle-diplomacy between Beirut (to meet with the head of the GDHER?? Fadi Comair, and members of the Prime Minister's panel) and Tel Aviv (to meet with the Chief of Staff of Foreign Minister Shimon Peres, Ram Aviram), it was understood that Lebanon could continue with construction of the pumping station, though its right to abstract and defined rightful abstractions from the Hasbani was an issue crucially left unresolved. The project was eventually completed, and the issue dropped off the radar of the Israeli media and public. Having met the government's short-term interests, the members of the Lebanese Prime Minister's panel claim diplomatic success (Anon 2010, pers.comm, Anon 2011, pers.comm-b). The Wazzani incident thus ended without the tragedy of similar events preceding (e.g. the wars in the 1970s and 1980s) or following it (e.g. the 2006 war).

The pumping station has since never even reached its design capacity of 4.4 MCM/y. A combination of poor supply of electrical power, of intermittent diesel fuel deliveries (for the stand-by generator), and a state of disrepair of the pumps means that the annual abstraction since 2002 remains much less that the design – some years as low as 2.5 MCM/y (Maternowski 2006, Anon 2008, pers.comm-b).

Hydropolitical impacts of the Wazzani Dispute

The importance the tensions raised throughout the Wazzani incident should be evaluated in terms of the effect they have had on future use and development of the river. Most notably, no expansion of the Wazzani pumping station, or indeed any further use of the Hasbani, has been initiated in the decade following the incident.

The bluster is seen in Section 7.1 as a tactic by Israel to contain further Lebanese development of the river, a discursive device intended to limit even discussion of re-

[35] The Government of Lebanon requested UN mediation, and was open to the EU offer to be involved. It was officially against US mediation for internal political reasons, but accepted it in practice. The Government of Israel requested US mediation only, was cold to EU involvement, and did not want UN involvement (Anon 2011, pers.comm-c).

distribution of the Hasbani or other tributaries. Indeed, an Israeli official involved in the incident stated that they were much more concerned about establishing their rejection of unilateral Lebanese action, than about the flow volumes, and thus sent clear "messages": a) that no further unilateral actions on the river would be tolerated, and b) that they were ready to discuss other options for delivery of water to the villages in need (through diversion of the Litani) (Anon 2011, pers.comm-c). The assertion is supported by Israeli academic Eyal Zisser, who notes that:

> "Israeli spokesmen have also explained that, from Israel's perspective, *the problem is not the quantity of water but rather the precedent of unilateral Lebanese action on a particularly sensitive issue*. Israeli decision makers are probably also thinking about past experience, i.e., the efforts of Arab states in the early 1960s to divert the sources of the Jordan River that set in motion a chain of events culminating in the Six Day War of 1967." (Zisser 2002: 2)

As consequence, the general lingering feeling in Lebanon is that projects such as the Ibl el Saqi dam are currently impossible to implement – for anticipation of Israeli retribution. The head of the GDHER asserts, for instance, that "when there is peace we will build the Dam" (Comair 2011, pers. comm.).

The attempts to mediate the Wazzani incident also shine a light on the role that the international community plays in the hydropolitics of the Upper Jordan River. This is impeded by the lack of an impartial mediator, the lack of accepted principles, and the in-fighting amongst the three main intermediaries. Several attempts at joint mediation were made, though no actor was seen as objective (with the UN and EU not trusted by most actors Israel, and the US not trusted by Hezbollah and others in Lebanon)[36] (Anon 2011, pers.comm-c).

Comair points out how the US urged the Lebanese side not to build the pumping station[37] (Comair 2009: 231), and in return agreed to request the Israelis not to attack Lebanon (see also ICG 2002, Maternowski 2006). This is despite the minor physical impact the project would have on Israeli abstractions, and despite the US' re-stated recognition of the 'right' of Lebanon to use 35 MCM/y according to the 1954 Johnston Plan. The US also suggested to Lebanon to reach an agreement on a abstraction quantity agreed by Israel, so as to secure abstractions (Anon 2011, pers.comm-c). The US position is in keeping with the George W Bush administration's openly-stated support of Israel, and its desire to avoid flare-ups in the region ahead of its planned attack of Iraq (which occurred several months later), as well as with its lack of support for the principles of international water law.

[36] Attempts at tri-lateral joint mediation were continued into 2003, but lost steam following the pressure-reducing effect of the heavy winter rains that year (Anon 2011, pers.comm-c).

[37] The same position is also taken by the US embassy Chief of Mission Carol Kalin (Deconinck 2006).

The representatives of the European Union and the United Nations seem to have taken a similar approach of conflict management over conflict resolution. The Lebanese representative at the talks portrays the UN (through mediator Stephan de Mistura) raising Israeli concerns, and not accounting for those of Lebanon ((Comair 2009: 234). The EU envoy recalls how he convinced Lebanese PM Hariri to take a *needs-based* rather than rights-based or legal approach (Mazziti, pers. comm. 2011). The political tactic serves to avoid direct confrontation of the status quo, and has also been employed by the EU transboundary water mediation between Palestinians and Israelis in the West Bank (through the same envoy). The EU mediator today points out that even today Lebanon does not even pump at the maximum capacity of the Wazzani pumping station (Mazziti 2010, pers. comm.), suggesting the capacity is greater than the need, and that extra flows are thus superfluous. In the public version of an otherwise confidential EU report, the mediator's success is claimed as having been granted "prime ministerial level access on the issue in Lebanon" and regular briefing sessions with the US State Department. It is also claimed that the EU intervention "provided a non-political channel of contact with the Israeli side, which eventually led to an official Israeli demarche and non-paper on 2 February 2003" (EC 2004).

Considered together, the positions taken by the mediators appear aimed at *reinforcing the status quo*, and at conflict *management*, not resolution. As such, an opportunity to transform tensions into the basis of eventual resolution of the conflict was allowed to escape, no agreement was reached, and the effort at environmental diplomacy failed.

4.5.2 Cheba'a Farms

While the invasion and occupation of Lebanon may not have been driven by control of water, there seems to be a hydrological explanation of Israel's retention of territory, both for the Cheba'a Farms and for the town of Ghajar.

The relatively small territory known as the Cheba'a Farms on the hillside of Mount Hermon (see Figure 3.1) is very highly contested. Maps drawn by the French Mandate authorities were done with disregard to local practices and ownership titles (see Section 2), and using surface water catchments as natural bounds for political borders. In their de-lineation of the border along the crest of hills (rather than in the wadis), the French Mandate officials treated the Cheba'a Farms slope of Mt Hermon as Lebanese (Khalife 2001, Kaufman 2002, Kaufman 2006, Khalife 2007). Nonetheless, Syrian inhabitants from Cheba'a used to work their lands and graze their flocks in these areas, at least until the Israeli occupation of 1967.

Today, Lebanon claims the land, and has received official explicit acknowledgement of Syria for this position. Israel claims the land belongs to Syria, on the other hand, leaning on the support of the UN reports issued following Israel's 2000 withdrawal from Lebanon. Former advisor to the UNIFIL forces Goskel clarifies the UN position: "The UN did not say Cheba'a belongs to Syria. We said according to best available data and maps, it looks that way but

since the UN was not tasked to demarcate the border, it was up to those two countries to sort it out" (Goskel 2011, pers. comm.).

Israel's position that the Cheba'a Farms are Syrian serves to justify its continued occupation of the Farms (as part of occupied Syria), while maintaining complete and legal withdrawal from Lebanon – a debate discussed at length elsewhere (e.g. Kaufman 2002, Kaufman 2006, Khalife 2007). Considering that an Israeli withdrawal from the Farms would weaken the legitimacy of Hezbollah's motives to remain armed political party, Israeli insistence on retaining the territory requires scrutiny, and may be explained in a number of ways.

The first motive is military-strategic. The ridge leading up to the Mt Hermon Station (in Israeli-occupied Golan) is dotted with Israeli military communications outposts connected by a road. An Israeli return of the Cheba'a Farms would place the road and outposts in Lebanon, thus making access to the Hermon Station more difficult and exposing it to greater risk of attack. The second is ideological: the site of the *Covenant of the Pieces* once visited by pious Muslims, now attracts pious Jewish pilgrims (Kaufman 2002: 594). Indeed, tourism to the area is controlled by the Israeli military, and is off-limits to non-Jews.

The hydropolitical dimension of the occupation of the Cheba'a Farms seems much more straightforward. Referring back to Figure 3.1, the territory maps almost directly and completely onto the surface water catchment of the Liddan and Banias springs. An Israeli surrender of the territory to Lebanon would thus result in loss of physical control of the bulk of the runoff and recharge zone of the most important Upper Jordan River tributary (and part of the recharge and runoff area of the Banias). So long as Israel *also* occupies the Golan, it ensures that the entire surface recharge zones of the Liddan of the Banias remain directly secured for continued Israeli use. Israel thus retains not only exclusive use of the flows, but an ability to control the water quality of flows destined for the Lake of Tiberias.

Of course, the complex hydro-geology of the region makes it is very difficult to estimate the contribution of groundwater flows of rain landing on the Farms. The discussion in Section 3.4 would set this at some fraction of the roughly estimated 250-350 MCM/y transboundary groundwater flows. Even the full flow of the Liddan and Banias rivers downstream of the Farms is only a small fraction of total Israeli water use, however, and the water volumes involved cannot be seen as of vital strategic importance. This study suggests that the hydropolitical dimension of retention of the Cheba'a Farms is best interpreted from within a dominant Israeli 'water-security' discourse (discussed in Section 6), as well as in regards to the ideological and military motives.

4.5.3 Ghajar

> "Many people are focusing on the territorial aspect of the conflict over Ghajar without taking into account the fact that a dispute over water resources is developing in the region. This conflict is strongly reminiscent of the showdown over the diversion of the sources of the Jordan River in Syrian territory on the eve of the Six-Day War of June 1967." (Schiff, 2001).

The territorial ownership of the town of Ghajar is as disputed as that of the Cheba'a Farms. The village sits at the top of the shallow canyon formed by the Hasbani River, and directly across from the source of the Wazzani Springs which bubbles into it the river – as in Figure 4.6. Initially left unoccupied by Israeli forces in 1967, the residents of the town sought inclusion with Lebanon (which was refused for a variety of reasons not discussed at further length here), before attracting Israeli occupation of the adjacent Syrian Golan. Ghajar was effectively divided into two: a southern part in the Golan under Israeli control even after the withdrawal in 2000, and a northern part in Lebanon. The latter was settled only during the Israeli occupation period by residents of Ghajar expanding north beyond the original limits of the village.

Figure 4.6 The town of Ghajar, above the Wazzani Springs. © Sébastien Pellissier (MO 2010) (labels added).

The Israeli retention of Ghajar following its near-complete withdrawal from Lebanon may be explained by the expressed will of the residents. There is also a geo-strategic component – the village would be the only sizeable Lebanese village in the nearby area, and could engender border incidents such as those related to many other Lebanese border villages to the west.

The hydropolitical dimension of the continued occupation of Ghajar is associated with control of the Wazzani Springs. Figure 4.6 shows how the Israeli guard towers have a clear view of the springs, allowing for constant surveillance. Any activity on or close to the springs is readily monitored, and could be easily be controlled and acted against.

As with the case of the Cheba'a Farms, the significance of the hydropolitical dimension of Ghajar should not be over-stated, however. Physical control of the Wazzani Springs provides Israel assurance to use the most stable portion of the Hasbani (and, along with the Cheba'a Farms, complete physical control over the great bulk of the Upper Jordan River tributaries). The quality of water flowing into the Lake of Tiberias is thus more readily managed (though upstream olive waste disposal still cannot be), while the roughly 60-80 MCM/y stable discharge of the spring is reserved exclusively for Israeli use.

If full control of the Wazzani Springs was a chief driver of the continued occupation of Ghajar, however, one would expect Israel to annex the territory of the Springs itself. This would clearly violate the Israeli claim of a complete withdrawal from Lebanon. There is also no apparent motive from a tactical or strategic point of view to annex the land, as it would be much more difficult to defend a position on the western side, essentially cut off from the newly-occupied territories by the shallow river canyon. The hydropolitical dimension of the occupation of Ghajar is thus subordinate to the geopolitical and legal arguments (as well as national security arguments – see Zisser (2009)). Israeli prevention of further Lebanese use of the Wazzani or Hasbani is more soberly interpreted, it is suggested, by consideration of the dominant 'water-security' discourse reviewed in Section 6.

5. Wars and Water

This section applies a hydropolitical lens to part of the violent conflict between Israel and Lebanon. With an emphasis on the 2006 war, the relation between war and water is examined first through classification of war damages to water resources and water infrastructure, followed by the impact of this on transboundary hydropolitics.

The bulk of international water conflicts around the world are played-out through expression of 'soft' power, and not through armed conflict or war (Zeitoun*, et al.* 2011). The case of the Upper Jordan River is no different, where outright hydropolitical factors – such as control of transboundary water resources – are found to be only moderately influencing (and certainly not driving) the decision to go to war. The examination of the damages concludes, on the other hand, that water infrastructure has often been a target of war, and damages are classed as either indiscriminate or deliberate. The impact on hydropolitics of the destruction of the 2006 war upon hydropolitics is seen mainly through deterrence of development of further water infrastructure in Lebanon, primarily through discussion of the (limited) damage to the Wazzani pumping station, which had nearly created a war itself four years earlier.

5.1 Understanding Water and War

The effects of war and water infrastructure have been documented by a select group of international humanitarian agencies, notably the International Committee of the Red Cross[38] (e.g. Nembrini 1995, ICRC 2000, Nembrini 2001, Nembrini 2002b, Nembrini 2002a). The documentation was given shape and expanded beyond water infrastructure to include the impacts of war on water-related politics and economy, as shown in Table 5.1.

Peter Gleick's foundational work on water and conflict moves beyond the impacts of war on water infrastructure, institutions or economies to get at the motives and use of water in violent conflicts, as shown in Table 5.2.

The classifications of Tables 5.1 and 5.2 constrain interpretation of the role and effect of armies and politics in relation to water. 'Warfare ecology' has been developed as a further method of understanding the relationship between war and the environment (see e.g. Machlis and Hanson 2008, Mason 2011). Primarily because of the heavy infrastructure component of the case at hand, this approach was not incorporated into the frames chosen.

[38] Work on the legal ramifications of water and war is found in e.g. Tignino (2011).

Type of damages	Description	Example
Infrastructure -indiscriminate	Unintentional damages to water infrastructure suffered under normal military rules of engagement (i.e. water infrastructure is not the target)	• Crushed manholes or fire hydrants • Crushed water network pipes (where exposed) • Water mainlines broken over a short span • Shrapnel or bullet damage to concrete water reservoirs or rooftop tanks
Infrastructure – deliberate	Intentional damages to water infrastructure suffered under normal military rules of engagement (infrastructure is the target, regardless of motive)	• Water mainlines dug up lengthwise • Bullet damage to steel water reservoirs • Mortar damage to concrete water reservoirs
Developmental / Economic	Financial or lost-opportunity costs	• Water development projects halted • Lost opportunities to re-invest because of donor reluctance • Water bills unpaid or not billed for • Further breakdown because of decreased operations and maintenance
Political	Impact on cooperative arrangements	• Worsening of relations at technical or political level

Table 5.1 Classification of damages to water infrastructure and water sector development (after Zeitoun 2005).

Base of Conflict[39]	Suggested criteria
Control of Water Resources where water supplies or access to water is at the root of the tensions.	a changed outcome in physical or effective control of the resource following the end of the conflict
Water as a Political Tool where water resources, or water systems themselves, are used by a nation, state or non-state actor for a political goal.	coercion – use of advantageous hydraulic (or security) position to advance interests in non-water domain
Water as a Military Tool where water resources, or water systems themselves, are used by a nation or state as a weapon during a military action.	use of flooding, moats, poisoning
Water as a Military Target where water resource systems are targets of military actions by nations or states.	deliberate destruction of wells, reservoirs, treatment or distribution facilities
Development Disputes where water resources or water systems are a major source of contention and dispute in the context of economic and social development	conflicting interests are neither fought over militarily nor resolved peacefully

Table 5.2 Gleick's classification of bases of (violent) water conflict (after Gleick 2009).

[39] A sixth category "Water Terrorism - (non-state actors): where water resources, or water systems are either targets or tools of violence or coercion by non-state actors" duplicates the categories 'Water as a Military Tool' and 'Water as a Military Target', but applies these to non-state actors. Considering this duplication as well as the labeling (when states carry out such an action it is considered a "military tool"; when non-state actors carry out the same type of action it is considered "terrorism") the category is omitted from the table. A more helpful definition could be considered: "Water Terrorism (state and non-state actors) - where water resources or water systems are employed as either targets or tools to create fear and panic in the opponent's civilian population".

The very extensive damages to water infrastructure documented in the 2006 war lends itself to questioning whether this was a case of 'urbicide'. 'Urbicide' is defined as "organised, extremely violent acts against cities, those who live in them, and the support systems that make them work'' (Graham, in Ramadan 2009: 4). Examining urbicide means questioning proportionality of the destruction of the built environment to the objectives of the war, where the city or town itself is the military target, as opposed to the "discrete installations relating to the pursuit of war" (Coward 2008: 9). Given the extensive damages to many of the villages in the south, and the near-total destruction of the Dahiyeh neighbourhood of Beirut, 'urbicide' may serve to further interpret the relation between war and water in Lebanon beyond the classification offered following.

5.2 Water and war in Lebanon, Palestine and Israel before 2006

An incomplete list of military events related to water resources prior to 2006 is shown in Table 5.3. These are classified according to the earlier frames of Tables 5.1 and 5.2.

Lebanon	Palestine / Israel
- 1965 Israeli Air Force bombing of diversion works on the Hasbani [deliberate]; - After 1978, (Selective) destruction of irrigation infrastructure and de-development of agricultural sector in southern Lebanon, after 1978 invasion [deliberate] (see Section 4.4); - 1982 Israeli invasion, IDF cut-off of water supplies of Beirut (Gleick 2009), [water as military tool] [deliberate]; Severe damages to cities south of Beirut indicate that infrastructure damages were indiscriminate (El Ezzi 1990). Damages to the public sector due to the war of June 1982 were estimated at about 4000 million L.L. (about US $ 1.1 billion at the time) (Baz 1983); Water networks in Saida, Khiam and Tyre and Taibe pumping stations damaged (total cost of about 156 million Lebanese Lira) (World Bank 2003). [deliberate, indiscriminate]; - Shelling of Dbaiye, Daichounieh and other water treatment plants, plus indiscriminate damages to several water treatment plants and water transmission lines, by various Lebanese militias, Beirut, 1989/1990 (ICRC 1994b). [deliberate] [water as military target] - 1993 and 1996 Israel Air Force bombing of southern Lebanon caused damages to the water infrastructure (Nizzam 2011, pers.comm) [insufficient information gathered to assess the nature of the damages].	- Poisoning of Acre water supply by Irgun, 1948. 70 civilian and 55 British soldier casualties (Lebanese Red Cross Hospital), recently released archives of the International Committee of the Red Cross [deliberate] (Sitta 2007). - Cut-off of West Jerusalem's water supply during 1948 fighting (Gleick 2009) [water as military tool] [deliberate] - Syrian attack on attempted diversion works, Bint Yacoub Bridge, 1953 (Gleick 2009) [deliberate] [water as military target] - Attempted sabotage of the National Water Carrier by PLO, 1965. [deliberate] [water as military target]

Table 5.3 Incomplete list of violent conflict and war events related to water in Lebanon, Palestine and Israel, prior to 2006, and their classification according to Tables 5.1 and 5.2.

5.3 Water and war in Israel during the 2006 war

The 2006 war was fought primarily with artillery, tanks and aircraft by the Israeli side, and with artillery and anti-tank weapons by Hezbollah from the Lebanese side. The bulk of ground combat occurred in southern Lebanon while Israel's air dominance allowed it to attack targets in the farthest north. Damages to water infrastructure over the war's 33 days were suffered primarily in Lebanon.

In Israel, the 2006 Summer War resulted in the deaths of 43 Israeli civilians and 119 soldiers, 690 injured and between 300,000 - 500,000 displaced. Approximately 4,000 rockets were launched by Hezbollah; 901 of which landed in urban areas. Over 6,000 homes where hit, of which approximately 2,000 were considered completely destroyed. The direct and indirect cost of the war was estimated at US $ 1.6 billion (Israel Project 2011).

The extent of the damages on environmental resources or water infrastructure in Israel has been investigated through public documents and through internal authorities. These have been provided through the manager of the 'water' file of the Ministry of Foreign Affairs at the time, and with the director of international relations of the Ministry of Environmental Protection. The documents show how the bulk of the damages are related to wastewater infrastructure.

Perhaps the most dramatic environmental damages of the war were the fires that destroyed some 12,000 dunums of woods and forests. The Ministry of Environmental Protection also reported that the Safad wastewater treatment plant (WWTP) "suffered direct damage to the sludge treatment facility, to the pipes and to adjacent buildings" (IMEP 2006). Approximately 14,000 m3 of sludge was dumped to the sea from the Naharia WWTP, due to "lack of sufficient security facilities", since the plant was (presumably) evacuated during the war. Biogas was either burned released (due to incomplete construction or lack of maintenance) from three WWTPs, meanwhile, including approximately 70,000m3 from Naharia WWTP, 100,000 from Karmiel WWTP, and 700,000m3 from the Haifa WWTP (IMEP 2006). Given the overall inaccuracy of the Katyusha and other missile types used by Hezbollah, these damages may be classified as 'indiscriminate', according to Table 5.1.

There is no evidence of any significant impact of the 2006 war on water resources, infrastructure or institutions in Israel. There is also nothing suggesting that the attacks on Israel were intended to regain any of the land still occupied by Israel – the Cheba'a farms, Ghajar or the Golan Heights (and thus no apparent hydropolitical motive, or effect).

5.4 Water and War in Lebanon during the 2006 war[40]

We don't claim a gallon of Lebanese water. We have no hostile intentions whatever towards Lebanon as a country, towards the Lebanese people or towards Lebanese natural resources. (Israeli spokesman Mark Regev, in Murphy (2006)).

In Lebanon, the Summer 2006 war resulted in the deaths of approximately 1,100 civilians and between 280 and 500 armed combatants, 3,700 injured civilians and over 900,000 people displaced (Amnesty International 2006, Bishop 2006, Crooke and Perry 2006, GOL 2006a, GOL 2006b). The Israeli Air Force flew some 15,500 sorties firing hundreds of thousands of missiles throughout the country, while its Navy conducted some 2,500 bombardments on targets near the shore and ground artillery pounded the south. Power transmission lines and main roadways were targeted, Beirut's airport was debilitated, and roughly 90 bridges were destroyed. Some 30,000 housing units were completely destroyed, with more than 100,000 partially destroyed (UNHRL 2006). The damages are estimated valued between US $ 1.8 and 3.6 billion, and opportunity cost at about US $ 8 billion (GOL 2006a, GOL 2006b).

5.4.1 Quantification of the damages to water infrastructure in Lebanon

A complete list of damages to water infrastructure, resources, institutions and water-related livelihoods is presented in Figure 5.1 and Table 5.4, and discussed following.

[40] This section relies on reports from Lebanese governments, and international aid agencies, as well as the authors' personal awareness of the extent and nature of the damages. Two were present during the fighting or shortly thereafter, both were involved in the relief effort, and one involved in restoration of the water supply to several villages in the south.

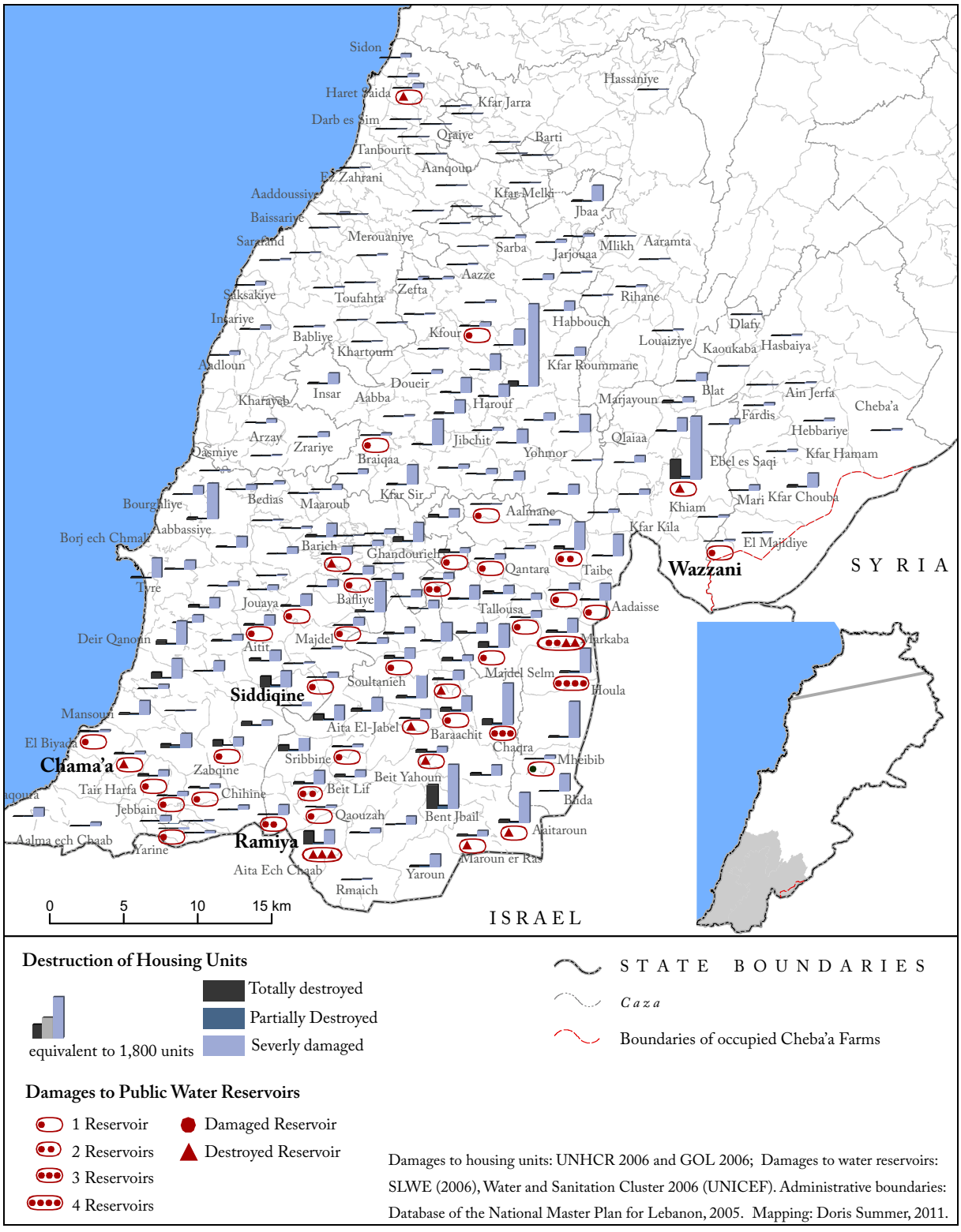

Figure 5.1 Damages by IDF to housing and public water reservoirs during the 2006 war. The towns in bold are discussed in the text. The corresponding list of damages is presented in Annex E.

Item	Area	Comments	Basis of Conflict (Gleick, Table 5.2)	Classification of Damages (per Table 5.1)	sources
INFRASTRUCTURE					
Water Reservoirs	South Ba'albeck	55 public water reservoirs partially or completely destroyed (see Fig 5.1)	Military Target / Military Tool	Deliberate - 12; or indiscriminate	(GOL 2006a, SLWE 2006)
Pumps	Lebanon	20 pumps damaged or destroyed.	Military Target	Indiscriminate	(GOL 2006a, SLWE 2006, Allès 2010)
Artesian Wells	South Lebanon	2 Artesian wells damaged or destroyed	Military Target	Indiscriminate	(GOL 2006a, SLWE 2006)
Distribution Networks	Lebanon	Numerous sections of internal distribution network Authors could confirm the use of bulldozers to destroy the old part of Aita el Cha'ab	Military Target / Military Tool	Indiscriminate (deliberate - Aita el Cha'ab)	(Sadeldeen, *et al.* 2009)
Small infrast. (roof tanks, etc.)	Lebanon	Tens of thousands	Military Target	Indiscriminate	(GOL 2006a, SLWE 2006)
Power Supply	South Lebanon	Electrical transmission lines to and distribution lines within most villages (including to most well pumps). 240 to 725 transformers destroyed.	Military Target / Military Tool	Deliberate	(GOL 2006a, SLWE 2006, UNDP 2006)
Irrigation schemes	West Beka'a Qara'oun	Parts of main irrigation canals destroyed	Military Target	Deliberate	(UNDP 2006)
	Qasmiyeh	Parts of main irrigation canals destroyed	Military Target	Deliberate	(GOL 2006a, SLWE 2006)
Dam works	Maalaka (el Assi River)	Damages at dam construction site on the al Assi River in Beka'a	Military Target	Deliberate Developmental / Economic	(Comair 2009)
Pumping stations	Nabatieh Fakereddine	Public wells	Military Target	Indiscriminate	(UNDP 2007: 9-1)
	Taibe	Was captured and occupied by the IDF	Military tool	Deliberate	(MDM 2006)
	Wazzani	Reservoir and pumps at the booster station partially destroyed.	Military Target	Deliberate	(GOL 2006a, SLWE 2006)

Item	Area	Comments	Basis of Conflict (Gleick, Table 5.2)	Classification of Damages (per Table 5.1)	sources
INFRASTRUCTURE AS A WHOLE					
	Lebanon	Total damages to the water infrastructure was estimated at US $ 81M by the GOL and US $ 61M by the WB.	Military Tool	Deliberate	GOL 2006 WB
WATER RESOURCES					
	Lebanon	Three particularly critical sources of pollution from substances leaking into the soil and potentially into the water supply chain. Destroyed factories, Petrol Stations, and potential PCB contamination leaked from transformers		Indiscriminate	(UNDP 2007: Ch 9, UNEP 2007)
WATER-BASED LIVELIHOODS					
Marine Fisheries	Lebanon / Coast	Destruction of ports. The oil spill caused by the attack on the Jieyeh power plant		Target/ Indiscriminate Developmental / Economic	(UNDP 2007, UNEP 2007)
Fish-Farms	Beka'a, along tributary of Litani and el Assi	Several fish-farms were directly hit and more than half (305 tons) of the yearly production was destroyed		Deliberate Developmental / Economic	(UNDP 2007, UNEP 2007)
Agriculture	South Lebanon	Between 500,000 and 1,5 million unexploded cluster bomblets render approx. 545 fields inaccessible		Deliberate Developmental / Economic	(Darwish, *et al.* 2009), (UNMACC 2007)

**see also www.rebuildlebanon.gov.lb*

Table 5.4 Summary of damages from the 2006 war to water infrastructure, resources and institutions in Lebanon (not comprehensive*).

The total cost of damages to water infrastructure was estimated by the World Bank at US$65M (World Bank 2007), and by the Government of Lebanon at US$81M, as in Table 5.5.
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Area/ Water Authority	Estimated Damage (million US$)[12]
South Lebanon Water Authority	26
Bekaa Water Authority	34
Litani Water Authority/ Qasmiyah Irrigation Project	4
Litani Water Authority/ South Bekaa Irrigation Project	2
Power Generation Factories/ Markaba Station	8
Power Generation Factories/ Al-Awaly Station	2
Power Generation Factories/ Joun Station	5
Total estimated damages	81

Table 5.5 Estimate of costs of water sector damages during the 2006 Summer War, in Lebanon. The figures do not include wastewater infrastructure or indirect costs (GOL 2006a).

As a result, of course, water supply was completely or severely disrupted throughout villages in the south, and in the Dahiya neighbourhood of Beirut. A US Government situation report of 28 August 2006 cites a UNICEF report that "60 percent of towns and villages in southern Lebanon are without regular water supplies due to infrastructure damage to the pipe network, lack of electricity to power the pumps, and destroyed or damaged roof water tanks" (USG sit-rep 2006). Assessments of villages in the Marjayoun district by the International Relief Committee paint a similar picture:

> "All villages receive a national supply of water from the Litani River, which is treated. The main transmission line from the river has been damaged, but regardless there is no electricity to power the pumping and water treatment stations. All the villages stated there were no problems for obtaining drinking water – bottled water is most often used for drinking. Approximately 40% of people still have a reserve of water in ground tanks, which have an average capacity of 64m^3.
>
> …The main problem for most households is that they have no electricity to pump water from their ground tanks to their roof tanks so that it can be used for domestic purposes. Additionally, many households' roof tanks were damaged from aerial bombardments so that even if electricity were restored they have no elevated storage. Now water is drawn from ground tanks by buckets and bottles and this exposes the reserve of water to potential contamination.
>
> …2 weeks to 2 months were given before this would be operational and supply electricity again. Prior to the war, all villages had between 10 to 15 hours of electricity per day." (IRC 2006)

Descriptions of the damages to water infrastructure in Lebanon

An understanding of the nature of the damages is necessary in order to classify the damages according to the frames of Tables 5.1 and 5.2. In many cases water supply was interrupted through indirect damages – that is, to the power supply of the pumps abstracting water from the wells. The electricity network was apparently singled out for destruction (with hundreds of transformers directly hit), thereby forcing the operators of the pumps to use back-up diesel generators. But diesel fuel for generators is also a link in the supply chain, and was in short supply due to the inaccessibility of roads and the destruction of fuel stations.

Direct damages to water infrastructure came through tank traffic, shrapnel, or direct fire from rifles, tanks or fighter-jets. The result was partially or completely destroyed pumping stations, transmission mainline and distribution lines, pumps at elevated reservoirs, networks within villages, underground tanks, pumps to convey water to roof top reservoirs, household roof top reservoirs and larger municipal water reservoirs. The bulk of damages to pipelines and roof tanks appear in general to be 'indiscriminate', or not intentional. The full extent of the damages to water infrastructure were not immediately apparent, furthermore, and many of the transmission lines and other appurtenances that were partially damaged are breaking down today. Of particular interest to this study are the damaged water reservoirs, and Wazzani pumping station, which warrant a closer look.

5.4.2 Damages to public water reservoirs

Public water reservoirs suffered damages considerably more than other elements of water infrastructure, with 55 damaged or destroyed. As shown in Figure 5.2 and Annex D, the nature of damages varies, suggesting different motives.

The public water reservoir in Siddiquine is an elevated reservoir model typical of the majority in the region. It is located on the village limits right beside its feeder well, and remained intact even as the village centre was heavily damaged by Israeli artillery and air strikes (see Figure 5.1). Any direct damages are superficial and considered to be 'indiscriminate'. The new mobile electricity generator shown in the photo speaks to the indirect damage suffered through destruction of the electricity supply. Water delivery and storage in Siddiquine were interrupted by the attack on the village, as there was no power to supply the pump that would feed the reservoir. The existing backup generator had not been adequately maintained, and in any case diesel fuel supply lines were interrupted during the fighting. Once fighting had ceased and the security of rehabilitation crews was assured, the generator was replaced and the well and reservoir quickly became functional again.

Figure 5.2 Water reservoirs in Lebanon damaged during the 2006 Summer War, showing a range of the nature of the damages. Siddiquine: no direct damage to reservoir; Chama'a: 'indiscriminate' and 'deliberate'; Ramiya: 'deliberate'. (All photos by authors. See also Annex D).

The Chama'a reservoir has suffered from multiple types of projectiles, shrapnel, bullets, and a direct hit from a tank or fixed artillery projectile at the lower wall. This reflects its highly-exposed location – on the edge of the town at the top of a hill the foot of which gives on to the border of Israel. There may or may not have been Lebanese fighters seeking shelter behind or inside of it, and the damages may be classified both as 'indiscriminate' and 'deliberate'. No quick restoration of the reservoir was possible, necessitating the delivery and construction of temporary 'Oxfam tanks' to restore water delivery services to the village.

Unlike the two previous examples, the Ramiya reservoir sits on the ground on a hill, slightly removed from the village.[41] It does not show the same signs of intense fighting or shelling but it has been suffered three very targeted hits of higher calibre – most likely tank shells. As with the case of the Chama'a reservoir, water delivery could only be restored through the construction of a temporary reservoir.

More photos with descriptions and assessments of damaged reservoirs are provided in Annex E. Establishing patterns between the overall level of destruction and destruction of the public water reservoirs in particular is difficult, in hindsight. Not all of the damaged reservoirs were located in villages with heavy fighting. The reservoir in Aalmane was destroyed, for example, though 'only' three houses were destroyed or severely damaged in the village. Most of the damaged reservoirs appear to be situated in villages where the general level of destruction was high, and which saw ground fighting on more or less intense scale (the reservoirs in Ba'albek and Haret el Saida excepted).

The humanitarian agency Médecins du Monde provide insight in their comments the nature of the damages to the public water infrastructure:

> "Les réseaux publics d'eau ont cessé d'alimenter les habitants dès le début du conflit. Lorsque les réservoirs municipaux étaient des installations aériennes, ils ont le plus souvent été endommagés par les bombardements. Le caractère délibéré de ces destructions est difficile à établir, même si dans certains cas, la position à l'écart du village et proéminente du réservoir peut porter à croire qu'il s'agit d'un acte intentionnel. Dans les rares cas où ils ont été épargnés, ou lorsque les réservoirs publics étaient des cuves souterraines, ce sont les canalisations, situées sous les routes bombardées, qui ont été endommagées" (MDM 2006: 30).

Reflecting on the extent to which the partial destruction of over 50 reservoirs was deliberate or systematic, Israeli academic Hillel Shuval lays the blame with individual soldiers: "It was not a war tactic but rather *disgraceful* acts by soldiers as an act of vengeance or retaliation to attacks around these infrastructures" (Shuval 2011, pers.comm.). An Israeli spokesman for the Foreign Ministry claimed "there's a policy decision at the highest level not to target

[41] Ramiya also has a typical elevated reservoir located at its centre, which also sustained deliberate damages.

those water pumping stations" (Murphy 2006). Having dealt with previous damages during the Israeli invasions in 1993 and 1996, on the other hand, former Director of the South Lebanon Water Establishment Ahmed Nizzam sees a pattern, and asks how the damages could be anything but deliberate (Nizzam 2011, pers.comm).

In any case, destruction of such vital services is a well-known method of clearing civilian populations during the time of fighting, and of preventing its return. As such, they are also a clear violation of the rules of war as codified in International Humanitarian Law (IHL). IHL relates both the vulnerability of water systems to armed conflict and the fundamental role it plays for human well-being in Additional Protocol I, 1997 - Article 54 (Paragraph 2), and Article 55 (protection of the "Natural Environment" and of "Objects indispensable to the survival of the civilian population" during wartime (ICRC 1994a).

5.4.3 Other water-related damages

Damages to the water administration in the south

Institutional damages were also suffered by the South Lebanon Water Establishment (SLWE), which had only been established one year prior to the war. The crisis it found on its hands halted the sector reforms it was undertaking, for the entire recovery and reconstruction period (Allès 2010). The cost to the SLWE of providing alternative sources of water and of repairing the damaged infrastructure is estimated at US$120M (World Bank 2007). The SLWE is also more directly and indirectly caught up in the internal Lebanon political tensions that ensued from the war.

Damages to water resources

The environmental assessments prepared by UNDP (2006) and UNEP (2007) highlight a number of threats to and effects upon the environment, specifically upon water resources. The real impact of the war on the quantity and quality of water resources cannot be accurately gauged, due to the lack of pre-war baseline data, however. It is thus difficult to distinguish between war-induced and chronic sources of water resources pollution (UNEP 2006).

The most obvious harmful effects of the war – with exception of the oil spill from the bombing of the fuel tanks at the Jiyeh power-station – were considered to be of significance locally (UNEP 2006). More critical environmental degradation was considered to originate from damaged and destroyed industrial sites, damaged petrol station, and PCBs leaking from damaged transformers.

The UNEP report highlights the Choueifat industrial area near Beirut as a hotspot of environmental contamination. Ash from burned industrial materials of the 13 sites hit in the area (specifically from the Transmed compound), and contaminated soil were identified as

potential sources of heavy pollution. Water quality testing from the Ghadir stream showed contamination with heavy metals and volatile organic compounds: "Laboratory analysis showed BOD and COD values to be two to seven times greater than the permissible values set by the Lebanese Ministry of Environment.... Finally, toxic compounds like benzene, naphthalene and toluene also considerably exceeded intervention levels." (UNEP 2006: 118-125)

Threat to groundwater quality was particularly prominent form damaged petrol stations. Twenty-five were reported damaged in the South and Beka'a areas, although 47 were reported damaged by local authorities. The risk of seepage into and contamination of groundwater was considered high in the Beka'a. The karst limestone aquifer predominant throughout the south (including in the Hasbani basin) is more resilient to benzene seepage, as it would be flushed away relatively easily and the relatively impermeable marl or chalk formation would prevent extensive seepage into the groundwater (UNDP 2007: 96).

Electricity transformers are a critically significant source of pollution because of the effects of seepage of polychlorinated biphenyls, or 'PCB's. These are carcinogenic compounds that have a risk-increasing long retention time. Because the number of reported damaged transformers varied from 199 to 725 it was estimated that those containing PCBs could vary between a few and 240 (UNDP 2007: 9-5).

This stock of damages does not include air and soil pollution due to increased quarrying activity to feed the reconstruction, forest fires, or the massive Jiyeh oil spill. The WB estimates the total environmental cost at approximately US $ 730 million. But the WB notes that this amount underestimates the real cost of degraded water to health[42] (World Bank 2007).

No information on damages to wastewater treatment plants – in terms of released sludge or biogas due to the fleeing of maintenance teams, as occurred on the other side of the borer in Israel – could be found, though it is not unreasonable to assume that these did also occur.

Fish-farms and marine fishing

Fish-farms were reported damaged by air strikes near the el Assi dam construction site, Al Zeitouni area, the el Assi bridge near Hermel, and the Al Zarqa stream in the West Beka'a. The most serious destruction was wrought by direct hits and the ensuing pollution on the al

[42] Another source of error seems to be that it only considers the cost incurred by the SLWE, when water resources and networks were damaged throughout the country and specifically in southern Beirut. It is also not clear if the investment by international aid and development actors is taken into account.(WB 2007a) Based on GOL and original WB estimates the cost could be US$ 20 – 30 million higher for the water sector.(See discussion on page 58, WB 2007a)

Assi River,[43] where an estimated 305 tons of Rainbow trout were killed (along with about 30 tonnes in the Zarqa stream), representing about half of total annual 'production' (UNDP 2007: 6-10).

The marine fishing industry also suffered damage, as numerous ports had equipment and infrastructure destroyed. The Jiyeh oil spill extended beyond the northern border of Lebanon with untold harm to marine life. Risks for the reproduction of fish stocks were expected over the subsequent years, as larva and eggs are more sensible to the toxic effects of contaminants from the oil spill (UNDP 2007, UNEP 2007).

Agriculture

The livelihood impact of the 2006 summer war may have been most pronounced in the agricultural sector. Air strikes and ground artillery positioned along Israel's northern border fired relentlessly into the area south of the Litani, including with millions of cluster bomblets. An estimated 500,000 - 1.5 million of these (UNMACC 2007) remained unexploded and continue to pose a threat to the local population until this day. Agricultural land has thus been inaccessible for years to come after the war. As Table 5.6 shows, the extent of fields damaged by such unexploded ordinance ('UXO') is approximately 550 hectares.[44]

The direct losses to the agricultural sector included the loss of husbandry animals, farming equipment, green houses and large amounts of crops. The impact on livelihoods was most pronounced in the south, where 30-40% of the populations depends on incomes from agriculture (Darwish*, et al.* 2009) – as in Table 5.6.

The losses over time from these types of damages have been estimated at four to seven times higher than from the direct loss of crops.[45] As such, the most water intensive sector was set back by many years in a way reminiscent of the impact of the much longer Israeli occupation period (see Section 4.4).

[43] The farms there were "bombarded on 3 occasions in 4 locations (14th and 29th of July and the 2nd of August 2006)" (UNDP 2007, p. 6-10)

[44] "In the aftermath of the 2006 conflict with Israel left approximately 43.2 million m2 of land contaminated with unexploded cluster munitions, with 20.6 million m2 remaining to be cleared, despite international assistance provided over the last few years" E-MINE 2011)

[45] See Darwish et. al. (2009) for a more detailed discussion.

	Buildings damaged*	Infrastructure and sections of road destroyed**	Agriculture fields damaged***
South Lebanon			
Tyre District	401	251	342
Bent Jbail District	929	240	131
Marjayoun District	159	44	72
Total	1,489	535	545
Beirut	333	6	–

Notes:
* Refers to structural damage beyond that which is cosmetic or related to the appearance of the structure.
** Refers to sections of road rendered inaccessible.
*** Refers to fields that were bombed and rendered inaccessible either due to craters or the presence of UXO.

Table 5.6 List of damages from the 2006 war in South Lebanon and Beirut, including agricultural fields rendered inaccessible by unexploded ordinances (UXOs) (Darwish*, et al.* 2009).

5.4.4 The effect of the war on hydropolitics

The heavy damages suffered by water infrastructure throughout Lebanon – and to the Wazzani Pumping Station in particular – suggest a link with the broader Lebanon-Israel water conflict. As seen in Figure 5.3, the reservoir of the booster station of the Wazzani project suffered from apparently deliberate structural damage. Furthermore the pump, the electricity supply and underground transmission pipes of the pumping station itself were damaged – as seen in Annex E.

The Wazzani pumping station and booster station themselves were not completely destroyed, however, though this would have been easy enough for the Israeli Air Force to carry out. The cosmetic and minor structural damages were repaired, and the pumping station was operational again some months following the end of the war. The (limited) extent of the damages suggests that the deliberate or indiscriminate damages suffered here were not intended to stop Lebanese withdrawals from the Hasbani, and are not directly linked with Lebanese-Israeli hydropolitics. The transboundary flows were, once again, not a prime driver of violent conflict.

Israeli hydropolitical interests *were* served by the war, nonetheless. The head of the Delta Centre for Research and the Press suggest that "In this war, the whole symbol of water has come back with the insurgency now....the long-range aim, I believe, is to again enter the water issue and push it on the Lebanese" (Murphy 2006). A clear message may have been passed to the Lebanese water authorities, in the destruction of the Litani irrigation projects.

As with the case of the 2002 Wazzani threats, the action here obliges the Lebanese government at the very least to anticipate future Israeli responses.

Figure 5.3 Wazzani Booster Station Reservoir suffering direct (and deliberate) damage, 2006 (SLWE 2006).

6. Upper Jordan Narratives and Discourse

The term 'discourse' describes the ensemble of messages and ideas that are passed through media, stories, academia and official propaganda. Discourses may be constructed by actors or institutions in attempts to influence the social order, according to some International Relations theory. Maarten Hajer (1997) suggests that *environmental* discourses[46] are composed of 'narratives' held together by 'storylines', to form what Dryzek (1997) understands as "shared ways of apprehending the world". Dryzek also notes that discourses have four structural elements: a) basic entities whose existence is recognised or constructed; b) assumptions about natural relationships; c) agents and their motives; and d) key metaphors or other rhetorical devices. It is thus understood here that any actor's discourse over transboundary waters can be developed through narratives passed through messages stated openly or behind closed doors, and replicated or challenged by the media and academic or policy circles.

When different narratives are sufficiently aligned to join those of other actors, a 'discourse coalition' may be formed. The coalition of discourses may become accepted to the point that it becomes hegemonic – that is, the narratives generated by the discourse become so widely and deeply accepted that they are generally no longer questioned. One term used to describe the phenomena is 'sanctioned discourse'[47] (after Allan (2001)), reflecting the fact that a discourse become hegemonic through a process of sanctioning – typically by the more powerful actor or set of actors.[48]

As Schoenfeld (2005: 4) notes in his discussion of Palestinian-Israeli environmental narratives in particular, narratives "are purposeful in the sense that *their portrayals of the past and present imply a path of action for the future*" [emphasis added] (see also Alatout 2006). This section reviews some of the narratives that have been constructed in relation to the Upper Jordan River, in order to examine how portrayal of the past and present may inform the future. It notes the extent to which Lebanese narratives have been taken up by the Lebanese public and officials, and are directed at actual or potential third-party mediators. Israeli narratives are found to be constructed within or through society, and sanctioned by the government and third-party mediators. Unlike the case of the Palestinian-Israeli water conflict (Zeitoun 2008: Ch 5), no single narrative in the Upper Jordan River has been clearly established, and the main discourse that exists – the Israeli 'water-security' discourse – is challenged to an extent in Lebanon.

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[46] *Discourse* is defined as "a specific ensemble of ideas, concepts, and categorisations that are produced, reproduced and transformed in a particular set of practices and through which meaning is given to physical and social realities" (Hajer 1997: 44).

[47] Used here in place of Hajer's (1997: 60) 'discursive hegemony'.

[48] The ability to *sanction* a discourse may also be seen as a particularly effective form of 'soft' power in transboundary water conflicts (see e.g. Zeitoun and Warner 2006, Zeitoun*, et al.* 2011).

6.1 Lebanese narratives related to Upper Jordan River

6.1.1 Theft Narrative: Israel is stealing Lebanese water

The idea that 'Israel is stealing Lebanese water' centred around the Litani River during the 1978 – 2000 occupation, and shifted afterwards to the Hasbani River. As discussed in the Box of Section 4.4, the idea of Israeli diversion of the Litani was given considerable backing following the publication of newspaper articles claiming to have identified diversion works, as well as eyewitness accounts of the Israeli military at the Qara'oun dam or seeking flow data inside the hydroelectric power plant. The authors' awareness of public perceptions suggests that the idea seems to have held for some time even following a UN investigation into the claim that found no physical evidence of such diversion works.

While the narrative of Israeli 'theft' of 'Lebanese' water was challenged by the lack of evidence following the Israeli withdrawal in 2000, it may have re-emerged during and following the 2002 Wazzani dispute. The *Al Moustaqbal* newspaper, for example, ran an article in October 2002 entitled "Israel is stealing the water of South Lebanon", which listed a number of Israeli actions and locations to divert water during the 1978 -2000 occupation (Atoui 2002).

Though an adequate investigation of the Lebanese public's perceptions has not been undertaken, it is safe to assert that the 2006 Summer War only served to revive the idea once more. Notions of Israeli coveting of Lebanese water may have been fuelled by yet another IDF invasion to the southern bank of the Litani River, and by news of the attacks on Canal 900 right next to the Qara'oun dam on the Litani. In his capacity as Director of the Council for Development and Reconstruction, for example, Fadl Shalaq commented that the Israeli side "started [their bombing campaign] with the Litani water reservoir, the Litani dam. And we all know that the Litani has a special place in this country,.. It's a big reservoir of water, and the Israelis don't hide the fact that there are several parts of the Litani that they would like to take for themselves" (Murphy 2006).

It is also perhaps conservative to speculate that the 'Israeli theft' narrative held by the Lebanese public (and replicated by the politicians and media) regularly confuses the Litani River with the Hasbani River. While there has been extensive lobbying for diversion of the (Lebanese) Litani by early Zionist and Israeli actors, no action was taken by the Israeli forces to divert it. Israeli action on the (international) Hasbani River, to the contrary, has assured that the vast bulk of the flows continue to flow to Israel – with no need for physical diversion.

6.1.2 IWL Narrative: International Water Law is the basis for resolution of the water conflict

A much less-well established narrative that is being constructed in Lebanon in relation to the Upper Jordan River is that the water conflict should be resolved along the lines of International Water Law.

The Director General of the GDHER envisions International Water Law (IWL) – specifically the 1997 UN Watercourses Convention and elements of the EU Water Framework Directive – as the legislative basis for what is termed the 'New Water Mass Concept'. The responsibility for resolution of the conflict lies with Israel, Dr Comair states: "It should be primarily Israel's diplomatic responsibility to find solutions for the management and equitable division of the water resources in the region. A new vision, initiated by Israel, for a future peace settlement integrating a positive hydro-diplomacy might change the present stalemated situation" (Comair 2009: 276). The concept suggests further that the water 'pie' would be enlarged through the additional water provided by desalination and the Red Sea – Dead Sea Canal, and could then be divided according to the distribution principles of 'equitable and reasonable use' of the 1997 UN Watercourses Convention.

The Government of Lebanon report prepared in response to the Wazzani incident reflects the position, stating that:

> "the ongoing water supply project within the Hasbani watercourse area falls completely within the legal framework of the norms and principles of international Law, particularly that Lebanon's utilization of its waters is without any excess bearing in mind that Lebanon has not yet addressed the totality of development needs of the water course area and is keen on achieving this goal within the scope of its rights under International [Water] Law." (GOL 2002).

Subsequent governments of Lebanon generally claim to have fulfilled all of the obligations of International Water Law, something that the Lebanese representatives were at pains to communicate to third-party mediators in 2002 (see also Trondalen 2008: 102, Comair 2011, pers. comm., Anon 2011, pers.comm-c). Lebanese officials chosen as members of former president Hariri's expert committee formed to deal with the Wazzani dispute similarly invoke water rights and international law, specifically the 1997 UN Watercourses Convention (Anon 2010, pers.comm).

Of course, any narrative being developed should be interpreted for the outcome it is constructed to achieve. This official 'water law' narrative appears targeted at actual and potential third-party mediators, particularly the US, UN, and EU. The importance of the international public relations component was not lost on Prime Minister Hariri who explained that "If Israel is moving to market its opinion with these powers so are we because it is wrong to leave the arena for Israel" (Al Kifah al Arabi 2002).

The ‘water law’ narrative is not, however, taken up broadly throughout the Lebanese government (particularly by the influential Hezbollah). Nor is the spirit of IWL reflected in the very selective audiences the narrative is disseminated to, as a level of secrecy surrounds the official government stance on transboundary waters. Lebanese stakeholders interviewed for this study overwhelmingly preferred their views on this subject to be off-record, and generally avoid entering into significant detail by recalling the record of events as told by the news media.

The Lebanese reports produced for the EU mission investigating the 2002 Wazzani Dispute, furthermore, is treated as highly confidential and is generally not accessible to the public. As Farajalla and Makdasi (Farajalla and Makdisi 2008) suggest, official discourse of the rivers is not at all transparent, and may reflect a ‘pure security paradigm’. The Lebanese narrative of International Water Law should thus be considered alongside this ‘security’ narrative that is less-voiced but perhaps more heavily sanctioned within government – and which mirrors the Israeli ‘water-security’ discourse, as we shall see in the following section.

6.1.3 An emerging view from Lebanon and Israel? Sale of water to Israel or ‘Palestine’

The idea of the commercial transfer of ‘Lebanese’ water to Israel or to the West Bank is emerging from a variety of circles, to the point that it may be considered as a budding narrative. An early voice critical of the idea comes from Michel Morkos in 1986: “So is it possible that water issues authorities in Lebanon are smart enough to dismiss – from the heads of Lebanese – that one of the reasons of wars and the occupation of parts of the country is the occupation of water sources and catchments; and that the call for selling waters to Arab countries was an act of ‘madness’?” (Morkos 1986).

The sale of water to Israel is also suggested by Tahal’s chief water engineer Elisha Kally (1991), who discussed it as one of the potential benefits of peace negotiations with Israel. Voices critical to the idea continue to mount, however, and were renewed in the 1990s (see e.g. Al Mashnouk 1995, Haddad 1995, Andraos 1998).

The possibility of Lebanese sale of water to Israel is re-iterated in 2000 in a report for the Israeli Institute for Advanced Strategic and Political Studies. The authors base their analysis on the information of “authoritative” (anonymous) sources in Lebanon, who state that “prior to the Syrian takeover of the Lebanese government in October 1990, Beirut had been planning for an efficient exploitation and management of its water resources by constructing two new dams, Khardali on the Litani River and Bisri on the Awali River... Furthermore, it would have allowed Lebanon to divert and sell its surplus water, in part contributing to the resolution of the acute water problems in neighbouring countries (confidential source)” (Wihbey and Berman 2000 (no page number)). The view supports what Aaron Aaronson had recommended in 1919, that “some kind of international

agreement is essential in order that the Litani may be fully utilized for the development of North Palestine and the Lebanon" (Aaronson 1919, in Wolf 1998: 228). The same recommendation was reportedly made by Israeli Technology Minister Neeman, at the time of the Israeli occupation.[49]

Lebanese sale of its waters to Israel is a commonly-expressed view at international water fora, typically on the back of observations that Lebanon is 'wasting' its waters (since some of the Litani still flows 'unused' to the sea). The view is held for example by Israeli water academics and practitioners (Anon 2011, pers.comm-c, Shuval 2011, pers.comm., Wolf 2011, pers.comm.) (see also comment by Albert Hiorth, Figure 4.3). Most recently, the commercial transfer of water from the Litani to Israel (or to the Palestinian Authority in the West Bank) comes via the 2010 *Blue Peace* report, where a commercial transfer of 150 MCM/y is suggested (Waslekar 2011: Figure 1-m). A very similar idea is promoted in an un-attributed pamphlet distributed at the 2009 World Water Forum (RPSO 2009), and by external consultants to the Palestinian Water Authority (AJTU 2008).

The idea may be gaining currency within official Lebanese circles, as well. The former Lebanese Minister of Energy and Water may have been hinting at an economic arrangement at the 2002 second World Water Forum where he is quoted stating: "Lebanon, which doesn't take but does provide water, declared that we will share our water if we are able but that there are several obstacles that are to be overcome first…. The Lebanese delegation affirmed that water is a gift of the heavens and that if it is possible to share resources, it should be done peacefully and never achieved by fire, we must let water run freely and leave all possibilities of sharing this resource open." (Beirut Daily Star, in Wihbey and Berman 2000).

6.2 The Israeli Water-Security discourse

Official Israeli discourses related to the Upper Jordan River waters are linked within broader strategic interests that were identified in Section 2.3. To recall, Schiff differentiates Israeli security requirements like the protection of water sources as a "strategic need", from the more traditional operational requirements such as the "defence of the Galilee". Two narratives that re-enforce this 'need' have maintained a remarkable consistency (and thus predictability) throughout Israeli hydro-political history: scarcity, and hydro- or geo-strategic. This section discusses the discourse that links water and security to group both narratives, and examines its drivers and consequences.[50]

[49] "Neeman added, however, if the Lebanese ever cared to sell some of the Litani water, "We would be glad to buy this little water and make good use of it in northern Galilee" " (Cooley 1984: 24).

[50] This section does not re-enter or discuss the 'hydrostrategic imperative' debate that attempts to attribute the importance of water in various wars between Israel and neighbouring states. The imperative is

Security study theory suggests that issues may be portrayed as "an existential threat requiring emergency measures and justifying actions outside the normal bounds of political procedure" – an act called 'securitization' (Buzan*, et al.* 1998: 23), which was briefly discussed in relation to the 2002 Wazzani incident (Section 4.5). As we will see, the scarcity and hydro-strategic narratives that make up the over-arching 'water-security' discourse on the Upper Jordan River serve to securitize the flows, most recently to the point that discussion of their re-distribution (which could otherwise be considered 'normal bounds of political procedure') are denied by authorities across the political spectrum.

The link with water and security is made by Zionist lobbyists as early as 1919, in a report by Aaron Aaronson (a dryland-farming researcher and spy trained "both in agriculture and in security matters") which asserts the importance of the Upper Jordan flows for electrical power production:

> "in Palestine, like in any other country of arid and semi-arid character, animal and plant life, and therefore, the whole economic life directly depends on the available water supply. It is, therefore, of vital importance not only to secure all water resources already feeding the country, but also to ensure the possession of whatever can conserve and increase these water – and eventually power – resources" (Aaronson 1919 from the Zionist Archives, in Wolf 1998: 227).

Wolf goes on to note that "the importance of the region's water resources remained embedded in the thinking of the Zionist establishment. "So far as the northern boundary is concerned," wrote Chaim Weizmann later that year, "the guiding consideration with us has been economic, and 'economic' in this connection means 'water supply' (Weizmann letters, September 18, 1919)" (Wolf 1998: 229). "Security is a paranoia" for Israel, suggests Wolf more recently, "especially for water" (Wolf 2011, pers.comm.).

The two elements that constitute the linked 'water-security' discourse are captured neatly in a 2000 statement by the Israeli Ministry of Foreign Affairs:

> "Scarcity of water resources is one of the most characteristic features of the terrain that was to constitute the area of the Palestine Mandate entrusted to Britain after World War I. Rain falls only in the short winter, leaving a long dry summer when agriculture depends entirely on irrigation. The neighbouring countries to the north have abundant resources for irrigation, Syria sharing the Euphrates with Iraq and the Orontes with Lebanon, and Lebanon endowed, besides, with the Litani. Palestine was to be dependent almost entirely on the exiguous Jordan. Therefore, when the boundaries of Palestine were to be settled after World War I, Britain, as the prospective Mandatory Power, and the Zionist Organization representing the nascent Jewish National Home, demanded that

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described at length in Wolf (1998, 2000), and in Wolf and Medzini (2004). The link between *control* of territory and control of water is discussed in this study in Section 7.

> the Jordan and all its tributaries be included in their entirety in the territory of Palestine and that the Litani demarcate Palestine's northern frontier. But, at French insistence, Palestine's northern boundary with Lebanon and Syria, both placed under French Mandate, was set south of the Litani and west of Mt. Hermon, so that three of the four main tributaries of the Jordan the Hasbani, the Banias and the Yarmouk were to originate in French-Mandated territories, and the Litani would become a Lebanese national river. The matter was further aggravated when Transjordan, containing a considerable section of the Yarmouk river, was separated from Western Palestine" (IMFA 2000).

The official statement contains a number of messages, notably: a (physical) *scarcity* of water resources in Israel; a relative abundance of water in neighbouring countries (notably Syria and Lebanon); and French refusal of Zionist demands to include the Litani and Yarmouk rivers into Israel, and the subsequent political problems entailed (for Israel). These messages may also be grouped according to two narratives that have been constructed about the past and present of the water conflict, and which may determine the future of the transboundary flows: a) Israel is short of water resources (while Lebanon is abundant); and b) water always has been and will remain crucial for Israeli state security.

6.2.1 Scarcity Narrative: Israel is short of water resources

There are a number of elements related to the narrative that Israel is short of water resources: blame on colonial powers; a focus on physical (not social) scarcity; and a focus away from Israeli *use* of water resources.

The statement by the Israeli Ministry of Foreign Affairs (above) suggests that the French Mandate authorities were responsible for placing British Mandate Palestine in a vulnerable position, from the perspective of water resources availability. While the French authorities definitely did refuse the advances and requests of Mr Pinhas Rutenberg, General Grant and others for the Litani (Section 4.2), this was only after earlier conceding (in 1921) to the significant hydrological border shift that gave most of the Huleh marshes and all of the Lake of Tiberias to British Mandate Palestine (Figure 2.5).

The projection of Israel as a dry country has as its foundation one of Zionism's founding myths – that Israel made the desert bloom.[51] While much of Israel *is* arid or desertic, the great bulk of the inhabited parts are not. The control that the Government of Israel has achieved over transboundary water resources has allowed it to develop them to the point that consumption rates are equivalent to or exceeding much wetter European countries. Israeli *per capita* water consumption was estimated at 380 m3/y, compared to 80 m3/y in Palestine (Messerschmid forthcoming: Fig 1) (while *per capita* consumption in Germany (in 2002) is estimated at 392 m3/y (FAO 2010)). While there is insufficient water for complete

[51] For deconstruction of the myth, see George (1979).

food self-sufficiency, the idea of water scarcity may be more imagined than real (the Israeli "psychological scarcity" that Dinar identified).

The projection of Israel as a dry and desertic country is so widespread that it is not possible to attribute any particular audiences to which it is directed (see Messerschmid 2010, Messerschmid forthcoming). The projection is replicated in Israeli government (GOI 2010: 10) or military (e.g. ICA 2010) documents, in academic papers (e.g. Feitelson*, et al.* 2007), through Israeli and international NGOs (e.g. FOEME 2010), and with almost clockwork routine in the local and international media.

Much more rare are the reports and discussion critical of Israeli *use* of water (e.g. to grow crops for export) or which mention *per capita* consumption, hence putting the supposed physical water scarcity into context. Here, activist reports (e.g. Amnesty International 2009, B'tselem 2011) complement internal investigations by the Israeli parliament (PCIIWS 2002, NIC 2010) to question the essentially unshaken incentives provided by subsequent Israeli governments to its irrigated agricultural sector.[52] Though critical of Israeli water use, however, these latter reports remain evidently subordinate to hydro-strategic ideas. The logical (and most common) outcome of the scarcity narrative is that Israel 'needs' every drop of water that flows into it, and is thus unable to share with its neighbours even if it would like to. The scarcity narrative thus underpins a much stronger and more determining *security* discourse.

6.2.2 Hydro-strategic Narrative: The Upper Jordan River is necessary for state security

From a hydrological or water resources management perspective, the extensive efforts exerted by subsequent governments of Israel to ensure control over the headwaters of the Hasbani River is not rational. The flows remain the main source of the Lake of Tiberias, and one-third of total Israeli fresh water consumption (or one-quarter of all water consumption). At the same time, the importance of the flows is relatively minor: less than current and projected desalination production, and a fraction of the water used to grow crops that are exported out of Israel. A combination of water demand management and desalination technology would serve to decrease Israeli dependence upon (and thus perhaps reduce the securitisation of) the Upper Jordan River flows. Indeed, one senses that there would be equitable sharing of the flows with Lebanon, and an end to the water conflict, were state interests pursued primarily by water resource managers. The relative unimportance of the flows, however, is not the base of the main argument or narrative deployed by those who advocate against equitable sharing with neighbours.

[52] For more on the subject of allocation of water in Israel, see Feitelson and Fischhendler (2007).

High-level state interests rise above what Lowi (1993) refers to as the 'low politics' of water, particularly along the Jordan River. The water-related official Israeli interests in maintaining control of the occupied Golan complement the (perhaps much) more important religious, military and strategic interests (in the Golan, at the Cheba'a Farms – Section 4). Nonetheless, the primary narrative drawn upon by decision-makers to avoid discussion of resolution of the water conflict is the importance of the Jordan River headwaters to state security.

The idea that transboundary waters are an existential component of Israeli seems so firmly held that it has been maintained unceasingly by the Israeli military in times of war, and by diplomatic circles during negotiations. The prominent Israeli security analyst Ze'ev Schiff emphasises the point: "When water resources are limited, it is possible for one state to "dry out" a rival, either by seizing complete or partial control of the former's water sources, by limiting their flow or by causing their salinization." (Schiff, 1989)

The hydro-strategic importance for Israel to control the Golan was made in the 1980s by Cohen (1985), whose concern for Israeli "strategic water space" and "defensible borders" led to the suggestion of maintaining sovereignty over the "Banias-Har Dov-Hermon shoulder headwaters region" (Wolf 1998: 259), by which he meant the Cheba'a Farms.

The assertion is further supported by the findings of a 1991 report by Schwarz and Zohar entitled *Water in the Middle East: solutions to water problems in the context of arrangements between Israel and the Arabs* [Hebrew translation]. The report had a limited distribution before it was deemed classified, due to its sensitive nature, as Libiszewski elaborates:

> "Schiff proposes to realize water-related security needs by territorial adjustments which would incorporate the escarpment surrounding Lake Tiberias and the sources of the Banias into Israeli territory. These proposals are based on a 1991 report commissioned by the earlier Israeli government and conducted by Jehoshua Schwarz and Aaron Zohar under the auspices of the Jaffee Centre for Strategic Studies. The report had been classified because it contained maps outlining possible withdrawal lines on the Golan heights and the West Bank that would safeguard water sources currently used by Israel. However, excerpts of the report, including the maps, were leaked to the press in late 1993 and published in an article by the same Schiff in Ha'aretz newspaper and then in an English version in Policywatch (Libiszewski 1995: 48, see also Brooks and Lonergan." (1994: 205))

The leaked map referred to very much replicates Cohen's "defensible borders", and is shown in Figure 6.1.

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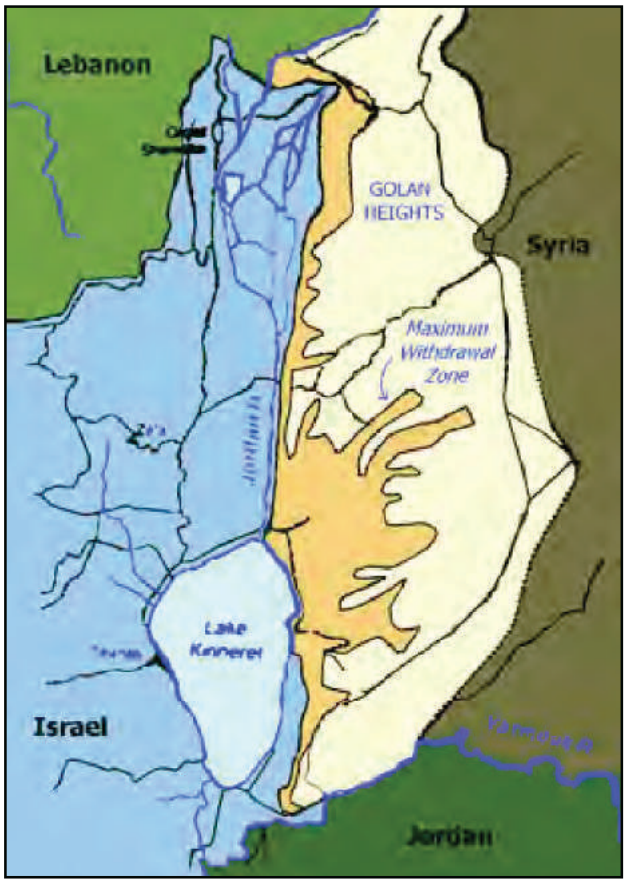


Figure 6.1 'Hydro-strategic' territory in the Upper Jordan River, indicated by the Maximum Withdrawal Zone'. According to Schiff (1993), based on Schwarz and Zohar (Lonergan and Brooks 1994: Fig 14).

Of the several interesting features of Figure 6.1, it is important to note that the 'hydro-strategic' territory includes the Wazzani Springs and the "shoulder" of Mt Hermon (i.e. the Cheba'a Farms), and that the territory actually occupied by Israel in the Golan far exceeds the 'hydro-strategic' territory identified. The first point serves to substantiate ideas about the international character of the Liddan, and to justify the continued occupation of the town of Ghajar and the Cheba'a Farms (Section 4.5). Even more interesting from a hydropolitical perspective, the fact that Israel continues to occupy the Golan beyond the 'maximum withdrawal zone' suggests both i) (of course) there is much more to the occupation than the control of water pollution into the Lake of Tiberias, and ii) *Israeli hydro-strategic concerns are met*, through the continued occupation of the Golan.

What is of considerable interest with the Israeli hydro-strategic narrative, then, is not so much that it exists, but that it *continues* to exist, even after the entire 'hydro-strategic territory' has been annexed by Israel for almost five decades. The elaboration of the 'hydro-strategic' discourse that occurred during the Wazzani dispute in 2002 may thus be seen as

either the lingering effects of long-held and deeply-embedded ideas, or, as a tactical move to set a precedent so as to maintain the status quo.

6.2.3 Effect of the Israeli discourse linking water and security: foreclosing resolution

The construction and maintenance of a discourse that so firmly binds state security with water resources, after decades of control over all 'hydro-strategic territory' and faced with very minor threats demonstrates considerable stamina and unity of purpose on the part of subsequent Israeli governments. Here, 'psychological scarcity' (Dinar 2003:190) drivers mix with religious imperatives, certainly, but there is also a geo-political element to the reactionary moves made by Israel in the Upper Jordan River.

One potential explanation of Israeli securitisation of the resource is the desire to avoid the onset of bilateral negotiations with Lebanon, prior to resolving the dispute over the Golan with Syria.[53] For instance, while the official Israeli National Investigation Committee promotes greater production of desalinated water, instead of seeing opportunity for resolution, *warns* that this "increases political pressures [sic] by the neighbours (the Palestinians, Jordan, Syria and Lebanon) on Israel to give-up the natural water sources, in the framework of political accords" (NIC 2010: 12).

The importance of Lebanon-Israel transboundary waters also routinely develops as an issue when Israel negotiates with Syria. Schiff, for instance, posits water alongside a number of other Israeli concerns:

> "No Israeli-Syrian agreement can ignore the situation in Lebanon, especially southern Lebanon and the Beka'a Valley. No understanding can be reached on Israeli withdrawal from the Golan Heights in the absence of broad security arrangements that include southern Lebanon and the Beka'a and address Syria's military presence in those areas. For military purposes, the Golan and Lebanon are one bloc, and security arrangements must, as a result, encompass areas falling under three different sovereignties – Syria, Israel and Lebanon.
>
> Lebanon must be included in any agreement and enjoy security arrangements from its two stronger neighbours. It, in turn, must commit itself not to divert the Hasbani River, an important source of the Jordan. Within the framework of this agreement, Lebanon must disarm Hezbollah and prevent potentially disruptive outside forces, e.g., the Iranian Revolutionary Guards, from operating against Israel from its territory. Israel, for its part, would withdraw from its security zone in southern Lebanon." (Schiff 1994)

[53] The link between Israeli control and use of transboundary water flows and negotiations with *Palestinians*, by way of comparison, is made in Allan (2001) and in Zeitoun, Messerschmid and Attili (2009).

Though the limits of Schiff's highly securitised perspective have become clear in hindsight (Israel did withdraw from Lebanon, without any of the agreements posited as 'minimum security requirements'), they nonetheless illuminate a part of the entrenched positions preventing conflict resolution. As previously discussed, the issue of water *quality* (of flows into the Lake of Tiberias) in such negotiations is as much or more of an Israeli interest as is maintaining the volume of flows (Daoudy 2008, Hof 2009). Seen in this light, Lebanese use of the Hasbani/Wazzani water thus not only impacts Israeli water use downstream, but also confronts Israel's ability to maintain the highly inequitable distribution of the flows, *as well as* its ability to set the terms of any future discussions (which includes avoiding negotiations unless under Israeli terms).

The main Israeli discourse related to the Upper Jordan River differs from the 'theft' and 'International Water Law' narratives developed in Lebanon, in two important ways. First, support for the Israeli linked 'water-security' discourse is much broader and stronger than is that for the Lebanese narratives. More importantly, the Lebanese narratives (whether used as rhetorical devices or not) leave open the possibility of basin-wide negotiation, whereas the Israeli discourse serves instead to lock-in asymmetry and conflict, and close down the possibility of negotiated resolution. From the perspective of narrative analysis, at least, the water conflict appears inextricably linked with the broader political arena. To return to Schiff (1994), "As long as a state of war exists between Israel and Syria, and as long as the sources of the Jordan cannot be secured, Israel cannot withdraw from the Golan Heights", the logic of which presumably extends to the town of Ghajar and the Cheba'a Farms. The analysis here suggests that the statement be re-considered: so long as the dominant discourse linking water and security is not critically challenged, the possibility of resolving the water conflict (and thus any chance of resolution of the broader political conflict) is foreclosed.

7. The Struggle for Control of the Upper Jordan

This chapter interprets the baseline data of the previous chapters within a hydropolitical framework. The focus is on transboundary water interaction between Lebanon and Israel, and to a lesser extent, Syria. The shifts in control – and use – of groundwater and surface water flows is traced in relation to its control of the land through and over which the water flows, and are summarised in Figure 7.1. These are then related to forms of power (including, in particular, discourses) and strategies of control that they support, as summarised in Figure 7.5, and discussed through the remainder of the section.

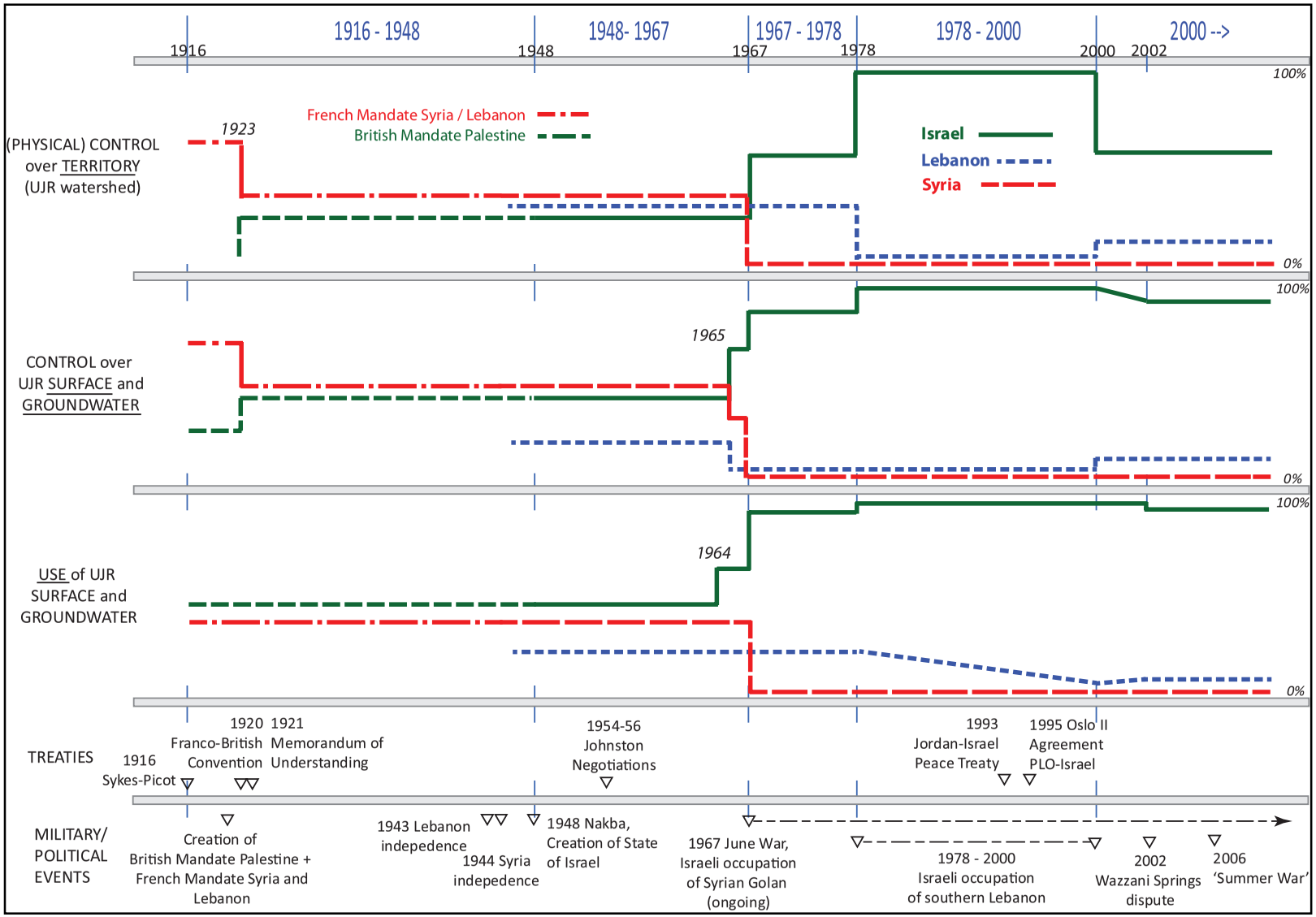
7.1 Shifts in control over and use of the Upper Jordan River

As we saw in Figure 4.2, interaction between Lebanon and Israel over the Upper Jordan River has fluctuated somewhat monotonously over the last century, from mildly conflictual to highly conflictual – with very little if any cooperation of any sort. Zeitoun and Mirumachi (2008: Table 1) suggest that one of the driving forces of such situations of 'High Conflict – Low Cooperation' is *control* over water resources (and exemplify it with the case of Israel-Palestinians on the Lower Jordan River and transboundary aquifers, and India-Bangladesh).

There have been several shifts in control and use of the flows of the Upper Jordan River, over the last century. Over the last half century – at least from 1967 – Israel has acquired and maintained essentially full control over the flows. As basin hegemon it has maintained an order which reflects the broader Israeli-Syrian and Israeli-Lebanese conflict. An examination of the types and degree of control adds more nuance to the conflict, particularly after year 2000.

7.1.1 Shifts in (physical) control over territory

The clear direct relation between water resources and the borders of French Mandates Syria and Lebanon, and British Mandate Palestine, was reviewed in Section 4.1. The relation between control over land and control over water in the current era is much less clear, however, for a number of reasons. First, military security today is based less on ground-based infantry prone to rivers as barriers, and more on fighter jets (and hence control of the *air* is the most coveted military objective). Second, developments in water treatment technology (mainly desalination) can significantly heighten or weaken the demand for freshwater. Third, imports of 'virtual water' become ever more common as world food trade develops – and national food requirements can (and are routinely) be de-coupled from water resources availability. States that have insufficient or squandered their water resources can import food rather than grow it, in other words.



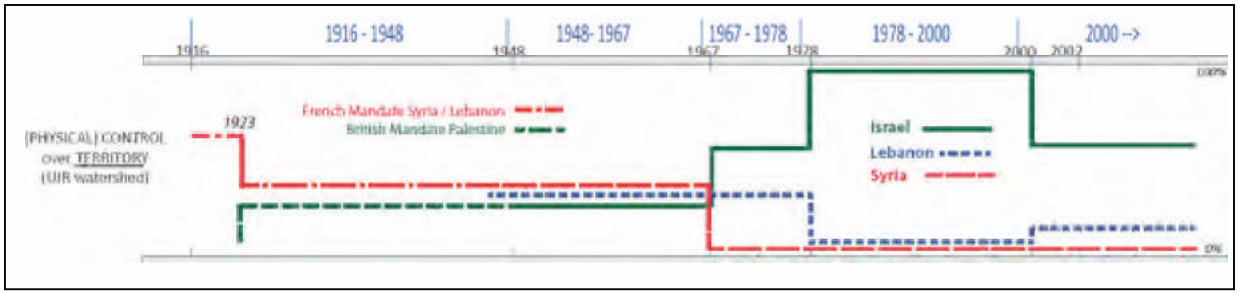
AEDHFC LIJ Hydropolitical Baseline of the Upper Jordan River: *Control and Use*. Figures are indicative, and relative to each other.

As such, links between control over water resources and the acquisition of territory must be situated within contemporary i) politics, ii) technology, and iii) trade patterns – an interesting subject that has attracted considerable attention (see e.g. Wolf 1998, Amery and Wolf 2000, Yiftachel 2002, Medzini and Wolf 2004, Jarvis*, et al.* 2005, Furlong 2006). Discussing potential negotiations with the Golan, for instance, Schiff asserts that for the Government of Israel "water must be viewed as an additional dimension of the terrain" (Schiff 1989).

The flip-side of the dynamic, on the other hand, has never been explored. That is – the relationship between control over water resources, and *withdrawal* from territory. As we will see, this is very relevant indeed to the case at hand.

The shift in association between water, territory and national security in the Upper Jordan River is reflected Figure 7.2., which shows the physical control over the 1,700 km2 of basin of each of Lebanon, Syria and Israel (or French Mandate Lebanon, French Mandate Syria and British Mandate Palestine, as the case may be).

The lobbying of British and French authorities by Zionist individuals or representatives of the World Zionist Organisation failed to extend the borders of Palestine to include the Litani (Section 4.1). The efforts were successful, however, in including Metullah, the Huleh marshes and upper reaches of the Jordan River by 1920 (refer to Figure 2.4). This is indicated in Figure 7.2 by the drop in use of French Mandate Syria, and rise for British Mandate Palestine.



CPNbU mfh Relative (physical) *control of territory* by Israel, Lebanon or Syria, in the Upper Jordan River basin. Figures are indicative, and relative to each other.

Israel expanded its territory significantly during the 1967 Six Days War, ensuring full control over both shores of the Upper Jordan River, the Hasbani River up to Ghajar (and effective control over the Wazzani Springs there), the Liddan Springs and, with the occupation of the Golan that continues until this day, the Banias Springs. The invasion of Lebanon in 1978 and subsequent indirect and direct 22-year occupation of southern Lebanon brought much more than the entire Upper Jordan River basin under full Israeli physical control. This included the

Litani River, the recharge area of the Hasbani Springs (at Hasbaya), and the provisioning slopes of Mount Hermon (the Cheba'a Farms, partial source of the Liddan and Banias springs). After having secured the territory so squarely, the Israeli withdrawal from Lebanon in 2000 posed a challenge to Israeli authorities for the maintenance of its hydro-strategic interests.

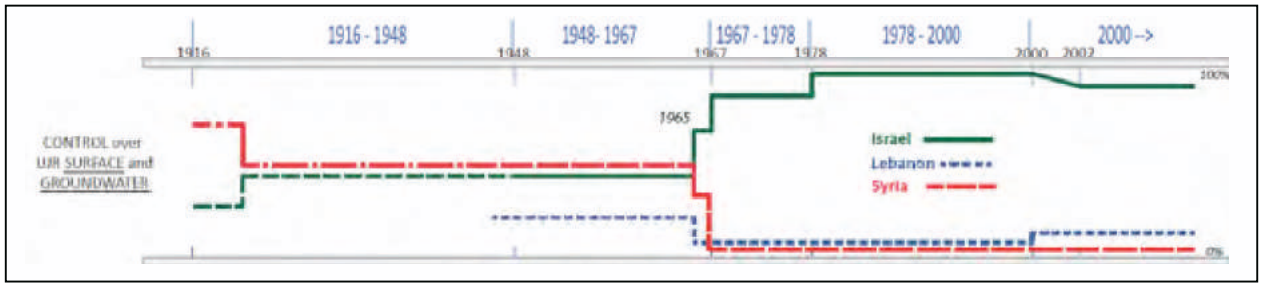
The withdrawal put the Hasbani Springs back under control of Lebanon, though the Wazzani springs remained under effective ('remote') Israeli control. Israel's continued occupation of the town of Ghajar – which facilitates the remote control of the Hasbani (along with the deterrent control effected by the aftermath and political costs of the 2002 Wazzani dispute, as previously discussed) – is similar to the continued occupation of the Cheba'a Farms, in this regard.

As an Israeli withdrawal from the Cheba'a Farms would undoubtedly serve to undermine Hezbollah's legitimacy to continue to bear arms (Section 4.5), Israel's interests in maintaining the mountain top and its slopes must be questioned. Here, the link between control over territory and control over water is still (very much) direct. The recharge area of the Liddan and Banias in the Cheba'a Farms is thus re-posited as one reason Israel maintains an occupation of the land (alongside the military communications, geostrategic and religious concerns).

mfgfh EORLaWP5 HTSaUTRTLVbULFHJ d FaJ UFSI NUTbSI d FaJ ULRTd W

The relative control over the Upper Jordan River source rivers of Lebanon, Syria and Israel is shown in Figure 7.3. The figure emulates that of *territorial* control (Figure 7.2), at least until 1967, when some important differences can be observed.

Prior to the Israeli occupation of the Golan, control over the Upper Jordan River springs was relatively equitably distributed. That is to say, the Liddan Springs were part of British Mandate Palestine, the Wazzani and Hasbaya Springs were fully in Lebanese control, and the Banias was under Syrian control. Israeli territorial expansion in the 1967 war, of course, "changed both the hydro-strategic relationship of Israel and her neighbours, and the power balance between them" (Feitelson – see Section 4.3). But the relations may have in fact been altered earlier, with Israel's 1965 bombing of Syrian efforts to divert the Hasbani River (Medzini 2001: Map 6.2). To date, no further abstraction has been attempted by Lebanon, which testifies to the effectiveness of the attack, and is further evidence of the effect of deterrent (or 'remote') control.



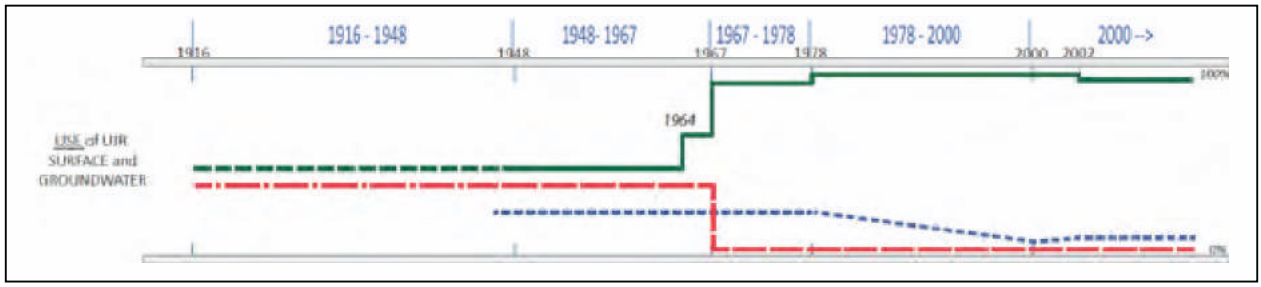
CRNbU mfi Relative control over *surface water and groundwater flows* in the Upper Jordan River Basin, by Lebanon, Syria and Israel. Figures are indicative, and relative to each other.

The occupation of the Golan replaced any Syrian physical control over the Banias springs, and gave Israel full physical control over most of the Hasbani and Liddan rivers as well. The decisive military victory almost certainly provided a measure of remote control enabled by deterrence that endures until today, to the point that there has not been a single skirmish between Syria and Israel over use of the waters (though this is also explained by the relatively low interest the Government of Syria has in the flows, as previously discussed). The 1967 war did not erode any of Lebanon's physical control on the upper reaches of the Hasbani River, but may arguably have deterred the Government of Lebanon from continuing with its plans e.g. to build the Ibl al Saqi dam (hence the drop in 1967, in Figure 7.3).

The 1982 Israeli invasion and direct occupation of southern Lebanon gave full physical control over all of the Upper Jordan River flows until the withdrawal in 2000. It is here that we begin to see the dis-association between control over land and control over water resources. The Israeli withdrawal from Lebanese territory (but not airspace) led to a gradual and steady loss in Israeli physical and deterrent control, and was soon followed by minor Lebanese abstraction plans from the Hasbani, and construction in 2002 of the Wazzani Pumping Station. The threats, fear, uncertainty and diplomacy generated during the 2002 Wazzani dispute in effect served to halt that loss of Israeli control. Indeed, pre-empting further unilateral actions was precisely the message the Israeli authorities passed to Lebanon through US and UN mediators (Section 4.5). Lebanese use of water may have (marginally) increased, but their physical control has arguably *decreased*, and it is far from clear that Israeli (remote) control over the remaining flows has diminished – an important point that we will return to.

mfgfi EORLaWP5 bW TLVbULFHJ d FaJ UFSI NUTbSI d FaJ ULRTd W

The relative shifts in use of the flows of the Upper Jordan River Basin are provided in Figure 7.4. The figure clearly demonstrates the importance of non-territorial control, by showing how use of flows is not tied with physical control over either the territory or the flows themselves.



CPNbU mfk Relative *use* of surface water and groundwater flows in the Upper Jordan River Basin, by Lebanon, Syria and Israel. Figures are indicative, and relative to each other.

Development of the water sector by the new Israeli state after 1948 (primarily through groundwater wells) was not mirrored in Syria or Lebanon, regardless of the number of official statements made to the contrary. The 1950s Johnston negotiations did little to alter the relative water use of any of the riparian actors, though the completion of the National Water Carrier (NWC) in 1964 certainly did (see Zeitoun*, et al.* 2009: Figure 3). The increased use of Upper Jordan River flows (abstracted via the National Water Carrier from the Lake of Tiberias) attracted an attempt of sabotage by the newly-formed PLO, and Israeli withdrawals remained insecure for lack of full control over the flows – which came, of course, in 1967.

Upper Jordan River water use by Syria has ceased since 1967, and Lebanese withdrawals were reduced dramatically from 1978 - 2000, with the dismantling and suppression of the agricultural sector there. With Israel using effectively 100% of the Upper Jordan River flows since 1967, this amounts to a total volume over 44 years until spring 2011 of roughly 19,800 MCM (Lebanon has benefitted during the same period from approximately 60 MCM).

Lebanese use of the Hasbani increased gradually soon after 2000, with minor Hasbani abstractions, and increased somewhat more so following completion of the Wazzani Pumping Station (less than the design 4.4 MCM/y), such that the maximum total surface water and groundwater abstraction is estimated at 11 MCM/y in 2011, compared with Israeli use of 480 - 520 MCM/y (see Section 3.4).

mfh EOPLaWPS D TaRcJ WeEaLFaJ NPJ WFSI APWMTbUJW

The shifts observed in control and use of Upper Jordan River waters is interpreted here within the context of each specific political era, and summarised in Figure 7.5. Corresponding shifts in motives, discourses and strategies may be observed; and while many of the shifts are similar for each of the riparian actors, they lead to dramatically different consequences.

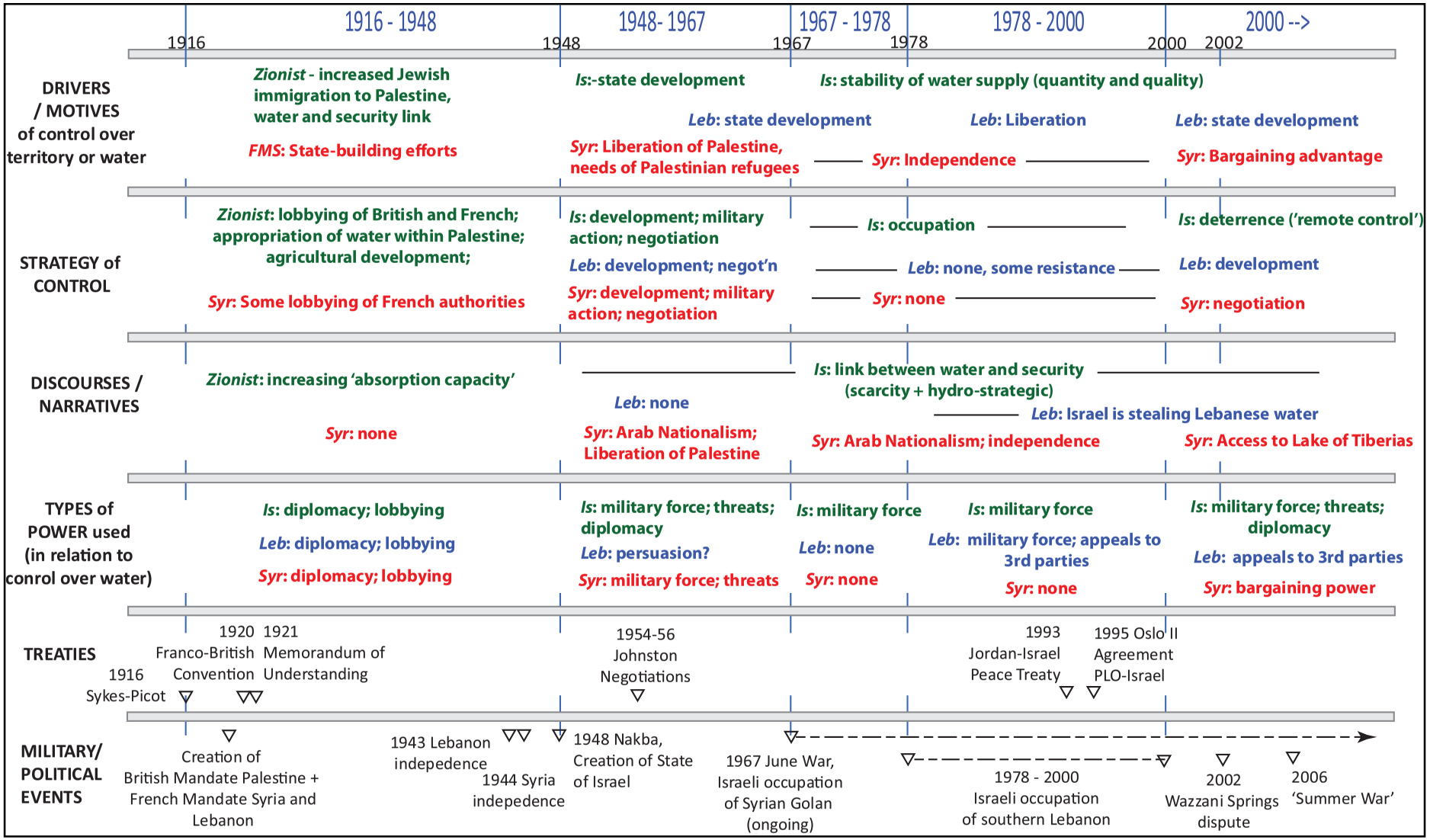


Figure 7.5 Hydropolitical Baseline of the Upper Jordan River: *Discourse and Power*.

7.2.1 Syria – shifts in motives, strategies, narratives

The interests of French Mandate Syria in the Upper Jordan River sources in the first half of the 20th century appeared minimal. The flows were useful for the Syrian families and villages living alongside them, but could not be considered of vital importance to the state as such – certainly not in comparison with the Yarmouk within the same basin, nor the much larger Orontes and very much larger Euphrates rivers. Bulk water transfers to Damascus or other urban centres were much easier from these latter rivers, and preferred from the outset over the relatively small and remote Banias.

The primary motives for control of the Upper Jordan River sources came after the establishment of Israel in 1948, and were (and remain) primarily political. As lead of the Arab League, Syria successfully thwarted the attempted Israeli diversion of the Upper Jordan River in 1953. Its development of large-scale water plans (Section 4.3) was stated as on the behalf of the needs of Palestinian refugees. The corresponding official state narratives (which are not entered into in greater length here) were Arab Nationalism, and the liberation of Palestine.

Following its loss of the Golan in 1967, Syria's motives for controlling the Upper Jordan River sources became an issue of self-liberation. The narrative developed over regaining the Golan Heights was couched in terms of sovereignty and national security (Daoudy 2003). The issue of control over Golan waters then died down, and if the water sources of the Golan were mentioned during this period, it was more in relation to the liberation of the land, and less for the flows themselves.

The political root of Syrian interest in the Upper Jordan River sources expressed itself differently upon Israel's 2000 withdrawal from most of southern Lebanon. The withdrawal coincided with a rare change of regime in Syria (following the death of the Syrian President Hafez al Assad), but was not followed by Israeli withdrawal from the Occupied Syrian Golan. Water became a common talking point during the Turkey-mediated Syrian-Israeli negotiations of the 2000s and 2010s (Daoudy 2008, Ahmad 2010), though to date no agreement has been reached. The Syrian narrative related to water appears related to the improvement of its position in the on-again / off-again negotiations, typically built much more on national sovereignty and access to (and less the use of) the Lake of Tiberias.

7.2.2 Lebanon – shifts in motives, strategies, narratives

Lebanese motives for exerting control over the Hasbani have shifted in response to the political environment, from 'development' to 'independence', and back to 'development' (Figure 7.5). Early French Mandate Lebanon plans for a dam on the Hasbani date from the 1920s (FNA 1921d – see Section 4.1). Use of the Litani to irrigate southern Lebanon has

been planned since the days of Ibrahim Abd el Al (the 'Canal-800' plan), while irrigation plans for the Hasbani centred on its banks. Lebanese engagement in the Johnston negotiations was very active, and there are suggestions Lebanon would have accepted the 35MCM/y share that the Johnston Negotiations had specified, had it not contradicted the Arab League position.

Israel's occupation of southern Lebanon halted Lebanese development efforts in the Upper Jordan River, of course, and military liberation of the south was a primary motive for any action related to the rivers. While negotiations were held between the Israeli authorities and the Gemayel government in 1982, this study has found no evidence that transboundary waters ever figured in these short-lived talks. The strategy for control was primarily through military resistance to the Israeli occupying army, and their Lebanese allies the South Liberation Army. The idea that Israel was diverting the Litani for its own use originated at this time, and has fit into a narrative that Israel is stealing Lebanese water that endures today in a different form (Section 6.1).

Lebanese motives for control of the Hasbani reverted immediately to development needs, following Israel's withdrawal in 2000. The construction of the Wazzani Pumping Station has been followed up by plans to re-start the 'Canal-800', to build the Ibl al Saqi dam (ROL 2008) and to undertake a hydrogeological study of the aquifer that lies under the Israeli border. The plans were dramatically pushed back, following the extensive damages to water infrastructure throughout southern Lebanon by the IDF in 2006 (Section 6). Not only did re-construction of existing infrastructure consume funds and time, but the concern for repeated destruction has hampered investment in the sector. Further development of the Hasbani has been essentially put 'on-hold' because of the potential international ramifications that would surely result – the effect, once again, of Israeli 'remote' control that has been achieved through deterrence.

7.2.3 Israel – shifts in motives, strategies, discourses

Pre-1948 Zionist (and later Israeli) motives for control over the sources of the Upper Jordan River were (and remain) stronger and more focused than those of Lebanon or Syria. The extensive lobbying of British authorities soon after the 1916 Sykes-Picot agreement was driven by the will to increase Jewish immigration to Palestine. Additional water resources beyond the borders of Palestine was argued as necessary to increase the "absorption capacity" of the land, and thus to host Jewish immigrants. The lobbying coincided with the appropriation of water from Palestinian residents (for instance in Gaza (CO 1938b)), and sustained development of agriculture, particularly in the Huleh marshes.

Control of Upper Jordan River tributaries following the 1948 *nakba* was driven by state-building efforts, in a way similar to those Lebanon and Syria just prior to and soon after their

independence from France in the 1940s. The military confrontation with Syria just across the bank of the Jordan was accompanied by further development efforts (described in Sections 4.3 and 7.1), and full participation in the Johnston negotiations. Israel's acceptance of the Johnston proposals in the face of their rejection by the Arab League's is still held as evidence of Israeli flexibility and Arab intransigence, while the facts about the additional unquantified flows Israel was to achieve from the proposal (see Section 4.3) are typically not discussed.

A clear shift in Israeli motives to control the sources of the Upper Jordan River appears after the 1967 war. As discussed in Section 4.3, it is not clear at all that the occupation of the Golan Heights was driven by the acquisition of the Banias Springs or both banks of the Upper Jordan River. But the occupation of the land brought with it control over the water resources for the six decades following – a stability generating security of flows that Israel has demonstrated unlikely to relinquish anytime soon.

Control established through the gun was first enforced by the gun, and then by legislation. The military rule of the area denied residents any further water development through military orders much like those that governed the Israeli-occupied Palestinian West Bank and Gaza. The Golan Heights were labelled by Cantor at the time as "hydro-strategic" territory (Wolf 2000a: 99), which along with the Israeli narrative of physical water scarcity serves to create a link between water and security that endures until this day. A particular sense of 'security' seems to be the driving force behind decisions made in relation to the transboundary flows by Israel since that time.

Having 'secured' the resources in this way since 1967, Israel's dependence on the flows only increased. With the National Water Carrier pumping water up from the Lake of Tiberias into industrial farms in the Negev Desert (and to urban demand centres along the way), several hundred kilometres south, Israel has established 'prior use' of Upper Jordan River flows, as well as developed the 'need' for them. The security argument not to relinquish any control or to allow further Lebanese development following the Wazzani dispute in 2002 is backed up, typically, by the narratives that make up the 'water-security' discourse: a) Israel is short on water resources (and Lebanon is abundant in water resources); and b) the Upper Jordan River flows are necessary for Israeli state security.

Resolution of the water conflict is thus prevented, by being locked-in by both existing use of water and by a security mindset that links the flows uncritically with existence of the State. It is not clear how sustainable this order is for the long-term. Here, Libiszewski provides an interesting hypothesis that projects the current political stalemate into a future scenario where a compromise might be found to the water dispute:

> "Consequently, water disputes must be regarded as part of the security dilemma in this trail of the Middle East peace negotiations. As long as the political differences and the climate of mistrust between the parties persist, water will be perceived as a potential 'weapon'. In turn, territorial claims resulting from that perception complicate a resolution of the conflict's political core issues. In a hypothetical context of comprehensive peace and trust, water would lose that strong security connotation. In such a situation, the hydropolitical goals, which Israel now pursues by retaining territory, could also be achieved by *legal agreements*. An arrangement would have to allocate a small portion of the water to the local population on the Golan and in Southern Lebanon while the bulk of the flow ought to remain Israel's property. The water distribution conflict proper thus seems not to be unresolvable in this case. Rather, the replacement of the current Israeli policy of physically controlling its water sources by a legal regime is subordinate to resolution of genuinely political and strategic concerns." (Libiszewski 1995: (emphasis added))

The author is suggesting a step away from the militarised end of the 'hydro-strategic' narrative of physical control of the territory and water, to one where control is maintained by "legal agreements". Such tactics have certainly worked (at least temporarily) on the Lower Jordan River, where Israel has negotiated and reached inequitable water-sharing arrangements with Jordan and the Palestinians, as part of the 1993 Jordan-Israel Peace Treaty, and the 1995 'Oslo II' Agreement. In effect, one possible way forward for Israel is to emulate the 'success' of the inequitable double bi-lateral treaties on the Lower Jordan River onto its upper reaches. Such an approach relies on a degree of *certainty* of water use being reached through unfair arrangements with its neighbours, and thus on maintenance of the asymmetry in power that can enable the situation. The approach clashes with the spirit of International Water Law, and is not likely to endure in the long-term, or under altered political circumstances.[54]

7.3 Evolution of Hydro-Hegemony

The numerous shifts in control, motives and discourses over the water and territory of the Upper Jordan River Basin over the last century has been a direct reflection of the poor state of relations between the states, and the ability of each to achieve their sovereign interests. Israel's superior position has been clear since 1965, after which time it can be considered as the 'basin hegemon'.

To recall, a position of hegemony in a basin may be held by one riparian if favoured by asymmetry in the balance of three factors: riparian position, exploitation potential, and 'power' (see Section 1.3). Figure 7.6 below demonstrates how Israeli hegemony in the basin

[54] The swift shift that politics can impart on hydro-politics is most evident on the Nile, where entrenched Egyptian strategy of water security has been rapidly eroded by processes set off by the Nile Basin Initiative, and followed by the January 2011 revolution (Cascão and Zeitoun 2010).

has evolved over distinct periods in each of the three main aspects of hydro-hegemony, and the limited extent to which it is entrenched.

7.3.1 Riparian Position

The upstream / downstream position that a riparian enjoys on an international watercourse is typically the most stable of the many factors that analysts of transboundary water conflicts have to consider. On the Upper Jordan, Lebanon is clearly upstream on the Hasbani River, with Syria upstream on the Liddan and Banias by virtue of the location of the recharge areas of the Liddan and Banias springs – as seen in the first tier of Figure 7.6. Israel's occupation since 1967 of the Golan Heights has - interestingly - given it the effective upstream position on the Banias, and relegated Syria to a 'no-stream' position. The occupation of Lebanon in 1978 made of Israel the upstream (and in fact, sole) riparian for over two decades. Israel's position as basin hegemon has not been challenged in any significant way, even with the withdrawal from most of Lebanon (but not from the Golan). In 2011, Lebanon is left in an upstream position, Syria in a 'no-stream' position, and basin hegemon Israel in a midstream position.

7.3.2 Exploitation Potential

'Exploitation potential' is held in the Framework of Hydro-Hegemony as the ability of a state to exploit transboundary water resources. As Figure 7.6 shows, there have been no significant changes in this measure on the Upper Jordan River, through time. From 1948 to 1967, the potential of Syria and Israel to exploit the groundwater or surface was roughly equal, as both sides were able to marshal well-drilling or river-diverting technology, wealth and know-how. Israel's ability to exploit proved the most decisive in practice in 1964, with its completion of the National Water Carrier, from which time it has developed steadily and considerably since that period. Lebanon's ability to exploit the Hasbani has long been hampered by a number of issues, including lack of funds; an unstable domestic political context and internal tensions; an unstable international political context; absorption of refugees from neighbouring states; and repeated Israeli destruction of infrastructure.[55] Lebanon's weakened ability to exploit the Hasbani currently is evident following its successful construction of the Wazzani Pumping Station – which abstracts much less than the design volume, for want of a regular power supply or diesel deliveries (Section 4.5).

[55] The Hasbani Dam and Canal-800 plans have been on hold for decades, for example, due to a combination of these reasons.

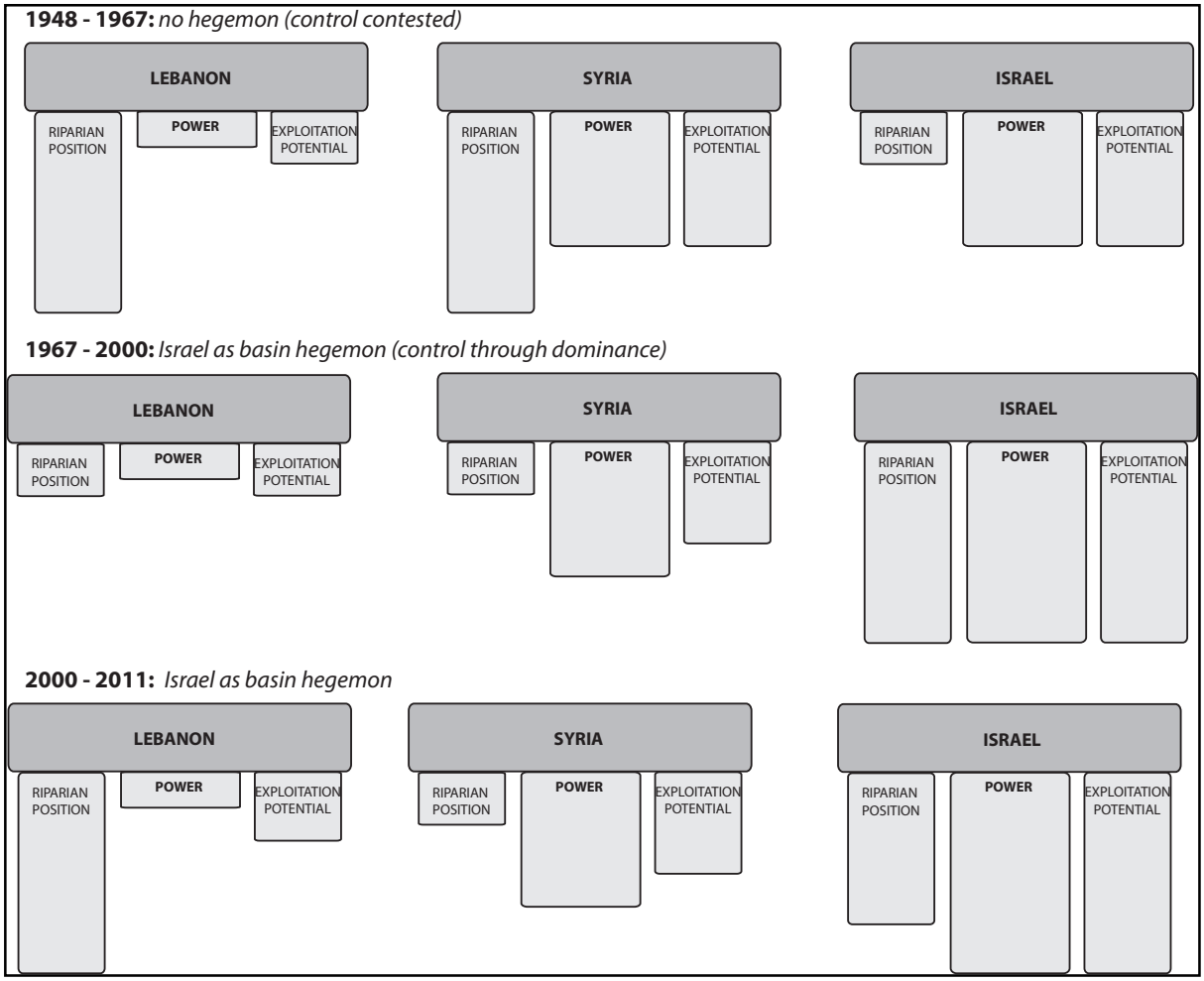


Figure 7.6 Shifts over time in hydro-hegemony on the Upper Jordan River.

7.3.3 Power: generals and diplomats

Several interesting features of the power used by Israel to achieve and maintain its hegemony over the flows of the Upper Jordan River are reflected in Figure 7.6. The hydropolitical history reviewed in Section 4 demonstrates how Israeli governments have successfully and without interruption marshalled hard/military power to meet their water-related interests – resulting in both an inequitable distribution of the flows in their favour and the strengthening of their bargaining position in any future negotiations. On occasions Israeli governments have supplemented this even further through attempts to exert ideational power.

Prior to the *nakba* in 1948, the somewhat successful attempts to control the Upper Jordan River flows by Zionist groups were expressed through bargaining, ideational, and hard power. Their lobbying of British and French authorities demonstrated effective bargaining power just after the 1916 Sykes-Picot agreement, and seems to have been built upon personal relationships or community peer pressure via the World Zionist Organisation and

other Zionist organisations (see e.g. Mathew 2009, Mathew 2011). Meanwhile, 'facts on the ground' were created by extensive settlement of Jewish people along and agricultural development of the Huleh marshes. Through such mild expressions of 'hard power', Zionist bargaining positions based on water 'needs' (and much later on 'established use' and 'security') were re-enforced. The arguments made about Palestine's capacity to absorb more European immigrants, including the grand ideas of Litani diversions to fulfil biblical prophecies, may be seen as weak expressions of ideational power. The efficient use of water in Huleh marshes also served to justify to at least some British authorities greater distribution of water to the Jewish communities (NSU 2008, Messerschmid 2010).

A similar combination of soft power supported by hard power ('generals and diplomats', in Figure 7.5) was used with some effect, from 1948 to 1967. Certainly, when military might between riparian states was roughly equal, it was used by all sides to thwart attempted diversion and water use plans. The official negotiations that led to the 1955 Johnston Plan displayed each side's relative skill with bargaining power. Use of expertise to back up political positions was manifested in the number of 'scientific reports' commissioned during this period. This included the 'Arab's Plan' (1954), UNRWA (1954), and the Cotton and Hays (1948) plans commissioned by the Israeli side to prove to the mediators both the 'efficiency', and need, of Israel for the water. With military balance of power swaying towards Israel – though as of yet still very much uncertain – the completion of the National Water Carrier in 1964 and the 1965 destruction of the Syrian diversion attempt can be seen as very effective and enduring 'facts on the ground'.

Israeli use of ideational or bargaining power ceased with the territorial conquest of the Golan in 1967 and southern Lebanon from 1978 – 2000. Negotiations during this period did not occur, and control of the flows was clearly through dominance, not through hegemony (hydro, or otherwise). The signing of two separate bi-lateral agreements with Jordan and the PLO on the *Lower* Jordan River during this period stand as stark contrasting evidence of Israel's very effective use of bargaining power (and its establishment of hegemony) elsewhere on the same river during the same period.

Israel's use of power in relation to the Jordan River sources broadened once again, following its withdrawal from southern Lebanon in 2000. The 'remote' control that Israel has established over the Hasbani (Section 7.1) was instilled by the use of unofficial threats in 2002. Israel's ability to frame the hydropolitical agenda for the Upper Jordan River has since that time been based partly on an ability to project and present the status quo to external intermediaries as a positive outcome. As discussed in Section 6.2, Israeli use of soft power here has been primarily through the generation and maintenance of a 'hydro-strategic' discourse.

The extensive damages to water infrastructure – including minor damages to the Wazzani pumping station –in this sense underpinning Israeli use of 'soft' power. The repeated Israeli use of military power in relation to water has been carried out as consequence or in pursuit of other political goals. The Sharon-led Likud government's heavy 'securitisation' of the Wazzani dispute may have been intended for domestic consumption, and certainly reflected the most extreme of the 'hydro-strategic' mind-sets - that Israel needs 'every drop' of the Hasbani (Section 6.2). Subsequent governments have approached the international community in the same as well as in much quieter ways, and with much more subtle ideas. The confusion over international law begins to influence here, with former senior Israeli water officials, for example, stating 'prior use' as a principle of law to justify no re-distribution of the flows (Arlosoroff 2011, pers.comm.).

It is perhaps Israel's *combination* of expressions of power that has ultimately most abetted Israel's control over the flows.[56] Israel's favoured riparian position and 'exploitation potential' has been achieved and maintained throughout with constant use – or threat of use – of hard power. This has been supplemented in the earlier and more recent periods by expressions of bargaining and ideational power.

7.3.4 Strategies and limits of Israeli hydro-hegemony

Of the variety of tactics to achieve and consolidate control over the transboundary flows, Israel's use of military force appears to be the one relied most heavily upon. Unlike the cases of Palestine and Jordan, there have only been hints of attempts to instigate normative arrangements of the status quo through signing a treaty to cement it in. The possibility of two more bi-lateral treaties (between Israel and Syria, and Israel and Lebanon) remains a possibility, nonetheless.

Israel's heavy 'securitisation' of the minor issue of Lebanese development on the Wazzani springs, for example, is only the most extreme version of an extensive and unrelenting promotion of the link between water and Israeli state security – the linked 'water-security' discourse. Attempts to reinforce this perception have been made through efforts to have the discourse's narratives sanctioned – as we have seen for example, by third-party mediators or NGOs proclaiming Israel's lack and Lebanon's abundance of water (Section 6.2). The exercise has also been under-written in part by the construction of knowledge – in relation to the Liddan as an 'Israeli' river, for instance. With public opinion supporting a negotiations 'red-line' of no compromise, Israel is thus well-placed to control the outcome of any future deliberations over the waters.

[56] The ability to manipulate different forms of power towards a single goal was noted as a form of power itself, in Hindu philosophy (see Gyawali 2006). Josephy Nye refers to 'smart power' as the blend of hard and soft power.

Israeli governments have also employed a strategy known as 'resource capture' (referring back to Section 1.3), and included control over all of the land associated with the Upper Jordan tributaries. They have furthermore successfully followed a strategy of 'containment' of the claims of others – through the effective deterrence of future development of the Hasbani resources ('remote' control). The suggestions of purchasing Litani water, or of diverting it to Palestinians in the West Bank so that Israel may maintain its current inequitable share of resources there, may be the early indications of an evolution of such a strategy to one of 'integration'.

Israeli hydro-hegemony on the Upper Jordan River cannot, however, be said to have been so effectively established as it has been on the river's lower reaches. The Syrian government's very limited challenge of Israel over the Golan (and its waters) may be seen as submission to the order established by Israel, though this contradicts with public positions stated during negotiations periods.

The very strongly-held belief in Lebanon that Israel is 'stealing' Lebanon's waters is evidence not only of the depth and reach of misinformation on the issue, but also the Lebanese people's and government's non-acquiescence to the status quo. Hezbollah's blocking of Israeli goals during the 2006 invasion was seen as the first blow to Israeli military hegemony – which until that point had been seen as 'undefeatable' in the minds of many Israelis and Lebanese alike (Achcar and Warschawski 2007). In a similar way, Lebanon's successful construction of the Wazzani Pumping Station is held as an example of a 'success' in its dealings with the much more powerful neighbour (e.g. Comair 2009). While this description of a dispute that was not officially resolved may be somewhat exaggerated, the outcome of the Wazzani incident further reveals the limits of the extent of Israeli hegemony in Lebanon. The order established by the much greater power in the basin was indeed challenged – to a point successfully – by (non-hegemonic) Lebanon.

The Lebanese plan to consider building the Ibl al Saqi dam on the Hasbani mainstream may also be seen as an alternative designed to challenge the hegemony by Israel. Dr Comair, for example, presents the idea ambiguously as either a collective ('win-win') or as a unilateral development: The Ibl al Saqi dam "could either regulate the upstream flow of the Hasbani River – Jordan River system… if the investigation meets the technical requirements or it could be used only by Lebanon to develop an integrated water management system for the Hasbani watercourse" (Comair 2009: 258). There are of course a number of trade-offs that would have to be considered prior to construction of the dam, weighing the small volumes stored against political benefit or tension, and against more readily-available alternatives. Of course, the direction that water use develops into remains unknown, but will surely reflect the broader political context, and be an outcome of (constructed) needs, interests, and power.

8. The Hydropolitical Baseline

The study has revealed a number of issues relating volumes and use of Upper Jordan River flows to interests, power and politics of the states involved, and to the future of the conflict. These range from deeply-held assumptions about the international status and hydrological importance of the flows, to the effectiveness of action, the limitations of rhetoric, and the potential for international water law to assist with conflict resolution.

8.1 Upper Jordan River flows and their use

There are significant data gaps in surface and groundwater flows, quality and use

Rather surprisingly for such a heavily-scrutinised river, basic water flow and use data on the upper reaches of the Jordan remains quite poor. This is particularly the case in Lebanon, where robust streamflow measurement has only recently begun. Groundwater modelling attempted from the downstream (Israeli) side suffers from lack of information from upstream monitoring wells (in Lebanon), and has not been verified in practice. Estimates of water use from abstractions in the basin (high-end 11 MCM/y in Lebanon, 260-480 MCM/y in Israel) are not solidly supported by metered records in Lebanon (as they do not exist) or in Israel (where they are not readily available to the public).

The Liddan is an international river

The idea that the Liddan is an 'Israeli' river can be added to the list of enduring myths emanating from the struggle over the Jordan. Certainly it is stated or shown as such in the majority of hydropolitical works on the subject, including Klein (1998: Fig. 1), and Zeitoun (2008: Fig. 3.1). Part of the wadi runoff and the largest part of the surface and sub-surface recharge area of the Liddan, however, is located in Lebanon, as seen in hydrological and hydrogeological studies, and as any visit to the area will show. The idea of the Liddan as Israeli river may reflect unconscious or direct attempts to imply control or to assert sovereignty over what is the most important source of the Jordan. The sources of the Jordan River are evidently part of the Jordan River Basin, on the other hand, and as such are subject to the same principles of water sharing as any other transboundary resource – regardless of which country people tend to consider has sovereignty over the flows.

Groundwater flows are more important in hydrological terms than are river flows

While the level of the Lake of Tiberias is closely monitored by the media, public and scientists of the Kinneret Limnological Laboratory alike, groundwater levels in the Upper Jordan River Basin rise and drop essentially without notice. Six decades of gauging flows upstream of the confluence of the Upper Jordan River provide the mean annual surface water flows for the Liddan at 241 MCM (and steady); Hasbani 123 MCM (and very highly variable), and the Banias at 114 MCM (and highly variable). The groundwater flowing silently and invisibly through the Karst limestone geology under the Lebanon-Israel or Syria-

Israel border is not monitored in Lebanon and Syria, and poorly monitored in Israel. Golan rain or Mount Hermon snowmelt flows meet a topography that sends the major proportion of it directly to the aquifer basins underlying the border, unrelated to the size of the river basin lying above them. Modelling and hydro-chemical analysis of the hydraulic links between rainfall, groundwater, spring discharge and rivers is still in its early stages, and has not yet produced accurate estimates. This study's cautious estimate of transboundary groundwater flows of 250 – 350 MCM/y (Section 3.4) demonstrates that their scale is equal to, if not greater than, the Hasbani, Liddan and Banias rivers they feed.

Historic Lebanese use of the Upper Jordan is greater than is normally held

Lebanese or Syrian use of the Upper Jordan River at the beginning of the French Mandate period was facilitated by a significant amount of infrastructure (as well as by the Sursock Concession) that had been developed during the Ottoman period (Section 4.1). Though the quantities abstracted at the time are not known, it is clear that agricultural development was severely impacted by its dismantlement or neglect during the 1978-2000 occupation period (for Lebanon), and the 1967-ongoing occupation of the Golan (for Syria). Thus, while 'prior use' is not a distribution principle in international water law, and is invoked by Israeli governments to deny equitable allocation of flows, the same argument may be invoked by Lebanese governments. In this same vein of reasoning, Israel has accrued a 'historic debt' to Lebanon that increases with each year the asymmetric distribution continues (see below).

There is great asymmetry in use of and dependence upon the flows of the Upper Jordan River

Estimates of water use from the Upper Jordan River in Lebanon and in Israel are greatly compromised by poor data. The high-end estimate of Lebanese abstractions of surface and groundwater within the basin is 11 MCM/y, which is roughly one-third of the proposed 'Johnston Allocation' (for surface water only) to Lebanon of 35 MCM/y (and one-quarter of the 50 MCM/y claimed by some as Lebanon's share). It is also only 3% of the low-end estimate of comparable Israeli abstractions of 360 MCM/y (and about 2% of the higher-end estimate of 520 MCM/y). The water not used by Lebanon is felt in terms of compromised livelihoods and state development. The water used in Israel is devoted to domestic use (seen as a basic human need) as well as to agro-industrial farms in the Negev desert (which export 'virtual water' in the form of cash crops abroad, and which are generally viewed as a luxury items).

8.2 Interests and Power in the Upper Jordan River

The current allocation of transboundary waters benefits Israel and its residents, at the expense of Lebanon and its residents

The study has shown the extent to which the current allocation and use of the Upper Jordan River flows has been beneficial primarily for the basin hegemon Israel. The political costs of the ongoing water conflict are potentially significant. As a legitimate grievance from the Lebanese or Syrian perspective, the inequitable sharing may be (and has been) used to rally domestic support from actors within Lebanon, thereby contributing to existing internal political divisions. The costs are even more substantial when measured in terms of human security or livelihoods. The clear difference in irrigated agriculture on either side of the border speaks to the thousands of Lebanese residents that have been compromised by their inability – or the unwillingness or inability of the state – to develop the water resources. A reversal of the war-forced rural-to-urban migration is thus compromised, and tens of thousands of Lebanese families suffer as they are forced to adapt.

Israel's hegemonic position in the basin has limits

The analysis of Section 7 has shown the extent of Israel's ability to protect its stated interests. In every measure and application of power since 1965, Israel has proven itself the clear basin hegemon. Unlike the case with control over water resources transboundary with Palestinians in the West Bank and Gaza, however, that hegemony has not permeated very deeply to the so-called 'weaker' parties in the Upper Jordan River basin. What may be described as 'tacit consent' or submission on the part of Syria to Israeli use of waters in the Golan is challenged by positions taken during the unofficial negotiations. Current water sharing arrangements are also generally contested by various groups and portions of the government in Lebanon, though there is disunity amongst them. The order established by the basin hegemon does not appear inherently stable, and shows sign of possible shifting.

Israel's interests in the Litani may be changing from capture to purchase

The idea that Israel has diverted or sought to divert the Litani is readily perpetuated by action and narratives. Extensive lobbying of French and British authorities to include or divert Lebanon's Litani River into Palestine (Section 4.2), was later followed by Israel's 'Operation Litani' invasion of Lebanon in 1978 (Section 4.4), invasion to Beirut in 1982, and invasion up to the river again in 2006. This study has re-confirmed the knowledge of the staff of the Litani River Authority and anyone who has walked the river – that there has not been such a diversion. This is attributed to a combination of factors relating to the fact that the topography made diversion prohibitively expensive, that Israel had already 'secured' enough water sources from Lebanon, Syria, Jordan and Palestinians throughout the entire Jordan River Basin, and that the political costs involved could not be justified domestically.

Current Israeli interests with the Litani lie partially in purchase of the flows, or suggested diversions for the use of Jordan or Palestinians. Indeed, the latter suggestion has been made

explicitly by liberal Israeli academics and external analysts as a means to address the water shortage in the West Bank and Gaza, and has been strengthened by an emerging narrative in Lebanon (see Section 6.1.3). The suggestion is more often rejected by Lebanese analysts and authorities, on the grounds that the shortage of water for Palestinians is a result of the inequitable distribution that an economic arrangement cannot displace. An economic arrangement to divert the Lebanese river is thus predicted to deepen rather than resolve the Palestinian-Israeli water conflict, and to possibly open a new branch of the Lebanese-Israeli water conflict.

Israeli control of the Hasbani River is centred on the Wazzani Springs/Ghajar

Over half of the flow of the Hasbani measured in Israel is attributed to the discharge of the Wazzani Springs (Section 3.2). The flow of the Hasbani upstream of the Wazzani varies considerably throughout the year, often drying up during the summer months. From a water resources management perspective, only the base flows of a river can be counted on for a reliable supply, while flows additional to the base are counted as welcome surplus. Securing the stable flows from the Wazzani Springs is thus more important than establishing control of the entire Hasbani River.

The area around the Wazzani Springs coincides with the 'hydro-strategic territory' of Zohar and Schwarz (Figure 6.1) and Cohen's 'strategic water space' (Section 6.2). There is little evidence to suggest that Israel's occupation of southern Lebanon – which included physical control of the entire Hasbani River Basin – was motivated primarily by control over the water resources. Israel's withdrawal in 2000 from *nearly* the entire occupied zone may, however, be explained in part by hydrological considerations. Israel's continued occupation of the northern part of the town of Ghajar allows it physical control (Section 4.5) over the nearby Wazzani Springs. Coupled with the 'remote' control re-established by deterrence following the 2002 Wazzani dispute (preventing further Lebanese development of water resources), the continued Israeli presence at the source of the springs is not inconsequential to their continued flow to Israel.

Israeli control of the Upper Jordan River is centred on the Liddan and Banias/Cheba'a Farms

As is the case with the Hasbani River, there is no reason to believe that control over the catchment area of the Banias and Liddan basins was a primary factor for the occupation of the Syrian Golan (in 1967), or invasion and subsequent occupation of southern Lebanon (from 1979). Israel's failure to withdraw completely from Lebanon has multiple explanations, including a hydropolitical one. The flow of the Liddan River is twice as great as each the Banias and Hasbani rivers, and much more reliable (as the base flow (mainly from springs) is very stable). Though the Liddan Springs are located just within Israel, part of the catchment area (and most of the surface and sub-surface recharge zone) is in Lebanon, and the springs are fed from runoff and snowmelt from Mount Hermon and the Cheba'a Farms. The Banias

Springs are located just inside the Syrian Golan, but the river is also derived from rain and snow falling on or infiltrating Hermon. Israel's retention of the Cheba'a Farms following its 2000 withdrawal is attributed mainly to the strategic military (communications) and religious (Abraham's *Covenant of the Pieces)* importance. The occupation thus provides Israel full control over the entire catchment areas of the Liddan of the Banias – and thus exclusive use and an ability to control the quality of the surface water flows that ultimately enters the Lake of Tiberias. Control over the recharge zones that lie in Lebanon is exerted through non-physical means, as described below.

8.3 Lessons for Hydropolitics

The water conflict sits within the broader political conflict

Unlike 'environmentally determinist' studies which may emphasise (or exaggerate) the role of the Jordan River in stoking or preventing violent conflict, this study interprets the struggle over transboundary flows from within the broader political context itself. That context has since 1948 been defined by a state of war and occupation, and is seen as driven mainly by ideological (Zionist, national) and territorial interests. Control of the resources is found to come more as an after-thought of every invasion, occupation and death – no matter how the capture of the resource itself was later managed by or beneficial to Israel. The river flows themselves are losing or gaining importance as changes in climate and in technology make them increasingly less attractive than other aquifers (or desalination) as a water source to rely upon. As a key point of contention between Israel and Syria (the primary one being the land of the Golan), and one of the few grievances that currently exist between Lebanon and Israel, furthermore, the transboundary waters of the Jordan River are expected to continue to play an important role in improving or perpetuating the broader political conflict.

Control over transboundary flows is possible through non-physical means, but is not sustainable

Israel's occupation of the Golan and southern Lebanon clearly demonstrates how physical control over territory also provides physical control over the flows within that territory. More interesting is the study's exploration of the relation between control over water resources and the *withdrawal* from territory. While Israel's retention of the Cheba'a Farms ensures continued control of the Liddan and Banias, the loss of territory that accompanied the 2000 withdrawal from most of Lebanon was soon followed by Lebanese development of the Hasbani. The near-war and diplomatic activity that followed Lebanon's construction of the 2002 Wazzani Pumping Station served to send clear messages from Israel against any future unilateral Lebanese development. The Wazzani pumping station has been abstracting at less than its design capacity in the decade following the incident, and no further development has occurred. The Israeli 'remote' control established in this way through deterrence suggests a de-coupling of control over territory and of water. The recent failure

of cooperative efforts on the Nile Basin (where Egypt employed similar forms of control over upstream flows (Cascão 2009)) demonstrate that such control is subject to changed hydrological and political circumstances, however, and ultimately not sustainable.

Domestic influences on international

The discussion of Lebanese and Israeli narratives and discourses (Section 6) reveals the extent to which the transboundary water policy of riparian governments is shaped by or directed at domestic audiences. The construction of the Wazzani pumping station in 2002 was completed by the government through the Council of the South, reflecting the internal struggle with the influential Hezbollah. Israel's effective disabling of Lebanese use of the Hasbani is held up as a grievance by Hezbollah politicians, an effort likely to gain some domestic political support. Likewise, the Israeli government's promotion of a linked 'water-security' discourse may be aimed as much at domestic audiences as it is at gaining support from Lebanese authority or international audiences.

There is a clear relation between the decision-making structure in each country, furthermore, and its relative control over transboundary flows. The very centralised Israeli water sector (Section 2.4) is more adequately designed to deliver (and thus maintain) the 'water-security' discourse, as well as the influential strategies and tactics of control that are pursued. The numerous overlaps in roles and responsibilities of departments within the Lebanese water bureaucracy (Figure 2.7), likewise, may be the source of the inconsistent and often incoherent narratives heard on the Lebanese side, and for the limited coordinated effort on transboundary waters.

Rhetoric pales in effect, next to deeds

The archives employed to recount the hydropolitical history (Section 4) read as a battle of words transformed into a battle of deeds. The battle of words was fought more strenuously by the Zionist side prior to 1948, with the Arab state governments occupied by the colonial powers. What had been Zionist rhetoric about harnessing nature and controlling the flows was soon converted into Israeli state plans, and then into practice. This includes the extensive development of groundwater after 1948, the 1964 National Water Carrier, and the conquests of territory in 1948, 1967 and 1978. Bellicose statements from the Arab states about Israeli 'theft' of water and numerous threats complemented a flurry of plans generated to meet the water needs of the Palestinian refugees (Section 4.3) – none of which were to be carried out. The forces behind the original Zionist rhetoric (which were commercial, religious, and political, and unified by Zionist ideology) have proven to be much more determined and driven than the relatively fleeting intentions of the Arab state governments.

Water resources and water infrastructure are regularly targets of war, and often used as tools

Section 5 demonstrates the extent to which water infrastructure, resources and institutions have suffered from violent conflict, particularly in Lebanon. The lack of (or de-) development of the agricultural sector in southern Lebanon during the Israeli invasions and occupation (1978 – 2000) had the effect of reducing Lebanese abstractions from the Hasbani. During the 2006 Summer War, extensive deliberate or indiscriminate Israeli damage of over 50 Lebanese public water reservoirs call into question the possibility of an Israeli army policy of targeting water infrastructure. The damaged water infrastructure served as a tool in the war, by both encouraging civilians to flee their villages, and discouraging their return. Similar damages inflicted upon infrastructure related to the 2002 Wazzani dispute (i.e. the pumping and booster stations) appears deliberate, though as the damage is mainly cosmetic, there appears no further hydropolitical motives (such as to stop the Lebanese pumping from the Hasbani that had started in 2002). Considered alongside the impact of the de-development of the Lebanese agricultural sector in southern Lebanon, the armed conflict is nonetheless considered to have significant *indirect* impact on hydro-politics. Damages suffered serve a) to 'send backward' any development of water occurring along the Hasbani; b) to deter further water infrastructure investment; and c) to deter even the *planning* of such infrastructure. The resultant 'remote' control serves to preserve the established order of water use and distribution, and re-enforce Israeli hydro-hegemony in the basin.

The role of water law is currently minimal

Though the Jordan River is the basin with the highest percentage of signatories to the 1997 UN Watercourses Convention,[57] international water law does not reach very far. Syrian support of the principles is subject to their position vis-à-vis the basin hegemon (i.e. downstream of Turkey on the Euphrates, upstream of Turkey on the El Assi / Orontes). Lebanese support for the principles is asserted to each of the Orontes, Nahr al Kebir and Upper Jordan rivers, though there are questions about commitment to its spirit, given the continued lack of transparency (Section 6.1). Israel has not ratified the 1997 UN Watercourses Convention, though negotiators, academics and officials often invoke selective interpretations of it (primarily, 'prior use', which is not a recognised legal principle). In any event, International Water Law suffers from being non-binding in such situations of power asymmetry. Its principles nonetheless present the only serious basis for resolution of the conflict (see below).

Mediation by the international community has been partial

The international diplomatic community has never been very far from the Upper Jordan River water conflict, and has over a century taken a short-sighted approach based on politically expedience rather than principle. Indeed, British and French geographers

[57] Lebanon, Syria and Jordan have ratified the Convention, and the PLO has indicated their intention to do so upon the establishment of a State of Palestine.

followed the design of their political masters in producing the very borders that are at the root of the water (and broader political) conflict today. British acquiescence to Zionist lobbying after the 1916 Sykes-Picot agreement was followed by further failed attempts for a racially-defined state in the 1947 UN Partition Plan, and their eventual abandonment of the mandate in 1948. The US envoy Eric Johnston led the only basin-wide negotiations ever held, though notes in the archive documents demonstrate collusion with Israeli side to ensure a better deal than what was officially presented (see Section 4.3). The significant interest devoted by the international donor community following Israel's signing of double bi-laterals treaties with Jordan and the Palestinians in the 1990s remains confined to the Lower Jordan River. Where the international diplomatic community *has* been involved in the Upper Jordan River, it has advocated for Lebanese acquiescence to the asymmetric status quo (Section 4.3), and thus missed an opportunity to even begin to resolve the conflict. Currently, the international diplomatic community appears more focussed on conflict management (that is, the retention of the status quo), than on conflict resolution. 'Success' of diplomats is measured in terms of number and level of meetings held, not on laying the groundwork for later pursuit of internationally-agreed principles.

8.4 The future of the Upper Jordan River conflict

The future of the conflict over the flows of the Upper Jordan River will surely be an outcome of the political, economic, and social forces that have shaped it thus far. It is also a function of rainfall – as we have seen in Section 4.5, tensions rise as river and water table levels drop. Any contemplation of this shape must consider such forces under different climatic, political economic scenarios, and is beyond the scope of this study. Brief considerations of trends identified from this study's analysis may nonetheless serve to encourage in one or another particular direction.

The conflict will change along with shifts in power and in the regional political situation, and these are difficult to predict. Contemplation of Israel's response to proposed Lebanese development in the Hasbani area should bear in mind both how interests and expressions or balance of power may change. The existing arrangement that has been created through decades of bloodshed between Lebanon, Syria and Israel is likely to be challenged by the greater political changes occurring in 2011 in the region.

Technology can be used to play either a constructive or detrimental role

The dominant Israeli 'water-strategic' view of the reaches of the Upper Jordan River could in theory drop, with existing and planned desalination infrastructure. The volumes of 'new' water being created – about 200 MCM/y already on-line, and 500 MCM/y total planned for 2017 (Talhami 2005) (or 65% of total domestic consumption by other accounts (Udasin 2011)) – may relieve pressure to control all freshwater sources, as and when these are substituted by desalination. Certainly perceptions of Israel reliance on the Upper Jordan

River flows may come to more closely reflect the biophysical reality, through greater awareness-raising efforts.

Such efforts will have to develop from within the very strong and securitized 'water-security' discourse, however. As we have seen, the parliamentary inquiry into the water sector very strongly promotes desalination, but warns against it being used as an excuse to discuss re-distribution of freshwater flows (Section 6.2). The extent of development and merits of desalination is furthermore directly linked to the cost of fuel and further improvements in desalination technology. Unless and possibly even with significant advances in coupling alternative energy to desalination (or new desalination technology, such as forward osmosis), the pressure on freshwater will only increase along with the price of fossil fuels. Likewise, sustained pursuit of supply-side management (reaching for ever-new supplies such as desalination) will 'lock-in' existing (wasteful) agricultural practices, and continue with or increase harmful environmental impacts. In any case, the developments in desalination technology did little to assist the Palestinian negotiators during their last round in 2008, despite it forming the basis of their platform to resolve the conflict. Negotiations with Lebanon and Syria may likely be similar, barring any major developments in relations between the states.

The role of international water law may be greater in the future

The role of international water law has until now had little influence in guiding the water conflict towards resolution, or even towards slightly more equitable distribution. The principles of the 1997 UN Watercourses Convention still have potential to guide, and have formed the basis of recent basin initiatives. International water law – particularly the 2008 Draft Aquifer Articles – may well play a greater role in the future. As noted in Section 8.1, groundwater represents a substantial portion of the transboundary flows in the Upper Jordan River Basin, and will thus be subject to the Articles. Whether they are ratified and become binding or not, the Articles are expected to influence transboundary water conflicts through guidance rather than through strict application, as the Watercourses Convention has done in other cases. Serious concerns about the Aquifer Articles (particularly about the 'sovereignty' clause[58]) do not bode well for their application towards resolution of the Upper Jordan River conflict, however. A loose interpretation of the Aquifer Articles to the case at hand is expected to provide to both sides a legal cover to exploit 'their' groundwater resources at will. Other aspects of law can then be expected to be invoked, and the principles themselves will lose the little effect they may have offered.

[58] As McCaffrey (2009, 2010) notes, Article 3 recognises the "sovereignty" of states that share an aquifer - a concept that clashes with recognised state practice, with the terms of the 1997 UN Watercourses Convention, and with the spirit of transboundary water sharing the Convention has supported (of 'shared sovereignty' and 'communities of interests'). McCaffrey (2009: 290) points out that only six states reflected their strong interests by commenting on the draft of Article 3: Turkey, Portugal, Austria, Brazil, Cuba, and Israel.

An historic debt remains, and will have to be considered

A reversion to positions anchored in 'sovereignty' rather than in equitable and reasonable allocation is likely to place claims of power (from Israel) against aggression or claims of justice (from Lebanon and Syria). As previously discussed, Israel is 'indebted' to Lebanon and Syria over water issues in a number of ways. The volume of flows that Israel has benefitted from – above and beyond any understanding of 'equitable and reasonable' or even the suggested Johnston allocations – is in the rough range of 20,000 million cubic metres (see Section 3.5.3). The financial cost of the volumes have not been calculated, but it is likely to be minor relative to other economic activities (war, the oil trade). Lebanon's claims may extend to the much greater costs associated with lost opportunities and livelihoods from denial of the use of water from the thousands of farming families, or with the extensive damages to water resources and water infrastructure. These latter are estimated to be in the range of US$80M, from the 2006 war alone.

The next overt conflict may be generated by water quality, groundwater development, or Israeli occupation of Ghajar and the Cheba'a Farms

Point-source (olive waste) or non-point source (fertiliser runoff) pollution continues to threaten the quality of the Upper Jordan River flows. The relatively low level of monitoring that exists in the upper reaches of the Jordan means that any significant levels of transboundary contamination will not be noticed until after the damage has occurred. Under particular political circumstances, the contamination may spark an incident similar to the 2002 Wazzani dispute, and lead to international intervention and pressure on Lebanon to address the practice.

Similarly, intensive increases in either Israeli or Lebanese groundwater development, will directly affect spring discharge and river flows, and thus affect use for the other side. A direct and immediate diplomatic or military response is expected, under this scenario. Finally, Israeli motives for not fully withdrawing from Ghajar and the Cheba'a Farms are considered to be military, religious and hydrological (Section 8.1). Continued Israeli occupation of the land is a source of inter-state tension in and of itself, and cannot contribute in any way to reducing tensions over the transboundary waters. The attention drawn to Cheba'a Farms and Ghajar suggest that the future of the water conflict will continue to derive in part from these areas.

The inequitable status quo of water sharing may be yet further entrenched

Another possible outcome on the Upper Jordan River is entrenchment of the current form of Israeli hydro-hegemony. Both treaties Israel has signed with Jordan and the PLO on the Lower Jordan River are bi-lateral agreements reached in isolation of each other, and of the upstream riparian actors. The water clauses of both agreements were subordinate to the agreements over more strictly political issues, i.e. peace between former enemies. And both were highly asymmetric, thus serving to perpetuate rather than to resolve the water

conflicts between the political entities (regardless of how they are presented to and received by external audiences).

Israeli control of the Upper Jordan River may be further consolidated if a strategy of 'integration' was pursued. If, for instance, bi-lateral treaties were signed with Lebanon and Syria in the manner they have been with Jordan and the PLO. Were such treaties to be negotiated instead across the basin and in accordance with the 1997 UN Watercourses Convention, the century of strife over the Jordan River would end. Israel's very successful separation of the Lower Jordan River from the Upper Jordan River (in terms of talks, sharing and analysis) is telling, in this regard. The ability to maintain the status quo is in large part due to Israel's advantage in all forms of power over its riparian neighbours (Section 7.3). This includes the combination of soft power backed up by hard power ('generals and diplomats'). The water conflict is thus 'locked-in' to a degree by existing wasteful water use – such as exports of food (virtual water) to Europe, and by the demand that drives that use. In this sense, the preferential trade agreements for produce exports to the EU implicate outsider parties in the conflict in very relevant (if indirect) ways.

Resolution or management of water conflicts?

Transboundary initiatives often 'speak' to the division of the basin into its upper and lower reaches. The great bulk of transboundary efforts in the basin are of course focussed on the Lower Jordan. This includes the 'environmental peace-making' work of Friends of the Middle East, and the *Red Sea – Dead Sea Conveyance Project* referred to as the 'Peace Canal' by the World Bank (2005). Even 'outside-the-box' attempts at conflict resolution are prone to the separation of the Upper and Lower Jordan River Basins, for instance the Geneva Initiative (2009). Indeed, one of the most seasoned water conflict mediators in the region, builds his entire case on politically expedient resolution of the bi-lateral components (see Trondalen 2008), rather than taking a basin-wide approach. Of the few transboundary initiatives that claim to take a basin-wide approach, that of the *Blue Peace Initiative* by the Strategic Foresight Group is the most developed. Experts who have participated in related meetings refer without exception, however, to the lack of guiding principles, to the divorce of politics from the goodwill-generating exercises, and to the complete separation of the basin into the upper and lower sections. The trend established by British and French colonial delegates to the region – of political expedience instead of principle – is thus reflected in 2011 by external efforts focussed on managing rather than actually resolving the Jordan River conflict.

References

Abd el Al, Ibrahim (2004 [1948]) *Aménagement du Litani*. Beirut, Translation and re-publication of the fourth volume of *'Le Litani, étude hydrologique'*, by Association of the Friends of Ibrahim Abd el Al

Abdallah, Chadi, R. Bou Kheir, M. Khawlie and Ghaleb Faour (2006) Comparative Analysis of Drainage Networks Extracted from DEMs and convetional Approaches in Lebanon. *Lebanese Science Journal* 7 (1): 49-62

Achcar, Gilbert and Michel Warschawski (2007) *The 33-Day War: Israel's War on Hezbollah in Lebanon and its Aftermath*. London, Saqi Books.

Ahmad, Fatima (2010) *Water in the Israel/Syria Conflict: The viability of the Peace Canal on the Golan Heights*. Development Studies. Master's of Science, School of Oriental and African Studies, London

AJTU (2008) *Transboundary Cooperation over the Jordan River Basin: The Positive Sum Outcome*. Ramallah, Private Correspondence presumably for or by the Palestinian Water Authorty, made available through the Al Jazeera Transparency Unit, undated, http://ww.ajtransparency.com/en/node/3612

Al Kifah Al Arabi (2002) "*The Water of Lebanon: an Issue of Sovergeinty*." Al Kifah al Arabi newspaper, 18 October 2002

Al Mashnouk, Mohammad (1995) "*Water and the complicated peace in the Middle East*." Al Nahar, 23 June 1995: Arabic transliteration: Miyāh wa-'l-salām al-saʿb fi ash-Sharq al-Awsat

Alatout, Samer (2006) Towards a bio-territorial conception of power: Territory, population, and environmental narratives in Palestine and Israel. *Political Geography* 25: 601 - 621

Allan, J.A. (2001) *The Middle East Water Question: Hydropolitics and the Global Economy*. London, UK, I.B. Tauris

Allès, Christèle (2007) *La question du retour de l'État libanais dans l'ancienne zone occupée par Israël. L'exemple du bassin versand du Hasbani-Wazzani*. Master's thesis, Universite lumiere Lyon II, Lyon

Allès, Christèle (2010) La réforme du secteur de l'eau au Liban-Sud face à l'urgence de la reconstruction après la guerre de juillett 2006. *Ecocarrefour* 85 (2)

Amery, Hussein (2000) A Popular Theory of Water Diversion from Lebanon: Toward Public Participation for Peace. *Water in the Middle East: A Geography of Peace*. Wolf, A. and H. Amery. Austin, USA, University of Texas Press

Amery, Hussein A. (1993) The Litani River of Lebanon. *Geographical Review* 83 (3): 229 -238.

Amery, Hussein and Aaron Wolf, Ed. (2000) *Water in the Middle East: A Geography of Peace*. Austin, USA, University of Texas Press

Amnesty International (2006) *Israel/Lebanon: Out of all proportion - civilians bear the brunt of the war*, Amnesty International , http://www.amnesty.org/en/library/info/MDE02/033/2006/en

Amnesty International (2009) *Troubled Waters - Palestinians Denied Fair Access to Water: Israel-occupied Palestinian Territories*. MDE 15/027/2009. London, Amnesty International

Andraos, Nada (1998) "*Water catchments and (where the river ends) are a crucial issue in the region's struggles*." Al-Nahar, 16 October 1998: Arabic transliteration: Masāqit al-miyāh wa-masābbuhā mihwar asāsī fi nizāʿāt al-mintaqah

Anon (2008, pers.comm-a). Anonymised discussion. Litani River Valley. 11 April 2011

Anon (2008, pers.comm-b). Anonymised discussion with engineers involved in the reconstruction of the Wazzani pumping station. Beirut. December 2008

Anon (2010, pers.comm). Anonymised interview. Beirut. 30 Novemer 2010

Anon (2011, pers.comm-a). Anonymised discussion. Beirut. 31 January 2011

Anon (2011, pers.comm-b). Anonymised interview. Beirut. 11 April 2011

Anon (2011, pers.comm-c). Anonymised telephone interview. 26 August 2011

Arab Plan (1954) The Arab's Plan for Development of Water Resources in the Jordan Valley, March 1954

Arlosoroff , Shaul (2011, pers.comm.). Face-to-face interview. Tel Aviv. 28 March 2011.

Atoui, Mohammad (2002) "*Israel is Stealing the Water of South Lebanon*." Al- Mustaqbal, 17 October 2002

B'tselem (2011) *Dispossession & Exploitation: Israel's policy in the Jordan Valley & northern Dead Sea*. Jerusalem, B'tselem - The Israeli Information Center for Human Rights in the Occupied Territories May 2011

Beaumont, Peter (2005) Water Institutions in the Middle East in Gopalakrishnan, C., C. Tortajada and A. Biswas (eds), *Water institutions: Policies, performance, and prospects*. New York, Springer

Bishop, Patrick (2006) "Peacekeeping force won't disarm Hizbollah"

Blanford, Nicholas (2009) *The Seven Villages dispute*. Bitter Lemons International.org Edition 32, 20 August 2009, http://www.bitterlemons-international.org/inside.php?id=1168

Brielmann, Heike (2008) *Recharge and discharge mechanism and dynamics in the mountainous northern Upper Jordan River Catcment, Israel*, LMU Muenchen: Faculty of Goesciences

Bromiley, G. (1982) *International Standards Bible Encyclopedia E-J*. Michigan, Eerdmans Publishing Co

Brooks, David and Julie Trottier (2010) Confronting water in an Israeli-Palestinian peace agreement. *Journal of Hydrology* 382: 103 - 114

Bulloch, John and Adel Darwish (1993) *Water Wars: coming conflicts in the Middle East*. London, Victor Gollancz

Buzan, B., O. Waever and J. de Wilde (1998) *Security - A new Framework for Analysis*. London, UK, Lynne Rienner Publishers, Inc

CAS (2004) *Census of Buildings & Establishments*. Beirut, Central Administration of Statistics, Government of Lebanon

Cascão, Ana Elisa (2009) *Institutional Analysis of the Nile Basin Intitative: what worked, what did not work and what are the emerging options?*, Report prepared for International Water Management Institute, the International Livestock Research Institute, the Nile Basin Initiative and the Eastern Nile Technical Organization

Cascão, Ana Elisa and Mark Zeitoun (2010) Power, Hegemony and Critical Hydropolitics. *Transboundary Water Management: Principles and Practice*. Earle, A., A. Jägerskog and J. Ojendal. London, Earthscan

CO (1926) *Agreement as to Water Concession at Jerusalem, between the Crown Agents for the Colonies and Euripides Mavrommatis*. Westminister, London, UK National Archives Commonwealth Office record CAOG 14/124

CO (1927) *Case concerning the Re-Addaptaiton of the Mavrommatis Concessions - Opinion of the Attorney General and Mr. Fachiri*, UK National Archives Commonwealth Office record CO 733/131/1-3

CO (1928) *Correspondance related to J. Gesundheit and B. Joseph request for honuring of Tiberias mineral springs concession*, UK National Archives Commonwealth Office record CO 733/157/14

CO (1937a) *Irrigation and Settlement in Southern Palestine*. Miscellaneous Correspondence from the Commonwealth Office, UK National Archives Commonwealth Office record CO 733/349/13

CO (1937b) *Note on the Proposed Hydrographic Survey of Trans-Jordan, by D.G. Harris*, UK National Archives Commonwealth Office record CO 733/353/10

CO (1938a) *Documents and correspondance related to Sir Louis Dane, 1939 - 1940*, UK National Archives Commonwealth Office record CO 733/411/12

CO (1938b) *Irrigation and Settlement in Southern Palestine*. Miscellaneous Correspondence and Reports from the Commonwealth Office, including 'Notes on the Negeb, Palestine's Empty Half', UK National Archives Commonwealth Office record CO 733/380/8

Comair, Fadi (2011, pers. comm.). Discusion with Head of the GDHER, Dr Fadi Comair. GDHER offices, Beirut. 4 January 2011

Comair, Fadi Georges (2009) *Water Management and Hydrodiplomacy of River Basins: Litani, Hasbani-Wazzani, Orontes, Nahr al Kebir*. Louaize, Notre Dame University.

Cooley, John K. (1984) The War over Water. *Foreign Policy* 54 (Spring): 3 - 26

Courcier, Remy, Jean Philippe Venot and Francois Molle (2005) *Historical Transformations of the Lower Jordan River Basin (in Jordan): Changes in Water Use and Projections*. Comprehensive Assessment of water management in agriculture, Research Report 9. Colombo, Sri Lanka, International Water Management Institute

Coward, Martin (2008) *Urbicide: The Politics of Urban Destruction*. London, Routledge

Crooke, Alastair and Mark Perry (2006) PART 1: Winning the intelligence war. Asia Times Online: Middle East News

Daoudy, Marwa (2003) Eau et pouvoir: la relation stratégique Irak/Turquie. *Géostratégies* 2nd Semester 2005 (7): 99-118

Daoudy, Marwa (2008) A Missed Chance for Peace: Israel and Syria's Negotiations Over the Golan Heights. *Journal of International Affairs* 61 (2): 215 - 234

Darwish, Ragy, Nadim Farajalla and Rania Masri (2009) The 2006 war and its inter-temporal economic impact on agriculture in Lebanon. *Disasters* 33 (4): 629-644, available at http://onlinelibrary.wiley.com/doi/10.1111/j.1467-7717.2008.01091.x/abstract

Deconinck, Stefan (2006) *The Wazzani-incident in the summer of 2002 - a phoney war?*, Waternet http://www.waternet.be/jordan_river/wazzani.htm

Dinar, Ariel (2003) Preventive diplomacy, international relations, conflict resolution and international water law: implications for success and failure of the Israeli-Palestinian water conflict. *International Journal of Global Environmental Issues* 3 (2): 188 - 225

DO (1927) *Palestine Agreements 1924 - 1937*. Agreements signed by the British Mandate Authorities, UK National Archives Dominions Office Record DO 118/69/1

Dryzek, John S. (1997) The Politics of the Earth: Evironmental Discourses. Oxford, Oxford University Press

EC (2004) *EU Rapid Reaction Mechanism, End of programme report Lebanon/Israel Wazzani springs dispute*. Brussels, European Commission.

El Ezzi, Ghassan (1990) L'Invasion Israélienne Du Liban (1982): Origines, Finalités et Effets Pervers. Paris, Éditions L'Harmattan.

el Musa, Sharif (1996) The Land-Water Nexus in the Israeli-Palestinian Conflict. *Journal of Palestine Studies* 25 (3)

el Musa, Sharif (1997) *Water Conflict - Economics, Politics, Law and Palestinian-Israeli Water Resources*. Washington DC, USA, Institute for Palestine Studies

EXACT (2005) Groundwater Recharge, Water Data Banks Project, Multilateral Working Group on Water Resources, Middle East Peace Process - Overview of Middle East Water Resources. http://exact-me.org/overview/p12.htm *Accessed:* May 2011

FAO (2010) Aquastat Database, Food and Agriculture Organization. *Accessed:* July 2010

Farajalla, Nadim and Karim Makdisi (2008) *Lebanon, Hasbani and the Jordan*. Presentation given at American University of Beirut

Feitelson, Eran (2000) The Ebb and Flow of Arab-Israeli water conflicts: are past confrontations likely to resurface? *Water Policy* 2000 (2): 343-363

Feitelson, Eran, Itay Fischhendler and Paul Kay (2007) The Role of a Central Administrator in Managing Water Resources: The Case of the Israeli Water Commissioner. *Water Resources Research* 43 (11)

Fischhendler, Itay (2008) Institutional conditions for IWRM: The Israeli Case. *Ground Water* 46 (1): 91 - 102

Fisher, Franklin and Annette Huber-Lee (2005) *Liquid Assets: An Economic Approach for Water Management and Conflict Resolution in the Middle East and Beyond*. Washington, Resources for the Future

FNA (1920) *Convention Franco-Britannique, signée à Paris le 23 décembre 1920*. French National Archives in Nantes, Archives des postes diplomatiques, consulaires, culturels et de cooperation: Caisse 748; Fonds - Beyrouth - Cabinet politique; Serie - Cabinet politique - Traités; Sujet - Traités

FNA (1921a) *Communication issued by Etat-Commissariat de la Republique Francaise en Syrie e au Liban, 19 Novembre 1921. Signed by "British Experts" General Grant and Rotenberg, and by "French Experts" E. Achaud and A. Younes.* French National Archives in Nantes, Archives des postes diplomatiques, consulaires, culturels et de cooperation: Caisse 450; Fonds - "Beyrouth"/2e versement; Serie - Service Techniques "Hydraulique"; Sujet - Utilisation de la rivière Yarmouk et du bassin supérieur du Jourdain Station de jaugeage de Wadi-Khaled, 1921 - 1942

FNA (1921b) *Compte Rendu, Mission du 29 Septembre au 7 Octobre 1921, Haut-Commissariat de la Republique Francaise en Syrie & au Liban - Travaux Publics*. French National Archives in Nantes, Archives des postes diplomatiques, consulaires, culturels et de cooperation: Caisse 1373; Fonds - Syrie-Liban/1er versement; Serie - Bureau Diplomatique, Dossiers de principe/Inventaires no 12 et 15, t.1, 1926 - 1941; Sujet - Conventions, Relations franco-britanniques dans leurs mandats respectifs

FNA (1921c) *Confidential letter (marked 'Secret') from Lieutenant-Colonel PAULET, Chef de la Mission Francaise de délimitation Syro-Palestinienne au Général Commandant en Chef, Haut Commissariat en Syrie et au Grand Liban, 12.10.21*. French National Archives in Nantes, Archives des postes diplomatiques, consulaires, culturels et de cooperation: Caisse 1373; Fonds - Syrie-Liban/1er versement; Serie - Bureau Diplomatique, Dossiers de principe/Inventaires no 12 et 15, t.1, 1926 - 1941; Sujet - Conventions, Relations franco-britanniques dans leurs mandats respectifs

FNA (1921d) *ETUDE GENERALE DE LA FRONTIERE PROBABLE vers METELLI et du pays au N. et au SUD, immédiatement des deux côtés de (la) frontière. De l'Inspecteur des Travaux Publics de l'Etate du Grand Liban*. French National Archives in Nantes, Archives des postes diplomatiques, consulaires, culturels et de cooperation: Caisse 450; Fonds - "Beyrouth"/2e versement; Serie - Service Techniques "Hydraulique"; Sujet - Utilisation de la rivière Yarmouk et du bassin supérieur du Jourdain Station de jaugeage de Wadi-Khaled, 1921 - 1942

FNA (1921e) *Rapport sur le territoire du Sandjak de Saida, de Monsieur S. Florimond, chargé de mission par le Haut-Commissariat de la République Francaise à Monsieur le Lieutenant Colonel NIEGER, Administrateur en chef p.i. des T.E.O (Zône Ouest)*. French National Archives in Nantes, Archives des postes diplomatiques, consulaires, culturels et de cooperation: Caisse 1373; Fonds - Syrie-Liban/1er versement; Serie - Bureau Diplomatique, Dossiers de principe/Inventaires no 12 et 15, t.1, 1926 - 1941; Sujet - Conventions, Relations franco-britanniques dans leurs mandats respectifs

FNA (1922) *Concession du Houle*. French National Archives in Nantes, Archives des postes diplomatiques, consulaires, culturels et de cooperation: Caisse 655; Fonds - Syrie-Liban/1er versement; Serie - Cabinet Politique, Dossiers de principe (1926-1941)/Inventaire no 5: repertoire numerique; Sujet - Palestine - Frontière Syro-Palestinienne

FNA (1934) *Communication entre le conseiller pour les travaux public de la Republique Syrienne et l'Inspecteur general des travaux publics du Haut-Commissariat, 6 novembre 1934*. French National Archives in Nantes, Archives des postes diplomatiques, consulaires, culturels et de cooperation: Caisse 450; Fonds - "Beyrouth"/2e versement; Serie - Service Techniques "Hydraulique"; Sujet - Utilisation de la rivière Yarmouk et du bassin supérieur du Jourdain Station de jaugeage de Wadi-Khaled, 1921 - 1942

FNA (1940) *Lettre de le Capitaine PERREUX, Officier des services speciaux à Merdjayou, à Monsieur le Haut-Commisaire (Cabinet Politique) à Beyrouth, concernant la Rectification de la Frontière libano-palestinienne. With accompanying map 'Carte Indiquant la Frontière entre la Syrie et la Palestine - Sheet 1'.* French National Archives in Nantes, Archives des postes diplomatiques, consulaires, culturels et de cooperation: Caisse 656; Fonds - Syrie-Liban/1er versement; Serie - Cabinet Politique, Dossiers de principe (1926 - 1941) / Inventaire no5: répertoire numérique; Sujet - Palestine: Frontière Syro-Palestinienne

FO (1920) *Peace Conference (British Delegation) - Eastern Mission (Turkey), Files 76-91*. Item No. 318, letter from British Foreign Office to French representative M. Vantissart, 9 November 1920. Regards request for control of the Litani and Yarmouk Rivers, UK Foreign Office record FO 608/274

FO (1937) *Letter from D.G. Harris to M.G. Ionides, 8 July 1938*, UK Foreign Office record FO 816/97

FO (1953) *On Jordanian Plans to Develop the Yarmouk Plans*. Correspondence between Palestine Electric Corporation and UK Government, and between Jordanian Government and UK Government, UK Foreign Office record FO 371/104953 - 1532/15-19

FOEME (2010) *Towards a Living Jordan River: An Environmental Flows Report on the Rehabilitation of the Lower Jordan River*. Amman, Bethlehem, Tel Aviv, Friends of the Earth Middle East

Frederiksen, Harald D. (2003) The World Water Crisis: Ramifications of Politics Trumping Basic Responsibilities of the International Community. *Water Resources Development* 19 (4): 593 - 615

Frederiksen, Harald D. (2005) Return Palestinian Water Rights If Not Land: A Proposal. *Middle East Policy* XII No. 1 (Spring)

Frederiksen, Harald D. (2009) The World Water Crisis and International Security. *Middle East Policy* XVI (4): 76 - 89

Furlong, Kathryn (2006) Hidden theories, troubled waters: International relations, the 'territorial trap', and the Southern African Development Community's transboundary waters. *Political Geography* 25 (4): 438 - 458

Gates, Carolyn and Studies Centre for Lebanese (1998) The Merchant Republic of Lebanon Rise of an Open Economy. London, Centre for Lebanese Studies in association with I.B. Tauris

Gedeon, Said (2006) *Institutional and Social Innovations in Irrigation Mediterranean Management - ISIIMM Lebanese Case Study*. Euro-Mediterranean Regional Program for Local Water Management. Lebanon, Meda Water (EC) / Zahle Chamber of Commerce

Geneva Initiative (2009) *The Geneva Initiative: The Geneva Accord and Annexes - A Summary*. Ramallah and Tel Aviv

George, Alan (1979) "Making the Desert Bloom": A Myth Examined. *Journal of Palestine Studies* 8 (2): 88 - 100

Gil'ad, D. and J. Bonne (1990) The Snowmelt of Mt. Hermon and its Contribution to the Sources of the Jordan River. *Journal of Hydrology* 114: 1 - 15

Givati, Amir and Barry Lynn (2011) Using the WRF model in an operational streamflow forecast system for the Jordan River. *Journal of Applied Meteorology and Climatology*, doi: 10.1175/JAMC-D-11-082.1.

Gleick, Peter (2009) *Water Conflict Chronology*, Pacific Institute, http://worldwater.org/conflict.html

GOI (2010) *On the Subject of the management of the Water Economy in Israel: Committee's Report - Abstract*. Haifa, Government of Israel National Investigation Committee

GOL (2002) Position Report: Service Area of Hasbani Watercourse. Final Copy 09 October 2002, with 'Rapport de synthese' and 'Plan de developpement pour le bassin versant du Hasbani-Wazzani', in annex. Beirut, Government of Lebanon

GOL (2006a) Lebanon: On the Road to Reconstruction and Recovery, a Periodic Report Published by the Presidency of the Council of Ministers on the Post-July 2006 Recovery & Reconstruction Activities 2006. Beirut, Lebanon, Government of Lebanon.

GOL (2006b) Setting the Stage for Long Term Reconstruction: The National early Recovery Process, 2006. Beirut, Lebanon, Government of Lebanon

Goskel, Timur (2011, pers. comm.). Interview with former UNIFIL commander Timur Goskel. Cafe Rawda, Beirut. 8 February 2011

Gur, Dafna, Miryam Bar-Matthews and Eitan Sass (2003) Hydrochemistry of the main Jordan River sources: Dan, Banias, and Kezinim springs, north Hula Valley, Israel. *Israel Journal of Earth Sciences* 52 (3-4): 155-178

Gyawali, Dipak (2006) Nepal's Intertwined Politics of the Wax, Wick and Flame. Forthcoming

Haddad, Mouin (1995) "Why would the Litani turn into a Lebanese crisis?" Al Nahar, 8 April 1995: Arabic transliteration: H addad, Muʿīn (1995) "Limādhā yatahawwal al-Līţānī ma'zaqan Lubnānīan?"

Hajer, Maarten A. (1997) The Politics of Environmental Discourse: Ecological Modernization and the Policy Process. Oxford, UK, Oxford University Press, Oxford Scholarship Online

Hartmann, Andreas (2008) Process-based modelling of karst springs in Mt. Hermon, Israel, Institut für Hydrologie Albert-Ludwigs-Universität Freiburg im Breisgau

Hays, James B. (1948) *T.V.A. on the Jordan - Proposals for Irrigation and Hydro-Electric Development in Palestine*. Washington, DC, USA, A Report Prepared Under the Auspices of the Commission on Palestine Surveys, Public Affairs Press, assisted by A.E. Barrekette, with an introduction by Walter C. Lowdermilk

Hiorth, Albert (1938) *Plan for the Restoration of the Near East in the Light of Biblical Prophecies (Gen. 15,18 Isa.19, 23-24*, UK National Archives Commonwealth Office record CO 733/355/13

Hof, Frederic C. (2009) *Mapping Peace between Syria and Israel*. Special Report 219. Washington DC, United States Institute of Peace March 2009

HSI (1966) *Hydrological Yearbook 1965 - 66*. (Hebrew), Jerusalem, Hydrological Service of Israel

HSI (1977) *Hydrological Yearbook 1949 - 1977*. (Hebrew), Jerusalem, Hydrological Service of Israel

HSI (2004) *Development of Utilisation and Status of Water Resources in Israel (Annual Hydrological Report) 2003*. (Hebrew), Jerusalem, Hydrological Service of Israel

HSI (2008) *State of water sources in Israel 2008*. Jerusalem, Hydrological Service of Israel

ICA (2010) *Civil Administration Quarterly: Inside the Water Department* Bet El, State of Israel - Civil Administration of Judea & Samaria

ICBS (2004) *Agriculture in Israel - The Industry Account, Area and Livestock, Price Index of Output and Input 2001-2003*. Jerusalem, Israel Central Bureau of Statistics September 2004. http://www.cbs.gov.il/haklaut/agrical_2003

ICBS (2008) *2008 Statistical Abstract of Israel*. Jerusalem, Israel Central Bureau of Statistics 2005

ICBS (2011). Jerusalem, Israel Central Bureau of Statistics 2005.

ICG (2002) *Old Games, New Rules: Conflict on the Israel-Lebanon Border* Middle East Report Vol 7. Amman/Brussels, International Crisis Group, http://www.crisisgroup.org/~/media/Files/Middle East North Africa/Israel Palestine/Old Games New Rules Conflict on the Israel-Lebanon Border.pdf

ICRC (1994a) Handbook of the International Red Cross and Red Crescent Movement - International Humanitarian Law. Geneva, Switzerland, International Committee of the Red Cross

ICRC (1994b) Lebanon: Water supply problems during the 1989 and 1990 wars. *Water and War: Symposium on Water in Armed Conflict, Montreux, 21-23 November 1994*. Geneva, International Committee of the Red Cross

ICRC (2000) Water, Wars and Humanitarian Futures. *War and Water*. Geneva, Switzerland, International Committee of the Red Cross

IMEP (2006) *Damages to Wastewater Treatment Facilities - after the Second Lebanon War 2006 [Hebrew]*. Jerusalem, Ministry of Environmental Protection, Government of Israel http://www.sviva.gov.il/Enviroment/Static/Binaries/Spokesman/war_2006_madan_1.pdf

IMFA (2000) VII. The River Jordan. *Israel's Foreign Relations - Selected Documents, Volumes 1-2: 1947 - 1974*. Tel Aviv, Israel Ministry of Foreign Affairs. http://www.mfa.gov.il/MFA/Foreign+Relations/Israels+Foreign+Relations+since+1947/1947-1974

IRJWC (1907) Souvenir Album of the Holy Land, with Exceptionally Rare Views of the Sacred River Jordan. New York, The International River Jordan Water Company

Israel Ministry of Foreign Affairs, (2002), "*Israel's Water Economy*", August 2002 http://www.mfa.gov.il/MFA/MFAArchive/2000_2009/2002/10/Ministry+of+National+Infrastructures.htm#watercomm

Israel Project (2011) The Hezbollah-Israel Conflict: By the Numbers, http://www.theisraelproject.org/site/c.hsJPK0PIJpH/b.2904297/k.131A/The_HezbollahIsrael_Conflict_By_the_Numbers.htm *Accessed:* May 2011

Jarvis, Todd, Mark Giordano, Shammy Puri, Kyoko Matsumoto and Aaron Wolf (2005) International Borders, Ground Water Flow, and Hydroschizophrenia. *Ground Water* 43 (5): 764 - 770

Jridi, Aida (2002) *The Development of the Jordanian Jordan River Basin: The Main Historical Steps*. Montpellier, France, French Institute for Forestry and Agriculture - Water and Environmental Engineering (Engref) October 2002

JVL (2006) Modern Israel and the Diaspora, Jewish Virtual Library , A Division of the American-Israeli Cooperative Enterprise. *Accessed:* 15 December 2006.

Kally, Elisha and Randah Haydar (1991) Al-Miyāh Wa-Al-Salām: Wujhat Naẓar Isrā'īlīyah. Beirut, Mu'assasat al-BJUHaHc FR HBBchIaJeBF

Kaufman, Asher (2002) Who Owns the Shebaa Farms? Chronicle of a Territorial Dispute. *Middle East Journal* 56 (4): 576 - 595

Kaufman, Asher (2006) Between Palestine and Lebanon: Seven Shi'i Villages as a Case Study of Boundaries, Identities, and Conflict. *Middle East Journal* 60 (4): 685 - 706.

Khalife, Issam (2001) Lebanon: water and the border. Arabic transliteration: Lubnān: al-miyāh wa-'l- Hudūd Beirut, Lebanon, al-Muʻallif

Khalife, Issam (2007) La Force du Droit face au Droit de la Force : les Fermes de Chebaa, le Village de Nkheilé et les Collines de Kfar Chouba. *Revue d'études palestiniennes* 103: 51-62

Kiser, Stephen D. (2000) *Water: The Hydraulic Parameter of Conflict in the Middle East and North Africa*. INSS Occasional Paper 35. Colorado, USA, United States Air Force Institute for National Security Studies September 2000

Kjellen, Bo (2007) A New Diplomacy for Sustainable Development. London, Taylor & Francis.

Klein, Michael (1998) Water Balance of the Upper Jordan River Basin. *Water International* 23 (4): 244 - 248

Klein, Naomi (2007) The Shock Doctrine: The Riste of Disaster Capitalism. London, Penguin.

Kolars, John (1992) Les ressources en eau du Liban: Le Litani dans son cadre régional (Abridged and translated version of 'Prospects for Lebanon', Centre for Lebanese Studies (Oxford)). *Monde Arab Maghreb-Mashrek - La question de l'eau au Moyen Orient: Discours et réalités* 138: 11 - 26

Libiszewski, Stephan (1995) *Water Disputes in the Jordan River Basin Region and their Role in the Resolution of the Arab-Israeli Conflict*. Environment and Conflicts Project Occasional Paper No. 13. Berne, Switzerland, ETH Zurich / Swiss Peace Foundation

LMoA (1999) Agricultural Census. Beirut, Ministry of Agriculture, Government of Lebanon.

Lonergan, Steve and David Brooks (1994) Watershed: The Role of Fresh Water in the Israeli-Palestinian Conflict. Ottawa, Canada, International Development Research Council.

Lowi, Miriam (1993) Water and Power - The Politics of a Scarce Resource in the Jordan River Basin. Cambridge, USA, Cambridge University Press

LRA (2011) *Unpublished river flow data and literature provided by the Litani River Authority*. Beirut, Lebanon

MacDonald & Partners (1951) *Report on the Proposed Extension of Irrigation in the Jordan Valley*. London, UK, Sir M. MacDonald & Partners, Chartered Civil Engineers, prepared for the Hashemite Kingdom of Jordan March 1951

MacGregor, John (2002 [1870]) The Rob Roy on the Jordan - The extraordinary 19th Century tale of the first canoeist to explore the Middle East and Africa. London, UK, republished by The Long Riders' Guild Press, 2002. Also published by Harper&Brothers, Publishers, New York in 1870, under the title: The Rob Roy on the Jordan, Nile, Red Sea, and Gennesareth, &c: A Canoe Cruise in Palestine and Egypt, and the Waters of Damascus

Machlis, G.E. and T. Hanson (2008) Warfare ecology. *Bioscience* 58 (8): 729 - 736.

Markel, Doron (2004) *Monitoring and Managing Lake Kinneret and its Watershed, Northern Israel - a response to environmental, anthropogenic and political constraints*, Unpublished, and undated

Markel, Doron (2004a) Monitoring and Managing Lake Kinneret and its Watershed, Northern Israel - a response to environmental, anthropogenic and political constraints. *unpublished*

Markel, Doron and Uri Shamir (2001) Monitoring Lake Kinneret and its Watershed: Forming the Basis for Management of a Water Supply Lake. *Kinneret Limnological Lab (unpublished)*. http://www.kineret.org.il/data/ArticlePh/Markel and Shamir.pdf

Mason, Michael (2011) The application of warfare ecology to belligerent occupations. *Warfare ecology: a new synthesis for peace and security*. Machlis, G., T. Hanson, Š. Zdravko and J. E. McKendry. Dordrecht, Springer

Maternowski, Eileen (2006) Die Wasserverteilungsproblematik zwischen Israel und Libanon am Beispiel des Hasbani/Wazzani Konflikts. Universitaet Potsdam, Potsdam, Germany

Mathew, William M. (2009) British Imperialism and the Annexation & Zionisation of Palestine, 1917 - 22: Ignorance, Reflex, and Disaster. Bicentennial Conference: the Colonial Question, 23-27 November 2009 National University, Bogota

Mathew, William M. (2011) War-Time Contingency and the Balfour Declaration of 1917: An Improbable Regression. *Journal of Palestine Studies* XL (2): 26 - 42

Mazziti, Walter (2010, pers. comm.). Discusion with EU Middle East envoy on water issues Walter Mazziti. American University of Beirut, Beirut. 24 October 2010

McCaffrey, Stephen C. (2009) The International Law Commission Adopts Draft Articles on Transboundary Aquifers. *The American Journal of International Law* 103: 272 - 293

McCaffrey, Stephen C. (2010) Sovereignty and Cooperative Management of Shared Water Resources In a Time of Shrinking Availability: The Role of International Law. Transboundary Aquifers: Challenges and New Directions, Paris 6-8 December 2010.

MDM (2006) *Les Conséquences du Conflit de l'été 2006 sur les Conditions de Vie et la Santé des Populations civiles du Sud-Liban*. Paris, Médecins du Monde

MEDA (2003) *Plan de developpment pour le bassin versant du Hasbani Wazzani: Rapport de synthese de la phase 2*. Investment Planning Programme (IPP) No. Meda LBN 4100/1B/96/111. Beirut, European Union - MEDA, wtih Partex-Thales-Sema Consortium

Medzini, Arnon (2001) *The River Jordan: Frontiers and Water*. London, UK, School of Oriental and African Studies

Medzini, Arnon and Aaron Wolf (2004) Towards a Middle East at Peace: Hidden Issues in Arab-Israeli Hydropolitics. *Water Resources Development* 20 (2): 193-204

Mekorot (2011) Mekorot website [Hebrew], Mekorot. http://www.mekorot.co.il/Heb/AboutUs/Pages/israelWater.aspx *Accessed:* August 2011

Merheb, Mohammad (2010) *Watershed management of the Hasbani- Wazani*. Lebanese University, Ecole, Doctoral des Sciences et Technologie, Beirut, Lebanon

Messerschmid, Clemens (2010) Lessons from the Israeli-Palestinian Conflict. Presentation given at Fifth Workshop on Hydro-Hegemony, 8 May 2010, University of East Anglia - London Campus, London Water Research Group

Messerschmid, Clemens (forthcoming) Hydro-apartheid and water access in Israel-Palestine: challenging the myths of scarcity and cooperation. *The Palestinian People and the Political Economy of De-development*. Turner, M., Routledge

Ministry of National Infrastructures, "*The Water Sector*" available at http://eng.mni.gov.il

Mirumachi, Naho and J. A. Allan (2007) Revisiting transboundary water governance: power, conflict cooperation and the political economy. Proceedings from CAIWA International Conference on Adaptive and Integrated Water Management: Coping with Scarcity, 12 - 15 November 2007, Basel, Switzerland

MO (2010) "Ghajar : la frontière introuvable entre le Liban et Israël." *Moyen-Orient: Le monde arabo-musulman* (no. 8, Octobre-Décembre 2010). Paris: Moyen Orient Presse. http://www.moyenorient-presse.com/?p=513

MoEW (2011) Draft Water Sector Strategy, Government of Lebanon, Ministry of Energy and Water

Morkos, Michel (1986) "Some Reasons for the Wars are the Greediness of some Countries to take the Lebanese Water Sources." Al Nahar, 24 March 1986: Arabic transliteration: Murqus, Mishāl - Ba'ad' `Asbāb al-Hurūb Mut'āmi`a al-Dūwal biMas'ādir al-Mīyāh al-Lūbnāniyyih

MOSA-UNDP (2007) *Development of Mapping of Living Conditions in Lebanon, 1995-2004: A Comparison with the Results of "Mapping of Living Conditions in Lebanon, 1998"*. Beirut, Lebanon, Ministry of Social Affairs, and United Nations Development Programme

Murphy, Kim (2006) "Old Feud Over Lebanese River Takes New Turn." Los Angeles Times. articles.latimes.com/2006/aug/10/world/fg-litani10

Najem, Wajdi (2011, pers.comm). Interview with the Dean of the Universite Saint-Joseph, Dr Wajdi al Najem. Beirut. 13 April 2011

Nembrini, Pier Giorgio (1995) Do Water Production and Treatment Facilities Need Greater Protection in Armed Conflicts? Water and War - Symposium on Water in Armed Conflicts, Geneva, Switzerland, International Committee of the Red Cross

Nembrini, Pier Giorgio (2001) *Huambo (Angola): Water supply in a war torn town - evolution and impact of the different interventions since 1985*. Cities in War: Thirsty Cities - Occasional Paper No. 3. Geneva, Geneva Foundation

Nembrini, Pier Giorgio (2002a) *Kabul water supply: evolution since the 1992-94 civil war*. Cities in War: Thirsty Cities - Occasional Paper No. 7. Geneva, Geneva Foundation

Nembrini, Pier Giorgio (2002b) *Monitoring of urban growth of Informal Settlements (IS) and Population Estimation from Aerial Photography and Satellite Imaging*. Cities in War: Thirsty Cities - Occasional Paper No. 6. Geneva, Geneva Foundation

Newsinger, John (2002) British Counterinsurgency: From Palestine to Northern Ireland. Hampshire, Palgrave

NIC (2010) *National Investigation Committee on the Subject of the management of the Water Economy in Israel*. Haifa, Israeli Knesset June 2002

Nizzam, Ahmad (2011, pers.comm). Interview with the Director of the South Lebanon Water Establishment (SLWE). Saida. 5 March 2011

NSU (2008) *The 'Prior Use' Argument:Establishing Benchmarks and Implications of Historic Water Use, 1920 - 1948*. Unpublished. Ramallah, West Bank, Negotiation Support Unit, Negotiation Affairs Department, Palestine Liberation Organisation Draft 2, 29 August 2008

PCIIWS (2002) *The Parliamentary Committee of Inquiry on the Israeli Water Sector*. headed by MK David Magen, Jerusalem, Israeli Knesset June 2002.

Peraino, Kevin and Joanna Chen (2008) "The Myth of Water: Making the Negev Desert bloom once seemed like a good idea, but it's killing the Dead Sea." *Newsweek* 2008(July 7 - 14)

Phillips, David, Shaddad Attili, Stephen McCaffrey and John Murray (2007a) The Jordan River Basin: 1. Clarification of the Allocations in the Johnston Plan. *Water International* 31 (5): 16 - 38

Phillips, David, Shaddad Attili, Stephen McCaffrey and John Murray (2007b) The Jordan River Basin: 2. Potential Future Allocations to the Co-riparians. *Water International* 31 (5): 39 - 62

Picard, Elizabeth and Franklin Philip (2002) *Lebanon, a Shattered Country Myths and Realities of the Wars in Lebanon*. New York, Holmes & Meier, rev. ed.

Ramadan, Adam (2009) Destroying Nahr el-Bared: Sovereignty and urbicide in the space of exception. *Political Geography* 28 (3): 153-163

Rimmer, A. and Y. Salingar (2006) Modelling precipitation-streamflow processes in karst basins: The case of the Jordan River sources, Israel. *Journal of Hydrology* 331: 524 - 542

Rimmer, A., Y. Salingar and C. Zammit (2005) Dynamic basin model for the upper catchments of the Jordan River (UCJR) using Geographic Information System (GIS).

Rimmer, Alon (2006) System Hydrology Tools for the Upper Catchments of the Jordan River and Lake Kinneret, Israel. Banff , Canada

Rimmer, Alon (2011, pers.comm.). Interview Yigal Allon Kinnerte Limnological Laboratory, Lake of Tiberias. 03 April 2011

ROL (2008) *Ebl El Saqi Proposed Dam: Final Report Master Plan*. Beirut, Ministry of Energy and Water, General Directorate of Hydraulic and Electrical Resources, with Rafik El-Khoury & Partners

Roy, Sara (1995) The Gaza Strip: The Political Economy of De-Development. Washington, DC, USA, Institute for Palestine Studies

RPSO (2009) *Trans-boundary Cooperation on the Jordan River Basin: A Regional Positive-Sum Outcome*, Pamphlet not attributed to any source

Sadeldeen, Amro Saleh, Engineering American University of Beirut. Faculty of, Architecture Architecture. Department of and Design (2009) Ways of Action During the Post War Reconstruction in a Lebanese Southern Village %L ET:005203

Salem, Elie (2011, pers. comm.). email contact 1 March 2011. Beirut. 4 January 2011.

Schiff, Ze'ev (1994) *Peace with Security: Israel's Minimal Security Requirements in Negotiations with Syria*. Policy Paper No. 34. Washington, Washington Institute for Near East Policy http://www.washingtoninstitute.org/templateC04.php?CID=56

Schmida, Leslie (1984) Israel's Drive For Water. *The Link* 17 (4): 1-14

Schoenfeld, Stuart (2005) Introduction. *Palestinian and Israeli Environmental Narratives: Proceedings of a conference held in association with the Middle East Environmental Futures Project*. Schoenfeld, S. Toronto, Centre for International and Security Studies, York University

Sedan, Gil (2002) "U.S., Israel seek to defuse tense Lebanese water plan." J Weekly.com. 20 September 2002

SFG (2010) *Water Security in the Middle East*. Report on International Workshops, Montreux, Switzerland, 15-16 February 2010, Strategic Foresight Group, supported by the Swiss Federal Department of Foreign Affairs, and the Swedish International Development Agency

Shuval, Hillel (2011, pers.comm.). Face-to-face interview. Jerusalem. 09 March 2011.

Sitta, Salman Abu (2007) Traces of Poison: Israel's Dark History Revealed. PeacePalestine Blog. http://peacepalestine.blogspot.com/2007/12/salman-abu-sitta-traces-of-poison.html

SLWE (2006) *Damages to the Water Sector in the South of Lebanon from the 2006 War*. Saida, South Lebanon Water Establishment

Sneh, Ephraim (1984) *Reaction on Coole's Foreign Affairs Article on Diversion of Water to Israel*, Former IDF "Coordinator for Southern Lebanon", handwritten note (also typed in Hebrew). Reference no 783 of the Associates for Middle East Research (AMER), now held by the Oregon State University Middle East Water Collection Database

Soueid, Mahmoud (1998) "*Remapping Israeli projects of withdrawal from south Lebanon. future scenarios: which serious opportunity of liberatio*n?"

Soueid, Mahmud and Elias Sanbar (2000) *Israël Au Liban: La Fin De Trente Ans D'occupation?* Paris, Minuit

Stork, Joe (1983) Water and Israel's Occupation Strategy. *Middle East Research & Information Project - MERIP Reports* 116 (July-August 1983): 19-24

Tahal (1959) *The Jordan Project Planning Report, submitted by Tahal Water Planning for Israel, Ltd.* Jerusalem, Jerusalem Academic Press (a.k.a. "The Seven Year Plan") 1959.

Talhami, Michael (2005) Water resources of Palestine in the period 1993 to 2003 (Oslo): Sustainability and security of use and management. Essay prepared for Water and Water Policy Class, Department of Geography. King's College London, University of London, London, UK

The Link (1984) "Zionists Target Water Sources." *The Link* 17(4). Americans for Middle East Understanding, Inc.

Tignino, Mara (2011) L'eau et la guerre - Eléments pour un régime juridique. Faculty of Law. PhD, University of Geneva, Geneva

Trondalen, Jon Martin (2008) Water and Peace for the People: Possible Solutions to Water Disputes in the Middle East. Paris, UNESCO Publishing

Trondalen, Jon Martin (2009) *Assessment of National Capacities for the Management of Shared Water Resources in Arab Countries*. Cairo, United Nations Development Program (Water Governance Programme for Arab States)

Udasin, Sharon (2011) "Biggest desalination plant in Israel approved." Jerusalem Post, 24 May 2011

UNDP (2006) *UNDP's Participation in Lebanon's Recovery in the Aftermath of the July 2006 War*, United Nations Development Programme

UNDP (2007) *Lebanon: Rapid Environmental Assessment for Greening Recovery, Reconstruction and Reform*. Beirut, United Nations Development Programme

UNEP (2003) *Desk Study on the Environment in the Occupied Palestinian Territories*, United Nations Environment Program

UNEP (2007) *Lebanon: Post-Conflict Environmental Assessment*. Nairobi, Kenya, United Nations Environment Programme

UNGA (1997) *Convention on the law of the non-navigational uses of international watercourses*. New York, Resolution Adopted by the United Nations General Assembly, Fifty-first session, Agenda Item 144 http://www.un.org/documents/ga/res/51/ares51-229.htm

UNHRL (2006) *Lebanon Crisis 2006*, Interim Report - United Nations Humanitarian Response in Lebanon, 12 July to 30 August 2006

UNMACC (2007) South Lebanon Cluster Bomb Info Sheet, UN Mine Action Coordination Center.

UNRWA (1954) *Jordan Valley Agriculture Economic Survey, prepared by UNRWA Economic Staff, 1954*. Vienna, Austria

US DOS (1964) *Unified Development of the Jordan River Valley Waters*. Washington DC, United States Department of State briefing paper.

US Embassy (1965) *Report on Meeting to address response to Israeli Security and Water Security Concerns*. Tel Aviv, Israel, US Embassy in Israel telegram to US Department of State, Washington, 26 February 1965 (published by the Jewish Virtual Library as "The United States Hears Israeli Concerns on Security and Water Rights") http://www.us-israel.org/jsource/US-Israel/frus0226652.html

Verdeil, Eric, Ghaleb Faour and Sebastien Velut (2007) Atlas du Liban. Beirut, Lebanon, Institut français du Proche-Orient / CNRS Liban

Waslekar, Sundeep (2011) *The Blue Peace: Rethinking Middle East Water*, Strategic Foresight Group, supported by the Swedish International Development Agency, Swiss Agency for Development and Cooperation, and Political Affairs Div IV of the Federal Dept of Foreign Affairs (Switzerland)

Wihbey, Paul Michael and Ilan Berman (2000) *The Geopolitics of Water*. IASPS Research Papers in Strategy, Institute for Advanced Strategic and Political Studies, http://www.iasps.org/strat10/strat10.htm

Wolf, Aaron (2011, pers.comm.). Telephone interview. Oregon State University. 01 April 2011

Wolf, Aaron T. (1995) Hydropolitics along the Jordan River: Scarce Water and its Impact on the Arab-Israeli Conflict. New York, United Nations University [website edition - http://archive.unu.edu/unupress/unupbooks/80859e/80859E00.htm - Contents].

Wolf, Aaron T. (1998) Hydrostrategic Decisionmaking and the Arab-Israeli Conflict. *Yale F&ES Bulletin* 103: 221 - 273

Wolf, Aaron T. (2000) "Hydrostrategic" Territory in the Jordan Basin: Water, War, and Arab-Israeli Peace Negotiations. *Water in the Middle East: A Geography of Peace*. Wolf, A. and H. Amery. Austin, USA, University of Texas Press

Wolf, Aaron T., Ed. (2002) *Conflict Prevention and Resolution in Water Systems*. The Management of Water Series. Cheltenham, UK, Elgar

World Bank (2003) *Republic of Lebanon: Policy Note on Irrigation Sector Sustainability*. Report No. 28766 - LW. Washington DC, The World Bank, Water, Environment, Social and Rural Development Group (Middle East and North Africa Region and Agriculutre and Rural Development Department)

World Bank (2005) *Red Sea - Dead Sea Water Conveyance Project: Feasibility Study - Environmental, Technical and Economic and Environmental and Social Assessment Terms of Reference* siteresources.worldbank.org/MENAEXT/Resources/RDS-TOR-18_July2007.pdf?resourceurlname=RDS-TOR-18_July2007.pdf

World Bank (2007) Republic of Lebanon: Economic Assessment of Environmental Degradation due to the July 2006 Hostilities. Beirut, Lebanon, International Bank for Reconstruction and Development

Yiftachel, Oren (2002) Territory as the Kernel of the Nation: Space, Time and Nationalism in Israel/Palestine. *Geopolitics* 7 (2): 215 - 248

Zaslavsky, Dan (2002) *Water as a Metaphor*. Haifa, Israel, Technion - Israel Institute of Technology, Faculty of Agriculture

Zeitoun, Mark (2005) Conflict and Water in Palestine - The Consequences of Armed Conflict on Drinking-Water Systems in Jenin, West Bank. *Water Values and Rights*. Khatib, I., K. Assaf, D. Clayes and A. al Haj Daoud. Ramallah, Palestine, Palestine Academy Press

Zeitoun, Mark (2007) Violations, Opportunities and Power along the Jordan River: Security Studies Theory Applied to Water Conflict. *Water Resources in the Middle East: Israeli-Palestinian Water Issues - From Conflict to Cooperation*. Shuval, H. and H. Dweik. Heidelberg, Germany, Springer Verlag. 213 – 224, http://www.ipcri.org/index1.html

Zeitoun, Mark (2008) Power and Water: The Hidden Politics of the Palestinian-Israeli Conflict. London, I.B. Tauris

Zeitoun, Mark, Clemens Messerschmid and Shaddad Attili (2009) Asymmetric Abstraction and Allocation: The Israeli-Palestinian Water Pumping Record. *Ground Water* 47 (1): 146 - 160

Zeitoun, Mark and Naho Mirumachi (2008) Transboundary water interaction I: Reconsidering conflict and cooperation. *International Environmental Agreements* 8: 297 - 316

Zeitoun, Mark, Naho Mirumachi and Jeroen Warner (2011) Transboundary water interaction II: Soft power underlying conflict and cooperation. *International Environmental Agreements* 11: 159 - 178

Zeitoun, Mark and Jeroen Warner (2006) Hydro-Hegemony: A Framework for Analysis of Transboundary Water Conflicts. *Water Policy* 8 (2006): 435-460

Zisser, E. (2002) Israel and Lebanon: The Battle for the Wazzani. *Tel Aviv Notes - An Update on Political and Strategic Developments in the Middle East, No. 50,*. Heller, M. Tel Aviv, Israel, Moshe Dayan Center for Middle Easter and African Studies / Jafee Center for Strategic Studies, Tel Aviv University. October 2002: http://www.tau.ac.il./jcss

Zisser, Eyal (2009) *Israel between Shebaa and Ghajar*. Bitter Lemons International.org Edition 32, 20 August 2009. http://www.bitterlemons-international.org/inside.php?id=1168