

Managing Blue Gold

*New Perspectives on Water Security
in the Levantine Middle East*

Mari Luomi (editor)



Managing Blue Gold

*New Perspectives on Water Security
in the Levantine Middle East*

Mari Luomi (editor)

Managing Blue Gold

*New Perspectives on Water Security
in the Levantine Middle East*

FIIA REPORT 2010 25

Reports can be ordered from the
Finnish Institute of International Affairs
+358 20 6111 707
erja.kangas@upi-fiia.fi

All FIIA reports and other publications
are also available on our website at
www.upi-fiia.fi

Language editing: Lynn Nikkanen
Graphic design: Nordenswan & Siirilä Oy
Layout: Mari Pakarinen / Juvenes Print
Printed by: Tampereen Yliopistopaino Oy –
Juvenes Print, Tampere 2010

The Finnish Institute of International Affairs
Ulkopoliittinen instituutti
PL 400
00161 Helsinki
Finland
www.upi-fiia.fi
firstname.lastname@upi-fiia.fi

ISBN 978-951-769-282-3
ISSN 1458-994X

Contents

Introduction – <i>Mari Luomi</i>	11
I. Case studies	
1. The Internal dimensions of water security: the drought crisis in Northeastern Syria – <i>Hannu Juusola</i>	21
2. The Marginalization of water in Turkish-Syrian relations – <i>Zeki Kütük</i>	36
3. Conflicts, urbanization and bad governance: explaining Lebanon’s water problems – <i>Marja Kaitaniemi</i>	46
4. Is more enough? The sustainability of additional water projects in Jordan – <i>Taru Savolainen</i>	60
5. The management of water resources in Syria and Lebanon: shortcomings and challenges – <i>Kirsti Krogerus</i>	73
II. Emerging issues	
6. Water governance under reform pressure: are the Arab societies ready for change? – <i>Olli Varis</i>	86
7. Islam and water: Islamic guiding principles on water management – <i>Laura Wickström</i>	98
8. Mobilizing funding in the water sector: the potential for private sector participation and desalination in the Levant region – <i>Piia Moilanen and Ulla-Maija Mroueh</i>	109
Conclusions – Multiple challenges ahead – <i>Mari Luomi</i>	126
Annex 1: A situational assessment of water in Jordan, Lebanon, Syria, Turkey and Israel – <i>Piia Moilanen, Ulla-Maija Mroueh and Mari Luomi</i>	134
Annex 2: Training course on Water, Security and Climate Change in the Levant, spring 2010 – <i>Mari Luomi</i>	138
List of tables and maps	141

Acknowledgements

This report is based on an expert training course that was jointly arranged by the Finnish Institute of International Affairs and the Finnish Institute in the Middle East in Helsinki, Damascus and Beirut during the spring of 2010. In addition to acknowledging the contributors to this report for their enthusiasm and commitment, the editor would like to thank the organizers of the training course, without whom our trip to Syria and Lebanon in May 2010 would not have been possible: Dr Hannu Juusola, Manal Chatila and Laura Parviainen at the Finnish Institute in Damascus for scientific support and practical arrangements in Syria; Anu Leinonen and Eeva Talvitie at the Foundation of the Finnish Institute in the Middle East for logistical support, and the Foundation for financial support; and Wael Hmaidan and Nadine Ajami of IndyACT for lending us their vast network of local stakeholders and for their impeccable arrangement of meetings and visits in Lebanon.

The editor would also like to thank all the Syrian and Lebanese water professionals and other stakeholders who showed us true Middle Eastern hospitality during our stay by sharing not only their time, but also their insights into the often problematic and sometimes sensitive issue that water in this region has become.

The editor is also grateful to Anna Korppoo at the Finnish Institute of International Affairs for her support and guidance throughout the editing process.

Contributors

Hannu Juusola: *Director, Finnish Institute in the Middle East.* Dr Juusola was one of the organizers of the training course for Finnish professionals, of which this report is a continuation. Dr Juusola is currently on leave from the University of Helsinki, where he is a University Lecturer in the Department of World Cultures. He has published extensively on the history and politics of the Levant area. Dr. Juusola's main current research interest is identity politics in Lebanon, Syria and Israel/Palestine.

Marja Kaitaniemi: *Policy Advisor, European Parliament.* Ms Kaitaniemi assists Green League Finnish MEP, Satu Hassi, in her work in the Environment Committee of the European Parliament. Her work mainly focuses on EU climate policy and the UNFCCC negotiations. She takes a personal interest in the interconnections between climate change and human rights, development and security. Ms Kaitaniemi has previously worked as a climate and energy policy officer at WWF. She holds BSc and MSc degrees in environmental studies.

Kirsti Krogerus: *Senior Researcher, Finnish Environment Institute (SYKE) Freshwater Centre.* Ms Krogerus has extensive administrative and management experience in the leadership of the environmental and nature conservation departments and units in the Pirkanmaa and Häme Regional Environment Centres. She is currently completing a doctoral thesis on the importance of particulate matter on phosphorus flow and lake eutrophication for the University of Jyväskylä. She also specializes in the application of different water quality models and the development work of the models.

Zeki Kütük: *Adjunct Professor, Researcher, Tampere Peace Research Institute, University of Tampere.* Dr Kütük's primary research area is Turkey and its relations with the European Union, Greece and Cyprus. He is currently interested in Turkey's new foreign policy, particularly the country's relations with its neighbours in the Middle East and the Balkans. He also lists migration, integration, and border surveillance in Finland and Turkey as additional areas of interest.

Mari Luomi: *Researcher, International Politics of Natural Resources and the Environment research programme, the Finnish Institute of International Affairs.* Ms Luomi was one of the organizers of the training course for professionals on water issues in the Levant, which served as the impetus for this report. She is completing a doctoral thesis on the energy security and responses to climate change of small Gulf monarchies at the Institute for Middle Eastern and Islamic Studies of Durham University. She also specializes in climate policy and security in the Middle East and the politics of sustainability and regime survival in the Gulf.

Piia Moilanen: *Senior Technology Advisor, Finnish Funding Agency for Technology and Innovation (Tekes).* Ms Moilanen is managing Tekes' Water Programme for the period 2008–2012. The objective of the five-year programme is to contribute to technology transfer, new applications development, business competence development, and the overall competitiveness of the Finnish water sector in the international market. Ms Moilanen has completed her Licentiate thesis in environmental technology at the Tampere University of Technology and holds a Master of Business Administration degree from the Helsinki School of Economics.

Ulla-Maija Mroueh: *Senior Research Scientist, VTT Technical Research Centre of Finland.* Mrs Mroueh is research coordinator in the research field of water and waste technologies at VTT. She holds a Master of Science degree from Helsinki University of Technology, coupled with over 25 years of professional experience in environmental research and research management. Her main competencies include environmental aspects of water technologies, waste recycling concepts, and life cycle environmental aspects of recycling processes and concepts. She has published numerous articles and reports on environmental technologies.

Taru Savolainen: *Project Coordinator, Think tank e2.* Ms Savolainen is currently working as an intern at the Finnish Embassy in Damascus. She has studied Development Studies at the University of Helsinki and is writing her Master's thesis on the social ideals of Islamist movements. At Think tank e2 she has worked mainly with projects related to development policy research and awareness-raising on development issues.

Olli Varis: *Professor, Water Resources, Aalto University.* Professor Varis has expertise in a wide range of water-related disciplines, including global and international water issues, development policies, environmental and social impact assessment, computational modelling of the environment and resource management. He holds a doctorate in hydrology and water resources management from the Helsinki University of Technology, currently known as Aalto University. Varis has over two decades of professional experience and is the author of over 330 scientific articles.

Laura Wickström: *Researcher, Doctoral Candidate, Åbo Akademi University.* Ms Wickström holds a Master of Arts Degree in Comparative Religion and is currently specializing in Islam and ecology within the Department of Comparative Religion at the Åbo Akademi University. She also holds a Master's degree in Public International Law with specialization in Human Rights Law. During 2004–2005 Ms Wickström studied, among other things, Islamic law at the Friedrich-Alexander-Universität of Erlangen-Nürnberg in Germany.



The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the Finnish Institute of International Affairs or the authors, and are for illustrative purposes only.

Map 1. The Levantine Middle East

Introduction

Water security, namely the ability of governments to secure a sustainable water supply for their populations, is becoming increasingly questionable in the Levantine countries of the Middle East. Lebanon, Syria, Jordan, Turkey, the Occupied Palestinian Territories and Israel not only share a history of conflict but also a challenging, mostly arid climate, and scarce water resources in comparison to the levels of consumption. This report is a multidisciplinary endeavour to understand the present dynamics and shed light on the future challenges of water security in this part of the Middle East. Through five case studies and three thematic chapters, the report illustrates the complexity and multi-dimensionality of the region's water issue. A central outcome of the articles contained in the report is that the region is in dire need of sound water management policies and practices that are based on multi-stakeholder engagement and transboundary cooperation. Internal and external pressures such as growing populations, modernization, economic liberalization, Islam, and climate change will also have to be taken into account and managed. Without a proactive approach that breaks with the current wasteful consumption patterns, the countries of the Levant will not achieve water sustainability, with potentially disastrous ramifications in the near future.

While the geopolitics of the Levant region continues to be as complicated as ever, concerns about the increasing water scarcity in these countries have been mounting in recent years. Recurrent droughts in the agricultural regions of Syria have led as many as a million people to lose their livelihoods. These people have flocked to the country's urban centres to become 'water refugees'. The droughts and their unmanaged economic and social consequences have resulted in increasing poverty, unemployment, and social discontent, which in turn increases the potential for internal instabilities. Turkey's dams have further decreased the flow of the Euphrates River to Syria and Iraq, prompting repeated protests by the lower stream riparians. Jordan, one of the water-poorest countries in the world, sees no

other solution to its water crisis than expensive additional water supply megaprojects. These projects tap into shared groundwater aquifers, potentially sowing the seeds of either cooperation or, in the worst case, conflict with the neighbouring countries. In Lebanon, unequal and unsafe water distribution is a major concern, with only around 10% of Beirut's population of two million having daily access to clean water. Also, it is feared that if droughts in the region increase as a consequence of climate change, Israel, which already occupies territories containing strategic water resources, such as the Golan Heights, might seek to increase its control over these areas and other transboundary water sources. It is therefore evident that insufficient water supply is not only an issue of human security, but one of national security and stability as well.

The Levant's water scarcity in numbers

The underlying cause of the Levant's water insecurity is the chronic imbalance between its population and its water resources: while the populations of Jordan, Lebanon, Syria, the Palestinian Territories, Israel and Turkey constitute 1.7% of the world's population, their freshwater resources amount to only 0.4% of the global total.¹

Despite differences in annual precipitation, 111–661 mm, and the availability of water resources, ranging from roughly 150 to 1100 m³ per capita, Jordan, Israel, Lebanon and Syria all suffer from water scarcity, the limit of which is considered to be 1000 m³ per person. Even Turkey's current water security, around 2900 m³ of renewable water resources per capita per year, is expected to decrease in the coming decades.² The region's arid and semi-arid climatic conditions are also characterized by uncertainty: annual rainfalls may vary from 60% to 125% from the multiannual average.³

¹ World Bank, *World Development Indicators* (April 2010); FAO, *Aquastat online database*. <http://www.fao.org/nr/water/aquastat/dbase/index.stm>. Accessed on 25 September 2010.

² See table 5 in Annex 1.

³ Rana Samuels, 'Understanding and predicting climate variations in the Middle East for sustainable water resource management and development', *Dissertation Abstracts International*, Volume: 69-05(2008), Section: B, p. 2858.

In addition to the physical challenges, there are a multitude of factors which interact to cause the Levant's dire water situation. In the largely arid Eastern Mediterranean, water consumption is not in equilibrium with availability and water mismanagement is widespread. Emphasis is still placed more on the supply rather than the demand side of management, while governance is often far from satisfactory and is characterized by top-down decision-making, weak institutions, lack of coordination and insufficient data availability and sharing.

Differences between countries in water withdrawal rates are large and, in the case of Israel, Jordan and Syria, withdrawals outstrip annual renewable water availability. The share of total actual freshwaters withdrawn ranges from 18% in Turkey to a highly unsustainable 90% in Jordan. Pressure on the renewable freshwater resources is particularly high in Israel, Jordan and Syria, which use 80% to 90% of their total available resources.⁴

Young and growing populations, rising living standards and wasteful consumption habits are pushing the demand for water increasingly higher, particularly in Jordan, the Occupied Palestinian Territories and Syria, where growth rates in 2008 were 2.5-3.2%.⁵ Rising living standards also contribute to increasing demand. The safety of water is still a concern in some states: in 2008, 11% of Syrians and 4% of Jordanians lacked access to improved sources of drinking water.⁶

Also, as is typical of developing countries, agriculture is a major consumer of water in the Levant. Unsustainable and unattainable food self-sufficiency policies are wasting the precious resource on water-intensive crops and profligate irrigation practices. The share of irrigation of total water withdrawals is 45-65% in the Palestinian Territories, Jordan, Israel, Lebanon and Turkey, and almost 90% in Syria.⁷

An important uncertainty factor from a regional stability perspective is that 80% of the Middle East's water resources are shared.⁸ What is more, the region's history of conflicts often prevents

⁴ See table 5 in Annex 1.

⁵ Ibid.

⁶ WHO, *Progress on Sanitation and Drinking-Water*, 2010 Update (2010). Data for the OPT was not available.

⁷ See table 5 in Annex 1.

⁸ Presentation by Tarek Sadek, 'Climate Change and Sustainable Development in the ESCWA Region', UN-ESCWA (21 May 2010). Presentation for the course participants in Beirut.

the equal distribution of water resources among countries and religious or ethnic groups. Most Levantine countries rely on water from rivers that originate outside their borders and have increasingly scarcer water flows: Syria and Iraq are the lower riparians of the Euphrates and Tigris rivers that flow from Turkey, while Jordan and the Palestinian Territories depend on the Jordan River, originating in Israel, Lebanon and Syria. The most dependent countries in these terms are Syria (72%), Israel (58%) and Jordan (27%).⁹ Lebanon, too, shares rivers, such as the Orontes (Asi) with its neighbours. Most worryingly, none of the multilateral water management agreements of the major regional rivers is all-inclusive. Shared groundwater aquifers also lack riparian agreements on their management.¹⁰ In the face of increased scarcity, the situation is a recipe for increased interstate tensions.

Climate change adds another level of uncertainty as it is expected to alter global and regional water cycles. According to the Intergovernmental Panel on Climate Change, in most parts of the Middle East, the climate is predicted to become hotter and drier than at present. Higher temperatures and reduced precipitation will increase the occurrence of droughts and escalate extreme rainfall events. As a result, an additional 80–100 million people are expected to become exposed to water stress in the coming 15 years, which in turn will further increase pressure on the region's already overexploited groundwater resources.¹¹

A more detailed examination of the five countries' water resources with related statistical data is available in Annex 1 on pp. 134–137.

Background to the report: training course on water

This report is the product of a training course for professionals on water issues in Syria and Lebanon titled Water, Climate Change and Security in the Levant, which was jointly organized by the Finnish

⁹ See table 5 in Annex 1.

¹⁰ Munther Haddadin, 'Water Issues in the Middle East: Challenges and Opportunities'. *Water Policy* 4 (2002), p. 217.

¹¹ The World Bank, 'Adaptation to Climate Change in the Middle East and North Africa Region'. <http://go.worldbank.org/BOG53VPB00>. Accessed on 17 September 2010.

Institute in Damascus and the Finnish Institute of International Affairs during spring 2010. The course consisted of an introductory part, involving preliminary reading, a working group meeting in Helsinki, and a one-week trip to Syria and Lebanon in May 2010. Fifteen Finns representing diverse backgrounds and career stages participated in the entire course. Of these, nine researchers and other experts took up the invitation to write a chapter for this report.

The training course grew out of a perceived need to enhance Finnish expertise on important contemporary questions in the Middle East. Water, security and the emerging issue of climate change, all with important interlinkages, were chosen as the main themes. The idea was to complement the perspectives of social sciences with a managerial-technical approach to understanding the complex nature of water scarcity in the Levantine part of the region. Participants were invited and selected on this basis, which largely enriched the issues discussed and questions posed during meetings with local stakeholders in Syria and Lebanon. This methodology, which turned out to be a fruitful one during the course, is also strongly reflected in the composition of this report. A short summary of the course is presented in Annex 2 (pp. 138–140).

Scope of the report

This report presents case studies on the Levantine countries of Syria, Lebanon, and Jordan, as well as Turkish–Syrian relations. The report also discusses technological aspects of water in the case of Israel. In addition, it touches on common issues for the entire Middle East and North Africa region. However, it does not cover frequently-discussed and well-studied issues, such as the Israeli–Palestinian water disputes or those regarding the River Jordan. Instead, the focus is on often neglected dimensions of the region’s water problems: internal power politics, the secondary role of water in conflicts and cooperation, additional water projects, the ‘human dimension’ of water governance, private sector participation, Islam, and climate change.

The main methodology of the report is a case study approach, complemented with studies on emerging cross-cutting issues. The

different types of water resources (surface and groundwater) and uses (drinking water and irrigation) are discussed and examined in the chapters. The diversity of the authors and their backgrounds explains the diversity of approaches in the report. The authors are all experts and professionals in the fields of water management, water technology, environmental studies, development studies, political history, Middle Eastern studies, political science, and international law. A distinct strength of this type of approach is the richness of perspectives achieved by examining one issue with the help of the toolkits of different fields of science.

The report naturally has its limitations, however, in terms of data and time resources. The field trip to Lebanon and Syria was a concrete reminder of the importance of increasing and improving scientific research into water and climate change in the Middle East. A major hindrance to improving water management and governance is the lack of scientific data and reliable, consistent statistics to guide the decision-making process. It is also a liability for comparative and future-oriented analyses, such as this report. Another limitation was time, as the participants only spent a week talking to local stakeholders on the ground. Nevertheless, this report will hopefully encourage not only the participants, but also its readers to carry out deeper analyses of this fascinating and challenging research topic.

Summaries of the chapters

The report is divided into two parts. In the first part, five case studies are presented. Chapter 1 by Dr Hannu Juusola concentrates on the internal dimensions of Syria's current drought crisis. By examining the possible consequences of drought for the country's internal stability and the legitimacy of the regime, the chapter demonstrates how internal conflicts over water and the consequent insecurities can pose a greater challenge for the Middle East than inter-state water conflicts. After discussing the social consequences of drought in the country's northeastern regions, including internal population movements and food insecurity, Dr Juusola considers their political causes. He suggests that the Syrian government's agricultural policies and economic liberalization, with important links to the domestic

legitimacy of the regime, play a significant role in escalating water scarcity and mass migration. Furthermore, he argues that economic liberalization and diversification as well as democratization are prerequisites for achieving sustainable water and development in Syria.

Chapter 2 by Dr Zeki Kütük examines the external dimension of water security. He presents the transformation of Turkish–Syrian relations in the 2000s as an example of how transboundary water resources can be contingent on the general state of relations between neighbouring states. The chapter traces the changing role of water in this relationship through an examination of the three bilateral problems of Hatay, Syria’s support to the PKK and water, and their resolution mainly through Turkey’s new regionalism. Dr Kütük shows that the positive developments in the area of security and territorial issues have brought Turkey and Syria closer to reaching an understanding in the area of water as well. He suggests that the emerging regionalism in the Middle East is an important factor in lowering the risk of interstate conflict, including disputes over water-sharing issues.

In Chapter 3, Marja Kaitaniemi assesses the causes of Lebanon’s water problems through a case study on Beirut. Despite a less acute water situation than in the neighbouring countries, considerable problems, including sect-based inequalities in access to clean water as well as wastewater management, plague the country. Ms Kaitaniemi shows how difficulties in governance act as a root cause these problems, while the challenging hydrological conditions, the history of internal and external conflict, and urbanization add to the challenges. Through her case study on Beirut, she concludes that any process designed to improve the situation needs to take into account the big picture of both the supply and demand sides, starting from collecting up-to-date data for planning and projections and tackling the delicate historical issues related to the governance of water.

‘Is more enough?’ is the question posed in Chapter 4 by Taru Savolainen. The chapter presents an overview of Jordan’s water security problems and their causes, plus analyses of two of the government’s current supply-side solutions at the Disi aquifer and the Red–Dead Sea. Ms Savolainen makes a critical assessment of the sufficiency and sustainability of the current measures on both the supply and demand sides and argues that both strategies

are necessary in order to alleviate Jordan's acute water insecurity. However, she argues that the country should not rush into supply-side mega-projects before studying their environmental and social effects extremely carefully. According to Ms Savolainen, enhancing water-saving schemes, minimizing the share of non-revenue water and reducing irrigation water consumption should be given priority over costly and risky supply-side ventures. She also makes the case for enhanced cooperation between Jordan and its neighbours in pursuing the current transboundary water projects.

Chapter 5 by Kirsti Krogerus presents a comparative examination of the current state of planning and governing of water resources in Syria and Lebanon. She points out that the chronic mismanagement of the resource poses escalating problems for water supply in these countries. The monitoring and evaluation practices, characterized by unsystematic data gathering, lack of modern techniques and low quality standards are, according to Ms Krogerus, inadequate for planning purposes. Planning and water protection measures are also insufficient and lack implementation, particularly in the area of wastewater treatment. A final problem concerns the complex and centralized water administration systems as well as weak enforcement mechanisms. As a solution, Ms Krogerus recommends the use of integrated water resources management (IWRM) and awareness-raising, among other measures.

Part two of the report sheds light on three cross-cutting themes that are receiving increasing attention in relation to water supply and sustainability in the Middle East. Chapter 6 by Professor Olli Varis evaluates the capacity of Arab states to succeed in reforming their water sectors and governance under the existing pressure factors. The chapter provides an overview of the present-day demographic and socio-economic characteristics and pressures within the context of water resources management. As the focus in water management is shifting from an excessive emphasis on supply to considering demand management and conservation, according to Professor Varis, more attention should be paid to the 'human component'. In his chapter, the Professor examines two facets of this dimension, namely power distance and individualism versus collectivism, and concludes that the water governance structures in the Middle East and North Africa exhibit much inertia in both aspects.

In Chapter 7, Laura Wickström analyses the potential role that Islam could play in alleviating environmental and water-related problems in Muslim countries. The chapter starts out with a presentation of general Islamic environmental aspects and water-related guiding principles, such as water priorities and water ownership. Ms Wickström then proceeds to illustrate the importance and relevance of Islamic values in contemporary Muslim societies through examples from the areas of international law and education. She suggests that solutions derived from Islamic principles could play a role in settling international disputes, emphasizing education and public awareness programmes as possible methods for changing environmental attitudes and raising environmental awareness in these countries. As her unique contribution to this report demonstrates, the importance of taking into account Islamic values in future changes affecting Muslim societies, including water-related ones, should not be underestimated.

Chapter 8 by Piia Moilanen and Ulla-Maija Mroueh discusses the need to mobilize funding for the water sector in four countries of the Levant. Because water infrastructure is deficient in Jordan, Lebanon, and Syria in particular, there is a need for massive investments in water infrastructure over the next decade. However, the limited public funding resources are a significant obstacle to developing the necessary water and sanitation services. The authors argue that increased private sector participation in these countries' water and wastewater utilities sectors is therefore acutely needed. The authors present desalination as a promising but relatively expensive technology for tackling water scarcity in the region, and argue that the role of financing mechanisms will become increasingly important, as other options for additional supply are exhausted. Through an analysis of the potential for private sector participation in investments in the water sector in Jordan, Lebanon, Syria and Israel, the authors illustrate the different situations in which the countries currently find themselves in relation to the ability to secure private sector funding.

Finally, the Conclusions chapter briefly discusses the complexity of the Levant region's water problems, as illustrated by the report. It also touches upon the water and climate change nexus, and suggests potential lessons from the countries in the region, which neighbouring states might find beneficial in their intensifying

quest for sustained water security. As the studies in this report demonstrate, tackling the Middle East's water management and governance problems and enhancing its adaptation capability to climate change are two sides of the same coin. In seeking solutions to the multiple water-related problems, states need not necessarily look far afield, as examples of positive practices and developments have already begun emerging in different countries and on different levels. It is these local practices, combined with assistance from the international community, including Finland, that can help establish the foundation for sustainable water security in the Levant.

1 The internal dimensions of water security: the drought crisis in Northeastern Syria

When analyzing water as a political and conflict risk factor in the Middle East, scholars typically emphasize the inter-state dimensions of this question and concentrate on the transboundary water resources in the area. This is, of course, a relevant and important point of view, given that many of the region's central waterways are shared by several riparian countries. Yet, as argued in some recent studies, the internal, often local, conflicts over water and the consequent insecurities can pose a greater challenge for the Middle East than inter-state water conflicts.¹² In this chapter, a concrete and acute water crisis in the Syrian northeast is described and analyzed regarding the possible consequences of drought for the country's internal stability and the legitimacy of the regime. Since climate change is likely to cause recurrent droughts in the Middle East, the management of their consequences will certainly be of the utmost importance for the governments also in terms of their internal legitimacy.

An arid country

Most of Syria is either arid or semi-arid, a factor which strongly affects renewable water resources in the country. Water in Syria is obtained from three main sources: rainfall, surface water, and groundwater. The average annual rainfall is about 256 mm, ranging from up to 1500 mm in the coastal region and along the Turkish border in the north to less than 200 mm (about 55% of the country). Only 15% of

¹² See e.g. Jan Selby, 'The Geopolitics of Water in the Middle East: Fantasies and Realities', *Third World Quarterly*, 26:2 (2005), p. 243; Jessica Barnes, 'Managing the Waters of Ba'th Country: The Politics of Water Scarcity in Syria', *Geopolitics* 14 (2009), pp. 510–511.

the area receives more than 350 mm of rain per year. Rainfall is also characterized by a considerable variation from year to year. According to a recent estimate, there has been a trend towards less rainfall since the early 1980s. As for the surface water, there are 16 main rivers or tributaries in Syria, the primary ones being the Euphrates, the biggest river in Syria, and the Tigris, both being shared with Turkey and Iraq. In the case of the Euphrates, there are provisional bilateral agreements between Syria and other parties regarding the sharing of water, whereas in the case of the latter, no formal agreement is in place. Unofficially, Turkey allows Syria to draw water from the Tigris for irrigation. The third most important river is the Orontes (al-Asi), which is, in turn, shared with Lebanon and Turkey. There is an agreement originating from 1994 between Syria and Lebanon regarding the allocation of Orontes flows, the only more official agreement Syria has with neighbouring countries. Even though there is no acute conflict over these transboundary waters, the attainment of formal multilateral agreements regarding water-sharing is vital for Syria, since more than 70% of the country's water originates outside its borders. It is generally believed that an agreement on firm and official water-sharing deals between Syria and its neighbours will be a difficult task to accomplish.¹³

A key problem with groundwater is that many of Syria's main aquifers are nonrenewable. Further, groundwater aquifers are very often overpumped, a fact which has resulted in the considerable deterioration of water quality and quantity in the aquifers. Non-traditional water resources have thus far played a very limited role in Syria. For instance, desalination is not employed as a water source and wastewater treatment plants are few.¹⁴

¹³ Yousef Meslmani, *Vulnerability Assessment and Possible Adaptation Measures of Water Resources*. Initial National Communication to UNFCCC (UNDP Syria, 2009), pp. 7-9, 21; John Dagge, 'Parting the Waters', *Syria Today* 57 (January 2010), 28-31; Kevin Freeman, 'Water Wars? Inequalities in the Tigris-Euphrates River Basin', *Geopolitics* 6:2 (2001), pp. 137-138.

¹⁴ For the foreseeable future, desalination can be a solution only in countries, notably the Gulf states, where the population lives along the coast at low levels, energy is very cheap, and no other solutions exist. / For data on water resources in Syria, see: Meslmani, *Vulnerability Assessment*, pp. 4-11.

All in all, the per capita available water resources in Syria (860m³/year) are well below the international water poverty standards (1000m³/year), even without taking the rapidly deteriorating quality of the water resources into account.¹⁵ Syrian water resources have diminished considerably due to the demographic change, recurring droughts and problems of water management. An example of the latter is the drying up of the River Barada, the primary water source of Damascus. As is the case in the Middle East in general, water sources in Syria are mainly used for irrigation. In the Syrian case, the percentage is almost 90. Since 2002 at least, there has been a deficiency between used water and the available water resources. It is only on the coast and in the Aleppo area that the water balance is not deficient. In the coming 20 years, it is estimated that the water deficiency will triple, even without any increase in water demand.¹⁶ Yet, with the growing population and the increasing water demand in industry, an overall increase is very likely. The fact that many rivers, lake dams and groundwater aquifers are polluted adds significantly to the problem. Climate change is projected to further aggravate the situation. In addition to decreasing precipitation, climate change is also likely to worsen the quality of groundwater, as coastal aquifers may be contaminated by intruding seawater.¹⁷

Severe drought in the northeast

A document by the International Federation of Red Cross and Red Crescent Societies characterizes Syria as ‘currently experiencing the dramatic effects of a drought that has been affecting the country since 2006’.¹⁸ Many areas have been affected, but the northeastern al-Jazira region has been hit particularly hard by the drought. According

¹⁵ Ibid., p. 11.

¹⁶ Ibid., p. 14.

¹⁷ Dia El-Din El-Quosy, ‘Fresh Water’, Mostafa K. Tolba and Najib W. Saab (ed.), *Arab Environment: Climate Change. Impact of Climate Change on Arab Countries*. 2009 Report of the Arab Forum for Environment and Development, p. 76.

¹⁸ International Federation of Red Cross and Red Crescent Societies, ‘Syria: Drought’ Map (3 August 2009). <http://www.reliefweb.int/rw/rwb.nsf/db900sid/HHOO-7UKL8A?OpenDocument&query=syria>. Accessed on 15 August 2010.

to government and UN estimates, as much as 95% of the affected population lives in the northeast. The drought adds to the significant water problems in this traditional breadbasket of Syria, which has already been heavily affected by water scarcity on previous occasions. A case in point was the complete drying up of the lower reaches of the Khabour River, the main tributary of the Euphrates in Syria, in the 1990s. A major reason for this was overpumping on both the Turkish and Syrian sides of the border for irrigation and, particularly, the construction of the Basel al-Asad dam south of al-Hasake. In June 2010, the World Food Program (WFP) started distributing food to up to 200,000 people in the vast semi-arid provinces of al-Hasake, al-Raqqa, and Deir al-Zor in an attempt to prevent severe malnutrition and starvation. This was the second time food had been delivered since the UN launched its Syria Drought Response Plan in 2009. Yet, according to WFP estimates, many more are in need of aid, but cannot be helped due to insufficient funding. The difficulties in obtaining adequate funding from international donors may be partly connected to the political tensions that still exist between Syria and the United States.¹⁹

One should bear in mind that even before the drought the northeastern region was the poorest area in Syria. While poverty declined in most of Syria between 1994 and 2004, in the northeastern provinces of al-Hasake, al-Raqqa, and Deir al-Zor poverty intensified both in terms of incidence and severity. All over the country, the number of landless people has increased in the past few decades, but especially so in the northeast. According to the International Fund for Agricultural Development, ‘water shortages and the drying up of groundwater wells, coupled with persistent droughts’ are among the main causes of rural poverty in Syria.²⁰

¹⁹ On the drought in the northeast, see The National, ‘110 000 in Syria “will be deprived of food aid”’ (27 June 2010); The Daily Star, ‘Job-hunting Syrians head for cities amid severe drought’ (June 23 2010), p. 9; New York Times, ‘Water Crisis grips Syria’ (2 March 2010).

²⁰ See: Rural Poverty Portal, ‘Rural Poverty in Syria’ <http://www.ruralpovertyportal.org/web/guest/country/home/tags/syria>. Accessed on 18 August 2010.



The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the Finnish Institute of International Affairs or the authors, and are for illustrative purposes only.

Map 2. Syria and its provinces

Social consequences of the drought

As a consequence of the drought, Syria's food security is becoming increasingly compromised and internal population movements are threatening social stability in urban centres. In addition, the production of key agriculture products such as wheat, barley and cotton fell dramatically, forcing the government to import wheat from abroad in 2008 for the first time since the 1990s. In 2008, barley was even more affected than wheat, with a crop failure of as much as 90%. Since barley is the most important crop used for animal feed, the failure has major repercussions for the raising of cattle.²¹ The fact

²¹ IRIN News (30 June 2008) www.irinnews.org/Report.aspx?ReportId=790. Accessed on 17 September 2010.

that in 2010 as much as one-third of Syria's wheat crop has been damaged by a wheat rust disease (Yellow Rust) further worsens the situation. The government has announced that due to the disease, wheat production in 2010–2011 could decline by 18% compared to the previous year.²² Consequently, the General Organization for Grains in Syria revealed that wheat had to be imported for a third consecutive year to meet local demand. The situation is worst in the Hasake province. It is assumed by the agricultural research centre ICARDA that 'drought conditions masked the rust', which resulted in a worse situation in Syria than in other affected areas such as Iran and Iraq. Despite the problems, however, both the UN Food and Agriculture Organization (FAO) and Syrian authorities maintain that there is no immediate threat to food security.²³ As opposed to wheat, the cotton crop is likely to be good this season (2010–11), at least according to the official estimates.²⁴

The social consequences of the drought in the badly affected areas are dire since the rural population hit by the drought has lost practically all means to sustain its livelihood. At least 2 to 3 million people are food insecure. In the al-Jazira region, 70% of livestock have perished in the crisis. There are indications of a drastic increase in nutrition-related diseases, as well as full-blown malnutrition.²⁵ The drought in the al-Jazira region and elsewhere has triggered a mass migration of people to the urban centres of Damascus, Aleppo, and Hama, which are already overcrowded. It is estimated that several hundred thousand people, up to over a million, have abandoned their homes in the northeast and are now seeking a livelihood in the

²² Baladna, 'Syria's wheat crop damaged by virulent disease' (6 June 2010), p. 10.

²³ IRIN News, 'Syria: Yellow wheat rust hits supplies' (19 August 2010) www.irinnews.org/Report.aspx?ReportId=90220. Accessed on 19 August 2010.

²⁴ al-Thawra, 'Mahsul al-qutn bi-halati jayyidah' (16 August 2010), pp. 1 and 11.

²⁵ UN, *Syria Drought Response Plan 2009–2010*. Mid-Term Review (February 2010); Unicef, 'Alongside Syrian health workers, UNICEF battles varied causes of malnutrition' (18 August 2010), http://www.unicef.org/infobycountry/syria_55611.html. Accessed on 20 August 2010; UN News Service, 'Renewed instability in global food markets requires urgent response' (7 September 2010), www.un.org/apps/news/story.asp?NewsID=35834&Cr=food+crisis&Cr1. Accessed on 17 September 2010.

cities and living in makeshift camps on the outskirts.²⁶ The internal displacement is the largest in the history of modern Syria. The internal migrants exacerbate the strain on the job markets and social services, which are already overburdened, due in part to the presence of a huge number of Iraqi refugees.

Global developments may further compound Syria's problems. In 2010, severe droughts and forest fires in Canada and Russia, as well as floods in South Asia, caused the price of wheat and barley to rise dramatically. Between June and August, wheat prices in the global markets rose by more than 50%, while those of barley more than doubled. A ban on wheat exports by Russia, the world's biggest exporter of grain, is expected to push up the prices of grain, flour and bread towards the end of the year.²⁷ According to FAO and OECD estimates, food commodity markets will remain volatile in the years to come and the average price of wheat over the next ten years may be 15–40 % higher in real terms than during the 1997–2006 period. At the moment, Syria is one of the countries classified as 'highly vulnerable' to a food crisis, even though until now the country's food problem has been less urgent than that of Egypt, for example.²⁸ Yet Syria is likely to face considerable challenges in providing food security for its population in the future.²⁹

The political causes of water scarcity

It is clear that in addition to Syria's basic water scarcity, rapid population growth (currently at 2.4%) and most likely climate change as well as the government's agricultural policies also play a significant role in the droughts, escalating water scarcity, and mass migration. Some analysts even argue that mismanagement of water sources and

²⁶ The Daily Star, 'Years of drought pushing millions of Syrians into extreme poverty – UN' (14 September 2010), p. 9; The National, '110 000 in Syria'.

²⁷ IRIN News, 'Yellow wheat rust hits'.

²⁸ See Alain de Janvry and Elisabeth Sadoulet, 'The Global Food Crisis: Identification of the Vulnerable and policy responses', *ARE-UPDATE* (2008).

²⁹ 'Renewed instability'; 'Higher average farm prices expected, food security concerns persist, say OECD and FAO', www.fao.org/news/story/en/item/43208/icode/. Accessed 16 September 2010.

misguided agricultural and economic policies play a much bigger role in the development.

Until the 1980s, 90% of Syrian agriculture depended on the rains, the irregularity of which affected production. The intensification of irrigation has been a focal point ever since then, and the Euphrates has been at the centre of this plan. Since 1985, irrigated areas have doubled, with an almost 10% increase annually, most of the irrigated lands being in the Euphrates river basin in northeastern Syria and on the coastal plain. Nevertheless, the irrigated area still represents only 21.6% of the total arable land, whereas the rest of the land depends on the rains. The increase in the irrigated landmass can mainly be attributed to the augmented use of groundwater sources. Between 1985 and 2002, the percentage of groundwater usage rose from 49% to 57% of the total amount of water used for irrigation. Issues such as the quality of the soil, and the water that traverses it, hamper the realization of irrigation projects. In the Euphrates basin, the salinity of the soil and water due to excessive agriculture, the evaporation of surface water sources and disagreements between the government bureaucracy and farmers count among the common problems. It is estimated that half of the irrigated land is impregnated with salt.³⁰

These policies are closely related to the basic objectives of the Syrian Ba’thist regime, namely the attempt to enhance national security by achieving self-sufficiency in the main crops and increasing agricultural production for this purpose.³¹ The ‘seven strategic crops’³² for which the government sets prices occupy three-quarters of the cultivated land in Syria. In particular, the use of irrigation for Syria’s main food crop, wheat, has grown substantially and, as a result, Syria became self-sufficient in wheat in the 1990s. Yet, as pointed out by Jessica Barnes, the aim of the major irrigation projects is not merely to accelerate wheat cultivation for the growing population. Instead, the intention has also been to increase the export of grains and other

³⁰ Marwa Daoudy, ‘Les Politiques de ‘eau en Syrie: Réalisations et obstacles’, in: Baudouin Dupret, Zouhair Ghazzal, Youssef Courbage & Mohammed al-Dbiyat (ed.), *La Syrie au present: Reflects d’une société* (Arles: Sindbad, 2007), pp. 607–615; Climate Change, Water and Policy-Making Process in the Levant and North Africa. A closed workshop with leading water experts from the Levant, 4 August 2009, Issam Fares Institute, AUB, p. 3.

³¹ See: Barnes, ‘Managing the Waters’, p. 511.

³² Wheat, barley, cotton, tobacco, sugar beet, lentils, and chickpeas.

crops. This is most evident in the case of water-intensive cotton, which has become one of the most important products for Syria and, alongside wheat, receives the most irrigation.³³

Barnes attributes this emphasis on irrigation to several factors inherent in Syria's Ba'thist legacy. Firstly, she refers to the peasant origin of many of the leading figures in the country's Ba'thist past. Notably, Hafez al-Asad, Syria's president from 1971 to 2000, always underlined his rural background. Secondly, peasants constitute a key part of the party's and the regime's supporters and, consequently, the promotion of their interests has been, and is, essential for the regime. Of particular importance is the influential Supreme Agricultural Council, which has been very active in lobbying for continued support for the agricultural sector and in objecting to any limits being placed on pumping from groundwater aquifers.³⁴ Finally, economic considerations play an important role alongside ideological and political factors. Half of the Syrian population lives in rural areas and agriculture's share of GDP was about 30% until recently.³⁵ According to a recent estimate, it provides work for about 50% of the population.³⁶

Instead of agricultural policies, other analysts emphasize the role of economic liberalization as a triggering or exacerbating factor. As early as the 1990s, and more pronouncedly during Bashar al-Assad's presidency, Syria pursued a policy that could be labelled as 'selective economic liberalization'. The policy, which was initiated in large part due to mounting resource scarcities, has sparked internal disputes among the regime's elite, between reformers and conservatives.³⁷ An

³³ Barnes, 'Managing the Waters', p. 515 and 524.

³⁴ *Ibid.*, pp. 522-523.

³⁵ In 2008, agriculture accounted for c. 17% of GDP.

³⁶ Meslmani, *Vulnerability Assessment*, p. 21. See also: Alexander Sarris, 'Agriculture in Syrian Macroeconomic Context' www.fao.org/docrep/006/y4890e/y4890e05.htm. Accessed on 15 September 2010. Percentage estimates for the labour force or the whole population vary considerably. One reason for the conflicting figures for agricultural employment is the fact that agriculture is often a source of part-time employment. In any case, the role of agriculture, albeit diminishing, is still very important.

³⁷ Raymond Hinnebusch, 'Syria under the Ba'th: The Political Economy of Populist Authoritarianism', in Raymond Hinnebusch & Soren Schmidt, *The State and the Political Economy of Reform in Syria* (St Andrews Papers on Contemporary Syria, 2009), pp. 18-22.

important instance of this policy is the government's recent decision to lower subsidies on basic commodities. Since then, fuel prices have skyrocketed and there have been severe multiplicative effects on the economy, including soaring transportation prices and increasing costs of water pumping for farmers. Moreover, the decision to end the subsidies was made just when the drought was at its worst.³⁸ The position of the government is difficult, given that the subsidy cuts have been precipitated by dwindling oil revenues and a fiscal deficit. The international financial crisis has also rendered the population more vulnerable to the effects of drought. The editor-in-chief of *Le Monde Diplomatique* in Arabic, Samir Aita, argues that the recent drought has only intensified a development that began years ago. According to him, a mass migration is indeed taking place owing to a deliberate government policy of adopting a neo-liberal economic philosophy. Without proper economic support, the structures of Syria's 'socialist agriculture' are doomed to collapse.³⁹

The government response

In public, the authorities have tended to downplay the problem. For instance, the Minister of Irrigation, Nader al-Bunni, stated in a recent interview that the term 'severe drought' is not applicable to Syria, since not all the governorates of the country are affected. He also pointed out that Syria may have less rain, but the country has 'an excellent water resources management system', which has developed over decades and guarantees the functioning of the irrigation system.⁴⁰ In practice, however, the Syrian government, which is struggling with considerable economic problems such as a heavy budget deficit, is going to great lengths to address the problem effectively. According to the UN, the scope of the drought crisis extends beyond the capacities of the Syrian government.

Despite the public rhetoric, and because the Syrian economy is still heavily dependent on agriculture, with approximately half of the population earning a living from it, the government has responded

³⁸ The National, 'Syria faces catastrophe in its east' (10 February 2010), p. 12.

³⁹ Ibid.

⁴⁰ Interview of Nader al-Bunni in Syria Today (January 2010, Issue 57), pp. 44-46.

with some urgent measures. Notably, it has increased the price it pays farmers for crops by 40%. Further, it has kept the price of bread stable, despite the overall policy of reducing subsidies. In April 2008, finance minister Muhammad al-Hussein called the price of bread a 'red line' for the government.⁴¹ In addition, the salaries of public sector workers have been raised. The government has also granted tax relief to farmers in the affected areas, rescheduled loans, and provided direct food assistance. In cooperation with FAO and ICARDA, the government is aiming to draw up a national contingency plan in preparation for 2011–12. As a longer-term solution, the government has pledged to increase investments in the northeast and to build a new dam in the area.⁴² Tentative plans have also been made to diversify the economic base in the northeastern provinces.⁴³ Yet, as pointed out by many critics of the government, the response has been slow and there are evident problems in the implementation of decisions.

Challenges to regime stability

The primary political goal of the Syrian regime is to maintain its power. Internal regime legitimacy has always relied in part on its ability to provide security and economic welfare for the population, particularly the workers and peasants that have made up its core constituency.⁴⁴ In authoritarian Middle Eastern countries, such as Syria, maintaining the food supply is a key element in government legitimacy. With the demise of Arab nationalism, the stability of the state as a regime legitimacy resource has become even more important in Syria. Hence, in the far less ideological climate of Bashar al-Assad's Syria, the failure to meet people's material needs

⁴¹ IRIN News, 'Yellow wheat rust hits'.

⁴² IMF, *Syrian Arab Republic, 2009 Article IV Consultation: Preliminary Conclusions of the IMF Mission* (21 December 2009). <http://www.imf.org/external/np/ms/2009/122109.htm>. Accessed on 25 June 2010.

⁴³ For the government response, see UN, *Syria Drought Response Plan*; The Syria Report, 'Averting Crisis: The Syrian Response to Rising Prices and Falling Subsidies', (23 June 2008) <http://www.syria-report.com/>. Accessed on 12 August 2010.

⁴⁴ Hinnebusch, 'Syria under the Ba'th', p. 19.

is much more dangerous than in the heyday of Baathism when vanguard nationalistic ideology and politics played a major role in legitimizing the regime. It is therefore evident that the recent drought in the northeast, especially if further protracted, is a risk to political stability in Syria, where water security problems are heavily linked to food security as well as to the state's ability to provide jobs for the population. The poor, unemployed and rootless masses in the slums of the cities are potentially susceptible to Islamism, the only serious opposition to the regime since the late 1970s.

Additional factors also serve to exacerbate the risk of political discord. Firstly, Syria has one of the fastest growing populations in the Arab region and the whole world. As mentioned above, the population growth rate is currently 2.4%, but for a long time exceeded 3%.⁴⁵ Secondly, the gradual move to a free market economy has had negative ramifications for the poorest. The gap between rich and poor that has long been narrow by regional standards is now widening. According to some estimates, 5% of the population now own half of the nation's wealth.⁴⁶ This may jeopardize social stability. Further, in the current international political system, it is also more difficult to obtain rent from Gulf countries and elsewhere. Earlier, Syria repeatedly received money from rich Arab countries for diverse (foreign) political reasons, such as being a vanguard state against Israel or participating in the first Gulf war against Iraq. Syria's best asset, its foreign policy, does not fare that well anymore. This, coupled with the forced retreat from Lebanon in spring 2005, has limited the regime's possibilities to gain resources for distribution to the loyal. With regard to the regime's allocatable resources, also of great significance is the fact that oil production has already peaked and is now dwindling. In 2001, the value of fuel exports as a percentage of all merchandise exports was 77.4%, while since 2006 it has slumped to approximately 40%.⁴⁷ Lastly, one should remember that the agricultural success story has been of great symbolic value for the regime. It is no coincidence that ripe grain fields and massive dams

⁴⁵ For the statistics, see Climate Change, Water and Policy-Making process, pp. 1-2.

⁴⁶ Carsten Wieland, *Syria: Ballots or Bullets: Democracy, Islamism, and Secularism in the Levant* (Seattle: Cune Press, 2006), p. 63.

⁴⁷ See: World Bank, *World Development Indicators* (April 2010).

are well represented in the ‘political iconography’ of the regime. Thus, economic failure is also a failure in the symbolic sense.

Drought-induced social and political unrest and the ensuing looting could easily destabilize the country. Sectarian divisions could readily escalate, given that Alawis, a Shia Islam sect constituting only about 10% of the population, are clearly over-represented in the higher echelons of the regime. One should also bear in mind that a great number of those who have migrated from the northeast to urban centres are Kurds. Since the 2004 violence in al-Qamishli, close to the Turkish border, and the resulting repression, the Kurdish question has become one of major national significance.⁴⁸ So far, the relationship between the majority Arab population and the minority Kurds has been much better than in Turkey or Saddam’s Iraq, but any additional impoverishment of Syrian Kurds due to drought and displacement essentially increases the risk of ethnic tensions.

The potential influence of climate change as a ‘challenge accelerator’ regarding the challenges and risks confronting the Syrian regime is evident. As is commonly assumed, climate change in the Middle East is likely to increase the frequency of extreme weather conditions, such as droughts, and decrease rainfall. As a consequence, water scarcity in Syria would increase further, and without a proper response, the consequences for water and food security might be dramatic. The biggest risks are the effects of recurrent and probably longer-lasting droughts on agriculture, which, in turn, could result in even larger waves of immigration to the major cities, as described above. Hence, the current drought and its ramifications may be seen as a foretaste of what is to come with greater frequency in the future. At the same time, climate change may provide an opportunity to make radical changes in terms of water governance (the overall water policy) and water management, which would otherwise be hard to implement in the Syrian political and economic setting. Of course, this kind of positive outcome would require the Syrian population to come to terms with the real consequences of climate change much better than at present. The political elite also needs to fully understand that the future of Syria lies in non-agricultural

⁴⁸ For the Kurdish question in Bashar al-Assad’s Syria, see Julie Gauthier, ‘The 2004 Events in al-Qamishli: Has the Kurdish Question erupted in Syria?’, in Fred H. Lawson (ed.), *Demystifying Syria* (London: Saqi), pp. 105–119.

development and to gain the will to confront the powerful interest groups that oppose any major changes in the current water policy. Importantly, this task also includes tackling the rampant corruption that hinders the implementation of decisions.

Too big challenges?

When it comes to drought and climate change, the Syrian government's policy has been largely reactionary to date. In order to tackle the consequences of recurrent droughts in the future, more proactive measures should be taken. Firstly, it is of paramount importance to modernize agriculture in terms of water management. The traditional modes of irrigation that consume excessive amounts of water should be substituted by water-saving modes. Agricultural policies based on the promotion of water-intensive agriculture should also be reconsidered. This is additionally necessitated due to the significant impacts on agriculture that may ensue from Syria's future accession to the World Trade Organization and an association agreement with the European Union, both of which are under discussion. It seems that the need for reform in irrigation practices is fully understood by the elite and, consequently, changes in that respect are likely to happen. A more profound change in the agriculture policies is much more problematic to achieve, given the vested interests of the regime's key support groups, such as the powerful agricultural sector.

Secondly, economic diversification should be sought, not only in the drought-affected areas but also in general. The flow of foreign capital necessary for economic diversification, as well as the major investments required for water management, inevitably call for further liberalization of the economy. At the same time, it is essential to ensure that the negative effects of liberalization do not only burden the poorest section of the population. This will entail economic support for the long-neglected northeastern provinces. In the absence of a booming private sector, it will be difficult to provide jobs for the people who are forced to abandon agriculture.

The recurring droughts in Syria highlight the importance of a permanent agreement being brokered between Syria, Turkey and Iraq on the sharing of the waters of the Euphrates-Tigris basin. The remarkable thaw in relations between Turkey and Syria creates a good basis for such an agreement. Similarly, a peace agreement with Israel, including a water agreement on Golan-related waters, should be a national priority for Syria.

Finally, the authoritarian political structure of Syria inevitably prevents the state from finding durable solutions to the challenges posed by climate change. Therefore, the very existence of the Ba'ath regime is contradictory to its attempts to tackle the challenges. At the end of the day, only democratization and the birth of a critical and active civil society will create a proper basis for sustainable development.

Taken together, the reforms needed are numerous and substantial. Under the current circumstances, it is unlikely that the regime will be capable of making all the necessary reforms and, consequently, there will be significant problems in tackling the anticipated challenges brought about by climate change. For the government authority, addressing the question of food prices will be essential. If future droughts result in a major food crisis, Syria is likely to witness serious political instability.

2 The marginalization of water in Turkish–Syrian relations

The transformation of Turkish–Syrian relations in the 2000s provides a case example of how transboundary water resources can be contingent on the general state of relations between neighbouring states. Despite the old predictions of imminent water conflicts in the area, control over the Euphrates and the Orontes rivers did not lead the two sides into conflict during the turbulent years in the two countries' relations. Neither did water issues lead to the improvement of bilateral relations in the 2000s. On the contrary, it has been due to positive developments in the area of security and territorial issues that Turkey and Syria have come closer to reaching an understanding on water. Regardless of Turkey's unwavering position vis-à-vis the Euphrates and the Tigris, which it considers as transboundary rivers rather than international watercourses, it has been advocating benefit-sharing on a bilateral basis with Syria. As this chapter illustrates, water has never been a determinant of Turkish–Syrian relations in the modern era. This suggests that in the future, in the case of the two states, neither conflict nor cooperation is likely to depend on the availability of water alone. The case study also suggests that the emerging new regionalism in the Middle East is an important factor in lowering the risk of interstate conflict, including disputes over water-sharing issues.

Since the establishment of the Syrian Arab Republic in 1961, Turkish–Syrian relations have gone through very troubled times due to the burden of their common history. For a long time, the modern Turkish state ignored its Ottoman past and the Middle East. On the one hand, according to Turkish thinking, the Arab world had been considered as problematic and negative because of the Arab alliance with the British forces against the Ottomans during World War I. On the other hand, the shift from a multinational 'Ottomanism' to 'Turkism' alienated the Islamic world from the Republic of Turkey. Furthermore, both the Turks and the Arabs accused each other of

backwardness.⁴⁹ Needless to say, the Arab nationalist narrative portrays the Ottomans as colonizers, and Syria was no exception in this respect until the recent rapprochement that started in 1998.

In the 2000s, particularly under the Justice and Development Party's (AK Party) rule, Turkey has followed a new and active foreign policy vis-à-vis the Middle East, under the heading of 'the zero problem policy'. This has led to enhanced regional cooperation in its near proximity, in which cooperation with Syria plays a very important role in developing Turkey's relations with the other Middle Eastern countries. In Turkey's and Syria's present multi-faceted and multi-dimensional cooperation, water is still an important area. After the new opening of Turkey to the Middle East, water has a great potential to become a new dimension in the cooperation between Turkey and its neighbours, especially in the case of Syria. On the whole, adequate water management and cooperation in water issues would be an important factor in contributing to stability and peace in the relations between the two states, and more widely in the Middle East.

Disputed waters

The water disputes between Turkey and Syria erupted in the 1970s with Turkey's projects for irrigation and hydraulic energy on the Euphrates and the Tigris, known as the Southeastern Anatolia Project (GAP). The filling of the Atatürk Dam began in 1990, and its completion in 1992 left Syria and Iraq without water for a period of one month. At the time, Syria's water demand was increasing due to the two agriculture-based export development programmes implemented in 1987 and 1992. At the same time, Turkey continued attempts to hold water for the dams and the GAP irrigation schemes.

Disagreements have revolved around two river basins: the Orontes and the Euphrates-Tigris. The less contentious of the two has been that of the Orontes River, which rises in Lebanon, passes through Syria, and flows into the Mediterranean Sea in Hatay. Until the mid-2000s, use of the Orontes River sparked tensions between Turkey and Syria. For a long time, Syria contested the cession of Hatay

⁴⁹ See e.g. Bülent Aras and Hasan Köni, 'Turkish-Syrian Relations Revisited', *Arab Studies Quarterly*, 24:4 (Fall 2002), pp. 50-51.

Province to Turkey, thereby questioning Turkey's riparian rights to the river, which flows through the province. Turkey, in turn, linked negotiations over the Euphrates to those over the Orontes, demanding similar downstream riparian rights as those of Syria to the Euphrates River.⁵⁰ Since the mid-2000s, however, as a consequence of the recent rapprochement, the two sides have made significant progress in the issue and agreed in 2010 to construct a friendship dam on the river. Both parties have also assessed cooperation opportunities in irrigation projects, agriculture and meteorology.⁵¹



The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the Finnish Institute of International Affairs or the authors, and are for illustrative purposes only.

Map 3. The Tigris-Euphrates basin

⁵⁰ ESCWA, BGR and GTZ, *Enhancing Negotiation Skills on International Water Issues in the ESCWA Region*, (Economic and Social Commission for Western Asia, Federal Institute for Geosciences and Natural Resources, and German Technical Cooperation Agency, Beirut, 2004).

⁵¹ Today's Zaman, 'Turkey, Syria, Iraq not to Allow Interference in Water Issue', (21 June 2010), <http://www.todayszaman.com/tz-web/detaylar.do?load=detay&link=213737>. Accessed on 5 July 2010.

The other disputed river is the Euphrates, which rises in Turkey and flows through Syria and Iraq, joining the River Tigris to form the Shatt Al Arab River, which descends into the Persian Gulf. Neither the upper riparian Turkey nor the lower riparian countries of the Euphrates basin are water-rich countries: Syria has 1 200 m³, Turkey 1 430 m³ and Iraq 3 020 m³ of water per capita per year, while the average global consumption is 7 600 m³.⁵²

The biggest bone of contention has been Turkey's Southeastern Anatolia Project (GAP), which includes the construction of dams on the Euphrates and the diversion of its waters to an irrigation system. The filling of the Atatürk Dam in 1990 reduced the Euphrates' flow rate, causing water shortages and hydropower loss in Syria and a reduction in irrigation water availability in Syria and Iraq. Until 1987, the upstream riparian Turkey utilized all the basin's waters. The same year, the country signed an agreement with Syria, committing itself to releasing 500 cubic metres per second from the Euphrates to Syria, but further water cooperation was not possible between the two states at the time. In 1993, the construction of the Birecik Dam sparked yet another moment of tension.

In 2002, just before the AK Party ascended to power, the two sides signed a joint communiqué, which promotes joint irrigated agricultural research projects, exchange programmes, field trips and technical cooperation.⁵³ Moreover, in the second half of the 2000s, on Turkey's initiative, tripartite cooperation between Turkey, Syria and Iraq also expanded to cover the areas of environment, forestry, and meteorology. In 2008, the three countries intensified their cooperation by resolving to establish a water institute at the much-criticized Atatürk Dam, to deal with the water issue, including effective management and information- and technology-sharing in the areas of irrigation and potable water systems. Turkey is expected to cover the expenses of the institute, and provide information and technology for the renovation of the irrigation and potable water systems. The institute is expected to map water resources in the region and draw up a report on measures that the respective countries

⁵² General Directorate of State Water Works of Turkey (DSİ) in 2008. See e.g. *Tümgazeteler*, 'Kişi başına düşen su miktarı gitgide düşüyor' (23 March 2008). <http://www.tumgazeteler.com/?a=2659077>. Accessed on 17 July 2010.

⁵³ ESCWA, BGR, GTZ, *Enhancing Negotiation Skills*, pp. 9–10.

should take for the effective management of these resources.⁵⁴ Turkey and Syria have also agreed to take significant steps in preventing the pollution of the Euphrates and Orontes Rivers.⁵⁵

Despite the recent confidence-building measures, Turkey continues to regard the Euphrates and Tigris as transboundary rivers, while Syria and Iraq see them as international watercourses and demand an equal division of water. Turkey's long-held position has been that it allocates enough water to both Syria and Iraq, and it rejects the equal division formula presented by the two countries. In fact, Turkey claims exclusive sovereignty over the Euphrates up to the Syrian border.⁵⁶ According to the Syrian and Iraqi view, this common water resource should be shared equally and fairly and they should enjoy equal riparian rights with Turkey.⁵⁷ With 31 billion cubic metres of water per year, Turkey contributes about 89% of the Euphrates' annual flow. At present, Turkey uses a limited portion, 35%, of the waters of the Euphrates River and only a minimal fraction of the waters of the Tigris River.⁵⁸ However, the Euphrates and the Tigris are expected to be increasingly utilized by Turkey for irrigation and hydroelectric production by 2020, when the GAP is completed.⁵⁹ Therefore, it is expected that Turkey's future water needs will complicate the reaching of a sustainable agreement on the two rivers.

⁵⁴ Today's Zaman, 'Turkey, Syria and Iraq to initiate water talks' (12 March 2008).

⁵⁵ World Bulletin, 'Turkey, Syria sign specifications on dam project' (21 June 2010), http://www.worldbulletin.net/news_detail.php?id=60252. Accessed on 5 July 2010.

⁵⁶ Aras and Köni, 'Turkish-Syrian Relations Revisited', p. 53.

⁵⁷ George E. Gruen, 'Turkish Water Exports: A Model for Regional Cooperation in the Development of Water Resources', Columbia University Middle East Institute, IPCRI Water Conference (2007), p. 2.

⁵⁸ Ankara Chamber of Commerce, Su Raporu (Water Report), <http://www.atonet.org.tr/turkce/bulten/bulten.php3?sira=381>. Accessed on 5 July 2010.

⁵⁹ American University, *Tigris-Euphrates River Dispute*, Inventory of Conflict and Environment Case Studies (Washington, 1997), <http://www1.american.edu/ted/ice/tigris.htm>. Accessed on 13 August 2010.

The three bilateral problems

For a long time, there were three main problems in Turkish-Syrian relations, only one of which, namely the water issue, remains unresolved. The first problem concerned the territorial dispute over Hatay (Alexandretta) Province, which started in 1939 when Turkey took over the area from France. The second issue was related to the Tigris-Euphrates river basin and started with Turkey's plan to build dams on these rivers, worsening in the 1980s when their construction began, and reducing the flow of water to Syria. The third issue was Syrian support for the Turkish Kurdish separatist organization, the Kurdistan Workers' Party (PKK). Mindful of the water issue, Syria used the PKK as leverage in the 1990s, allowing the party to set up its headquarters and military training camps on its soil and in Lebanon as a retaliatory strategy against Turkey's water policy concerning the Euphrates.

Turkish-Syrian relations had already deteriorated in the 1990s due to Syria's support for the PKK, and escalated when Turkey issued an ultimatum to Syria to end the support, mobilizing troops along the border in September 1998. As a result, Syria stepped back, expelling the leader of the PKK, Abdullah Öcalan, and withdrawing support for the group's activities on its soil in line with the Adana Accords in October 1998. The signing of these accords has been regarded as a milestone in Turkish-Syrian relations because after the event bilateral relations began to develop very quickly. The results of the Adana Accords, and more than 50 agreements that have been signed since, exceeded expectations and established a basis for future integration in a wide array of fields. A further fillip to recovery and normalization took place in 2000 when Ahmet Necdet Sezer, the then President of Turkey, attended the funeral of Syrian President Hafez al-Assad.

A thaw in the relationship began when the AK Party ascended to power in 2002, while in Syria the presidency was assumed by Hafez's son, Bashar al-Assad. Despite willingness on both sides to improve bilateral relations, the Hatay issue still hindered progress. Initially, Turkey emphasized cooperation on security matters and wanted to leave the water and Hatay issues aside. Turkey insisted that Syria relinquish all claims to the province in return for holding joint military training exercises, which would have reinforced the nascent military cooperation. The Syrian leadership rejected the deal on the

grounds that it would need time to gain acceptance from the Syrian public.⁶⁰ The issue is generally considered to have been resolved with an additional article to the Free Trade Agreement signed in 2004, according to which the two sides recognized each other's borders. Finally, the agreement to build a dam jointly on the Orontes River on the border between Hatay and Syria in 2010 can be interpreted as an official seal on Syria's acceptance of Hatay as a part of Turkey. This series of events strongly suggests that the two sides have buried the hatchet, preferring to resolve problems through cooperation and joint projects.

Turkey's new regionalism

Importantly, the prevailing positive climate has spilled over to Lebanon and Jordan. In 2010, the foreign ministers of Turkey, Syria, Jordan and Lebanon decided to set up a 'high-level quartet cooperation council' to strengthen the existing cooperation, develop a strategic partnership, and enhance economic integration. Most importantly, the countries also decided to establish a free trade zone with free movement of products and people.⁶¹

The current level of cooperation between Turkey, Syria, Lebanon and Jordan provides strong evidence for arguing that there is a new, emerging regionalism in the Middle East.⁶² Prior to Turkey's new opening in the Middle East within the 'zero problem policy with neighbours' framework, there were few, if any, cooperation initiatives in the Levant region. In the late 2000s, Turkey's southern neighbours

⁶⁰ See e.g. Özlem Tür, 'Turkish-Syrian Relations - Where Are We Going?', *UNISCI Discussion Papers*, No: 23 (May 2010), p. 167.

⁶¹ World Bulletin, 'Turkey, Syria, Jordan, Lebanon on first step to set up Mideast's "EU"', (1 August 2010), http://www.worldbulletin.net/news_detail.php?id=62093. Accessed on 10 September 2010.

⁶² Regionalism is a broad term, which refers to all forms of institutionalized cooperation within regions. The concept can be divided into 'old' and 'new' regionalism. Old regionalism usually refers to state-centric regionalism created from above, whereas new regionalism is spontaneous and created from below by non-state actors. According to an extreme interpretation, new regionalism can only take shape in democracies since civil society finds no living space in non-democratic countries.

have come to recognize the potential that Turkey has in terms of accelerating regional cooperation. Despite the fact that some critics have accused Turkey of axis shifting, this new regional cooperation is a promising step towards more widespread cooperation in the region, through which the water issue, among others, is largely expected by Turkey, Syria and Iraq to be handled and resolved peacefully within the regional framework.⁶³

The changing role of water in Turkish-Syrian relations

While scholars of Middle Eastern water scarcity often argue that water is either a cause of conflict or a tool for enhancing cooperation in the region, in light of the evolution of Turkish-Syrian relations it seems that neither of these arguments holds true.

This is, however, not to say that the sharing of the waters of the Euphrates and the Orontes rivers has been devoid of tensions: Syria and Iraq have consistently demanded more water from the Euphrates and the Tigris, while Turkey still accuses Syria of utilizing most of the water of the Orontes.⁶⁴ Importantly, there was a clear link between security and the water issue until the capture of the PKK's Abdullah Öcalan. While, according to the protocol signed in 1987, Turkey guaranteed Syria 500 cubic metres per second via the Euphrates, in the aftermath of the Öcalan crisis in 1998 the flow was raised to more than 900 cubic metres.⁶⁵ This gesture can be interpreted as an award or an attempt by Turkey to encourage Syria to cooperate.

Once Turkey and Syria succeeded in normalizing their relations and began perceiving each other as friends, their approach to problematic issues changed rapidly. It should be underlined that cooperation between Turkey and Syria in the 2000s started with military cooperation and then extended to other areas: the improvement of political relations boosted economic cooperation, and a Free Trade Zone Agreement came into force in 2007. The two sides also held joint military exercises for the very first time in 2008. Moreover, in 2009,

⁶³ See for example: Today's Zaman, 'Turkey, Syria and Iraq to initiate'.

⁶⁴ Turkish Ministry of Foreign Affairs, 'Water Issues between Turkey, Syria and Iraq', *Perceptions*, Vol. 1, (June-August 1996), p. 5.

⁶⁵ Aras and Köni, 'Turkish-Syrian Relations Revisited', p. 53.

both sides lifted visa requirements, which is generally considered as a first step in economic and political integration between countries.⁶⁶ As a result, Turkey and Syria have also started to play an active role in regional issues and have taken unitary positions on, for example, Israeli aggressions against the Gaza Strip. Accordingly, water has also ceased to be a security issue and has mainly become a technical matter. Despite this, enhanced cooperation has still not been visible in the most problematic bilateral issues, the Hatay question and the water issue, to the extent that one might expect. It is argued that this is due to President Bashar al-Assad's difficulties in explaining to Syrians that Hatay is lost for ever and, in the case of water, that the scarcity of water resources is caused by increasing demand and, possibly, the early effects of climate change in the form of the droughts that have plagued Syria in particular in recent years.

However, in 2008, Veysel Eroglu, the Turkish Minister of Environment and Forestry, described the prevailing spirit from Turkey's perspective: *'No war over water resources will erupt in the region. Instead of having problems over water with our neighbours, we prefer developing joint projects. Contrary to what some people claim, a war over water resources in this region won't emerge...'* The achieved point in the tripartite cooperation seems to discredit the water war thesis in the Middle East, at least in the case of Turkey, Syria and Iraq.⁶⁷

Conclusions

While in 1998 Turkey and Syria were talking war, now the countries are striving towards cooperation and integration. The recent positive developments emphasize the importance of increased regionalism: the more regionalism develops, the lower the risk of conflict over water in the Middle East. Furthermore, the planned water-related joint projects, such as the dam on the Orontes and the water institute to be established in Turkey, can be seen as initial steps towards joint water management, which would further enhance water security in the region.

⁶⁶ See e.g. Emrullah Uslu, 'Turkey Signs Strategic Cooperation Agreements with Syria and Iraq', *Euroasia Daily Monitor*, 6:190 (16 October 2009).

⁶⁷ Today's Zaman, 'Turkey, Syria and Iraq to initiate'.

It is largely accepted that as long as the AK Party stays in power there will be no change in Turkey's recent tendency towards regionalism in its neighbourhood. Therefore, there is every reason to believe that water-related issues, which used to be a source of disagreement, have become a secondary issue in the recovery process of Turkish-Syrian relations. As a result, further regionalist steps will not only increase the likelihood of water-related issues being resolved peacefully, but also boost opportunities for peace and prosperity.

It should be underlined that the reason for the success of Turkish-Syrian relations lay in the win-win setting. Both sides are benefiting from the cooperation in many ways: Syria was a stepping-stone for Turkey to broaden its horizons towards the long-neglected Middle East, whereas Syria is lessening its international isolation through the cooperation with Turkey. After a little more than a decade, the level of cooperation the two sides have achieved can be described as admirable. Moreover, the dynamics of this cooperation have spread to other Middle Eastern countries, such as Lebanon and Jordan.

Nevertheless, despite all the positive developments, there is always a risk of tensions flaring up between Turkey and Syria or Iraq, since increasing water scarcity in Turkey could lead the government to transfer significant amounts of water out of the Euphrates and/or the Tigris to the deprived regions.⁶⁸ This is to say that the more the GAP develops, the greater the risk of tensions between the three neighbours. However, as this case study suggests, the emerging regionalism in the Middle East is an important factor in lowering the risk of interstate conflict, including disputes over water-sharing issues. In the case of Turkey and Syria, neither conflict nor cooperation will depend on the availability of water alone, as these two countries have gone beyond water issues by enhancing cooperation in other areas. In this sense, the water issue has become a secondary one.

⁶⁸ Abdallah Droubi, *Climate Change, Water and the Policy-Making Process in the Levant and North Africa*, Issam Fares Institute for Public Policy and International Affairs, American University of Beirut (4 August 2009), p. 12.

3 Conflicts, urbanization and bad governance: explaining Lebanon's water problems

Despite the lack of data in terms of both population and hydrological conditions, water issues in Lebanon have been subject to a fair amount of research in recent years. The analyses have shown that, contrary to the official statistics, there are considerable problems regarding access to clean water, as well as wastewater management in the country. These problems can be explained in part by the hydrological facts, which are not as favourable as commonly perceived. The history of conflict and the rapid urbanization of the capital region add to the stress faced by the water sector, but problems over water governance have also been highlighted as the root cause of the problematic situation. This chapter aims at describing the situation in Lebanon by using the Greater Beirut area as a case example for crystallizing the *problématique*. Through the case study, the chapter seeks to point out that a synthetic approach, which takes into account the hydrological, historical and structural factors, is the most fruitful one for understanding the Lebanese situation.

Lebanon: the water tower of the Middle East?

Unlike many other countries in the Levant, Lebanon has, at least in terms of rainfall, adequate water resources to fulfil the needs of its citizens. It has an annual average rainfall of some 825 mm, which, in terms of volume, translates into around 8 600 million cubic metres (Mm³).⁶⁹ Surrounded by countries with less rainfall and more deserted

⁶⁹ For the purposes of comparison, the average annual rainfall in Syria is 252 mm. Aquastat, 'Country profiles: Lebanon', in: Karen Franken (ed.), *Irrigation in the Middle East region in figures* (FAO Water reports No. 34, 2008), pp. 263–278.

land areas, it has even been suggested that Lebanon should export its water resources to its less privileged neighbours.⁷⁰

However, this abundance of water is not the whole truth, and the question of whether Lebanon has any surplus water to give to its thirsty neighbours is a complex one. Firstly, the natural circumstances in Lebanon mean that not all of the precipitation can be optimally exploited. The temporal and spatial variation in rainfall is significant.⁷¹ Half of the rainfall is immediately lost to evapotranspiration, and another 20% flows to neighbouring countries and unexploitable groundwater reservoirs.⁷² Due to the geographical conditions, water storage is difficult to arrange in most places.⁷³ In addition to these challenges, the history of conflict and poor governance of both the supply and demand of water in Lebanon have led to considerable inefficiency in its use.

All in all, Lebanon is only estimated to have around 2 000 Mm³ of usable renewable water resources, whereas demand in 2010 is expected to be 1 987 Mm³. The exact total use of water is difficult to estimate due to lack of data. Population figures are also based on estimates, and the means for data collection and the monitoring of water resources are almost non-existent. A network of hydrological stations had been installed by the mid-1970s, but was largely destroyed by the civil unrest of 1975-1990, and has been only partially rebuilt since.⁷⁴ Another problem with estimating water use is the uncontrolled drilling of private wells, which has been ongoing since the 1970s and is set to increase.⁷⁵ By 2015, total demand is projected to increase to 2 248 Mm³, which would exceed the amount of available

⁷⁰ E. Bou-zeid & M. El-Fadel, 'Climate Change and Water Resources in Lebanon and the Middle East', *Journal of Water Resources Planning and Management*, 125:5 (2002), pp. 343-355; M. El-Fadel, M. Zeinati & D. Jamali, 'Water Resources in Lebanon: Characterization, Water Balance and Constraints', *Water Resources Development*, 16:4 (2000), pp. 615-638.

⁷¹ Lebanese Ministry of Environment, *Lebanon state of the Environment Report 2001*, Chapter 8: Water (2001).

⁷² Bou-Zeid & El-Fadel, 'Climate Change and Water Resources'.

⁷³ Aquastat, 'Country profiles: Lebanon'.

⁷⁴ M. El-Fadel, M. Zeinati & D. Jamali, 'Water resources management in Lebanon: institutional capacity and policy options', *Water Policy*, 3 (2001), pp. 425-448.

⁷⁵ S. I. Korfali & M. Jurdi, 'Assessment of domestic water quality: case study, Beirut, Lebanon', *Environmental Monitoring and Assessment*, 135 (2007), pp. 241-251.

water.⁷⁶ The additional stress caused by climate change has not been factored into these estimates.

Climate change is expected to exacerbate the problems of water scarcity in several ways. Firstly, by the 2020s, the average temperature in Lebanon is expected to increase by some 0.6 to 1.3°C in the winter and 0.8 to 1.8°C in the summer, relative to the 1961-1990 average. Obviously, this significant increase in the already hot and dry summer months will have a dramatic impact on the country's water balance. Evaporation is projected to increase by up to 6.6% and surplus water to decrease by up to 11% in Beirut. This will mean a reduction of up to 15% in the 2 000 Mm³ of available water resources – while the demand is simultaneously projected to increase. Additional challenges posed by climate change to the water governance in Lebanon will be the increased need for irrigation, the changing flow regimes of rivers fed by snowmelt, and the intrusion of saltwater into groundwater reservoirs.⁷⁷

A challenging political context...

Lebanon has had a very violent history, partly due to internal tensions and partly to the region's geopolitics, of which the country has been a constant victim since its independence. This has had disastrous consequences for the country's water infrastructure and governance. The most recent conflicts include the civil war (1975-1990) and the Israeli-Lebanese war (2006), which led Lebanon internally to the brink of a new civil war. The situation continues to be tense, with the latest casualties on the Israeli-Lebanese border occurring in the summer of 2010.

The population of Lebanon comprises numerous ethnic and religious groups, of which the biggest are the Sunni Muslim, the Shi'a Muslim and the Maronite Christian sects. The political system is based on the notion of confessionalism, whereby the power in governing the country is distributed according to the power balance of the religious groups. This system, based as it is on the differentiation of the sects, together with significantly changed demographics and a lack of population data, has caused tensions and pressure to rearrange

⁷⁶ El-Fadel, Zeinati & Jamali, 'Water Resources in Lebanon'.

⁷⁷ Bou-Zeid and El-Fadel, 'Climate Change and Water Resources'.

the balance of power, but in practical terms, no major reform has been forthcoming so far.⁷⁸

This history of conflict has taken its toll on the infrastructure of Lebanon. During the civil war and the conflicts that ensued, most of the water supply system was destroyed or at least neglected.⁷⁹ During the Israeli-Lebanese war in 2006, the Israeli forces centred their attacks on civil targets, such as water and power networks throughout the country, with heavy emphasis on the poor Shi'a regions of Southern Lebanon and the southern suburbs of Beirut.⁸⁰

In addition to the direct impacts on the physical networks, conflicts have also affected the capability of the authorities to function. This has caused a state of ineffective governance to the extent that a quasi-disappearance of the authority of the state has been seen to have taken place. As a consequence, an informal sector, competing with the public one and with more or less legal means of supplying the citizens with water, has been developed and keeps growing. This, together with the migration forced by the conflicts, has led to the formation of whole 'informal neighbourhoods' with alternative means of providing their inhabitants with the basic water and energy supplies they need. The best-known example of these informal settlements are the southern al-Dahiyeh suburbs of Beirut.⁸¹

... leads to water governance problems

It is therefore evident that the problems of the water sector in Lebanon not only have to do with the hydrological facts, but the history of conflict has also had an impact on the malfunctioning of

⁷⁸ I. Salamey & R. Payne, 'Parliamentary Consociationalism in Lebanon: Equal Citizenry vs. Quotated Confessionalism', *Journal of Legislative Studies*, 14:4 (2008), pp. 451–473.

⁷⁹ K. Makdisi, 'Towards a Human Rights Approach to Water in Lebanon: Implementation beyond "Reform"', *Water Resources Development*, 23:2 (2007), pp. 369–390.

⁸⁰ Makdisi, 'Towards a Human Rights Approach'; E. Verdeil, C. Fééré & F. Scherrer, 'De la réaction entre différenciation territoriale et modèle universel des services urbains en réseau: les enseignements du cas libanais', *Flux*, 75 (2009), pp. 27–41.

the water sector. The sectarian character of the Lebanese political system also influences the governance of water. In Lebanese law, water has traditionally been considered a public good. Until relatively recently, it has been part of the local governance system built on ancient patron-client structures, whereby the political elite provide services to their clients rather than governing affairs through a state-citizen relationship. This means there has been no incentive for the legislator to create a legal entitlement to sufficient water as this might threaten the status quo practices. What is more, citizens have been used to getting the services from their traditional leaders instead of the state.⁸²

The first regulations on the urban services were laid down during the Ottoman era and the French Mandate which succeeded it, resulting in a structure recognizing the power of the ancient local authorities, patronages and committees. This system has been described as convoluted, incoherent and slow in its actions.⁸³ A progressive revision of the water governance structure was initiated in the 1950s and 1960s, albeit with interruptions in the implementation of the new structures due to various conflicts, notably the civil war. Finally, in 2000 a new Water Law was approved, which brought with it a merger of the regional and local water authorities into five Regional Water Establishments.⁸⁴ Yet the legislation concerning the ownership of water and the right to distribute it continues to be essentially vague and based on the Ottoman laws with some revisions.⁸⁵

⁸² Makdisi, 'Towards a Human Rights Approach'; Verdeil, Féré & Scherrer, 'De la rétroaction'; V. Shields, 'Political Reform in Lebanon: Has the Cedar Revolution Failed?', *The Journal of Legislative Studies*, 14:4 (2008), pp. 474-487.

⁸³ Makdisi, 'Towards a Human Rights Approach'; Verdeil, Féré & Scherrer, 'De la rétroaction'; L. Barakat & S. Ghiotti, 'Quand territorialisation rime avec fragmentation. Les enjeux territoriaux autour de la réforme de la politique de l'eau au Liban', In: A. Brun & F. Lasserre (eds.), *Politiques de l'eau. Grands principes et réalités locales* (Québec: Presses de l'Université de Québec, 2006).

⁸⁴ Unicef, 'Lebanon', *Water, Sanitation and Hygiene sector review* (2010).

⁸⁵ Makdisi, 'Towards a Human Rights Approach'.

Since 2000, water governance in the Greater Beirut area has been allocated to the Establishment of the Water of Beirut and Mount Lebanon, an authority working under the Ministry for Energy and Water. The Establishment works in co-operation with the Council for Reconstruction and Development, which is in charge of all rehabilitation work with regard to water infrastructure. The Ministry has launched a 10-year plan to coherently govern and develop water management in the country.⁸⁶ However, the Ministry has recently experienced a significant loss of power to the regional Establishments that are now in charge of all water and sanitation projects in their jurisdiction.⁸⁷

The religiously and ethnically splintered power system is seen by many researchers as a root cause of the problems in Lebanese water governance. The political system was consolidated to represent the current population more accurately after the civil war in the so-called Taif Accord in 1989, but the system is still based on the old sect-based powers. The confessional system, combined with the multiple challenges of conflicts, population growth and rapid urbanization, among others, has evoked criticism, some as blunt as calling the Lebanese government ‘ill-equipped to deal alone with the present challenges’.⁸⁸ The regional water authorities lack the money and data they need to operate efficiently, political actors do not have a clear and strong vision of how to improve the situation, and the inefficient supply networks and wasteful consumer habits worsen the water situation day by day.

Urbanization adding to the water stress

It is impossible to quote the actual population of Lebanon, as no national census has been conducted since 1932 due to the political sensitivity of the balance between different religious groups in the

⁸⁶ Makdisi, ‘Towards a Human Rights Approach’; El-Fadel, Zeinati & Jamali, ‘Water resources management in Lebanon’.

⁸⁷ Makdisi, ‘Towards a Human Rights Approach’.

⁸⁸ B. Fattouh & J. Kolb, ‘The outlook for economic reconstruction in Lebanon after the 2006 war’, *The MIT Electronic Journal of Middle East Studies*, 6 (2006), pp. 96-114.

country. According to estimates, however, the population today amounts to some 4.13 to 4.25 million people.⁸⁹ Growth has been rapid in the past decades. If the development continues as projected, there will be more than five million Lebanese by 2050.⁹⁰

The Greater Beirut area, which covers the region in and around Beirut City, has, according to different estimates, 1.5 to 2.2 million inhabitants. This corresponds to between a third and about half of the country's total population.⁹¹ The city has faced rapid urbanization in recent decades: while the total population of Lebanon has almost trebled between 1950 and 2010, the urban population has seen an almost eightfold increase (see Table 1).

While the most rapid urbanization has indeed taken place in the past, the trend is continuing, accelerated by population growth. Between 2010 and 2050, the population of Lebanon is projected to grow by almost a million people, which implies a growth in the urban population of more than a million. Evidently, the projected trend means growth will continue in the Greater Beirut area as well.⁹²

Table 1. Urbanization in Lebanon⁹³

Year	1950	2010	2025
Population of Lebanon	1 443 000	4 255 000	4 736 000
Urban population of Lebanon	462 000	3 688 000	4 275 000
% of urban population	32.0	87.2	89.3
Population of Beirut	322 000	1 941 000	2 173 000
% of total population in Beirut	22.3	45.9	45.4

⁸⁹ CIA, 'Country profile: Lebanon', *The World Factbook 2009* (Washington, DC: CIA, 2009); UN, 'Country profile: Lebanon', *The 2008 Revision Population Database*. World Population Prospects (UN Population Division, 2008), <http://esa.un.org/unpp/>. Accessed on 25 June 2010.

⁹⁰ UN, World Population Prospects, Lebanon.

⁹¹ Korfali & Jurdi, 'Assessment of domestic water quality'; G. Yamout & M. El-Fadel, 'An Optimization Approach for Multi-Sectoral Water Supply Management in the Greater Beirut Area', *Water Resources Management*, 19 (2005), pp. 791-812.

⁹² UN, 'Country Profile: Lebanon', *The 2007 Revision Population Database*. World Urbanization Prospects (UN Population Division, 2007) <http://esa.un.org/unup>. Accessed on 25 June 2010.

⁹³ UN, World Urbanization Prospects, Lebanon; World Population Prospects, Lebanon.

An example of the difficulties caused by the rapid urban population growth and the stagnant governance is the water conveyor project between the river Awali and Beirut. The project, formally initiated by the Council for Development and Reconstruction in the mid-1990s, has been planned for decades but the final decisions on its construction are still pending. The conveyor would provide Beirut with 260 000 to 520 000 Mm³ of potable water every day. Even with just a water supply of 260 000 Mm³ in the first phase of the project, the water shortage in Beirut could be completely covered during the rainy season and almost completely during the dry season, based on current consumption estimates.⁹⁴ The World Bank worked on the project until 2000 but then dropped it as no progress was being made. Recently, the conveyor found its way back onto the World Bank's agenda as part of a larger Greater Beirut Water Supply Project.⁹⁵

Water for a thirsty metropolis: Case Beirut

As we have seen, Lebanon's water sector problems can be attributed to any number of identifiable causes. The challenging hydrological conditions combined with urbanization, and a history rife with conflicts and bad governance have all led to a situation where the availability of clean water varies temporally and spatially, and remains in deficit in several places. Beirut constitutes a prime example of this as only 10% of its inhabitants get clean water daily from the municipal supply service during the dry season.

The provision of water in Lebanon is seen as the responsibility of the public sector. However, in reality the situation in Beirut is controversial. According to the official state statistics, 100% of urban households in Lebanon are connected to the water supply system.⁹⁶

⁹⁴ The water shortage is currently estimated to be 145 000 m³/d during the wet season and 275 000 m³/day during the dry season. Council for Development and Reconstruction (CDR), *Environmental and Social Impact Assessment (ESIA) for Awali-Beirut Water Conveyor project, Study Update, Executive Summary* (Beirut, 2010).

⁹⁵ CDR, *Environmental and Social Impact Assessment*.

⁹⁶ Aquastat, 'Country profiles: Lebanon'.

Yet researchers, and indeed the UN, agree that there are problems with the water supply in terms of both quality and quantity.⁹⁷

The Greater Lebanon area is generally considered to be overpopulated, and it is widely acknowledged that not all of its citizens have access to the water supply system or decent sanitation.⁹⁸ According to one estimate, about 22% of the population of Beirut is not even connected to the public water supply system.⁹⁹ Due to the scarcity of water, inefficient supply systems and overpopulation, the public sector is now accountable for only 50%-60% of the water consumed in the Greater Beirut area. The rest of the demand is covered by purchases of water in bottles and containers, partly from uncontrolled vendors in the informal sector and by drilling uncontrolled private wells.¹⁰⁰ The biggest markets for informal private vendors in Lebanon are the southern suburbs of Beirut where the public sector supply is most inadequate.¹⁰¹

Compounding the problems of quantity, the water distributed by the authorities is of poor quality, which causes disease and even child mortality.¹⁰² The tap water in Beirut is often contaminated due to poor management of solid waste, hazardous waste and wastewater, the intrusion of saltwater into the supply system, and the corrosion of pipes. The water from the supply system is not generally potable

⁹⁷ Unicef, 'Lebanon'.

⁹⁸ G. Yamout & D. Jamali, 'A critical assessment of a proposed public private partnership (PPP) for the management of water services in Lebanon', *Water Resource Management*, 21 (2007), pp. 611-634; S. I. Korfali & M. Jurdi, 'Provision of safe domestic water for the promotion and protection of public health: a case study of the city of Beirut, Lebanon', *Environmental Geochemical Health*, 31 (2009), pp. 283-295; M. El-Fadel, R. Maroun, L. Semerjian & H. Harajli, H, 'A health-based socio-economic assessment of drinking water quality: the case of Lebanon', *Management of Environmental Quality*, 14:3 (2003), pp. 353-368.

⁹⁹ El-Fadel et al., 'A health-based assessment'.

¹⁰⁰ El-Fadel et al., 'A health-based assessment'; Korfali & Jurdi, 'Assessment of domestic water quality'.

¹⁰¹ El-Fadel et al., 'A health-based assessment'; E. Verdeil, 'Water and electricity networks between stress and reform: from post-civil war reconstruction to the new Lebanese wars', Paper presented at the conference *Politics and Planning of Destruction and Reconstruction in Lebanon* (Oxford, 13-14 June 2008).

¹⁰² Ministry of Environment, *Lebanon state of the Environment Report*.



The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the Finnish Institute of International Affairs or the authors, and are for illustrative purposes only.

Map 4. Lebanon

due to its poor quality.¹⁰³ All of these problems are also present in the municipal system: in the case of private wells and water bought from vendors, additional hazards include the presence of toxic substances used in agriculture due to the lack of proper water treatment.¹⁰⁴

Health problems associated with water quality include the presence of Hepatitis A, typhoid, dysentery and various diarrhoeal diseases. The latter is one of the leading causes of child mortality

¹⁰³ Verdeil, 'Water and electricity networks'; Korfali & Jurdi, 'Provision of safe domestic water'.

¹⁰⁴ Korfali & Jurdi, 'Assessment of domestic water quality'; 'Provision of safe domestic water'.

in Lebanon and a major scourge in general.¹⁰⁵ Up to 750 people are estimated to die prematurely in Lebanon every year due to poor water quality.¹⁰⁶

The hydrological situation in Beirut is not ideal. The water supplied by the municipality travels a long way to reach the city. There are two principal sources of water, the springs of Jeita and Kachcoush. These springs are supplemented by some 64 wells and two further springs. The water from the two main sources is treated at a water treatment plant, pumped to a main storage reservoir, and from there to two subsidiary reservoirs within Beirut City before making its way to consumers.¹⁰⁷ The auxiliary sources of water do not go through the treatment plant but are treated at the source.¹⁰⁸

In total, the distribution system comprises reservoirs at 23 sites, 19 pumping stations and about 650 km of pipelines. As the distances are long and the distribution network old and in bad condition, water losses are significant. The past conflicts have inflicted significant damage on the water supply facilities, and reconstruction has been lagging due to resource problems and slow decision-making. According to estimates, an astonishing 35–50% of the water in the supply network is currently lost due to leakages and illegal retrieval.¹⁰⁹

While there have been rehabilitation investments in certain parts of the country to improve the water infrastructure, this has not led to remarkable improvements in the service experienced by consumers. It has become common practice in the last few decades

¹⁰⁵ In a study conducted within the city of Beirut, 25% of the population had experienced vomiting and/or diarrhoea because of the water (Korfali & Jurdi, 'Provision of safe domestic water'). According to another study, 40% of the water samples collected throughout Lebanon were microbiologically contaminated; the water from private vendors in al-Dahiyeh was of particularly poor quality. (El-Fadel et al., 'A health-based socio-economic assessment'.) The presence of coliform bacteria in the water points to faecal contamination of drinking water, which arises from e.g. cross connections of distribution pipes with sewer pipes (Korfali & Jurdi, 'Assessment of domestic water quality').

¹⁰⁶ El-Fadel et al., 'A health-based socio-economic assessment'.

¹⁰⁷ Korfali & Jurdi, 'Assessment of domestic water quality'; Yamout & Jamali, 'A critical assessment of PPP'.

¹⁰⁸ Korfali & Jurdi, 'Assessment of domestic water quality'.

¹⁰⁹ Aquastat, 'Country profiles: Lebanon'; Makdisi, 'Towards a Human Rights Approach'.

to only distribute water for about ten hours every other day, with the supply varying spatially and temporally.¹¹⁰

The complex demographic structure of Lebanon can also be seen in the access to water in Beirut. There are differences in the coverage of municipal water and the power infrastructure of different parts of the town, and the inequalities often seem to concern entire neighbourhoods and the demographic groups living there. It is widely acknowledged that the Southern Shi'a suburbs of Beirut, crammed with illegal housing built for people displaced by wars, are the ones with the most problems in terms of access to water resources from the municipal sources.¹¹¹ However, these suburbs have their own infrastructure in place, provided and maintained by Hezbollah.¹¹² Another badly affected group are the Palestinian refugees.

The malfunctioning of the water supply is undoubtedly due in part to problematic governance practices, which have left the Water Establishment lacking the resources it needs to improve the system.¹¹³ In addition to illegal connections to the municipal supply network, non-payment of water bills is common and tolerated due to the common perception of water as a public good that people cannot be denied. According to one estimate, only 10% of the water consumed is paid for. This unsustainable practice is causing huge problems for the authorities that are supposed to be in charge of the operation and maintenance of the supply system.¹¹⁴

Despite the slew of problems already discussed, some Lebanese water experts think the worst problem in Beirut at the moment is the unsustainability of consumption habits. The current water distribution system is based on flat tariffs for subscriptions instead of pricing based on metering. The tariff system does not differentiate between different types of consumption, such as domestic use or tourist demands. On the one hand, consumers have no incentive to save water as they do not get rewarded for it; on the other hand, real

¹¹⁰ El-Fadel et al., 'A health-based socio-economic assessment'; Korfali & Jurdi, 'Provision of safe domestic water'; Verdeil, 'Water and electricity networks'; Unicef, 'Lebanon'.

¹¹¹ Verdeil, 'Water and electricity networks'.

¹¹² Fattouh & J. Kolb, 'The outlook for economic reconstruction'; Harb, 'La Dahiyé de Beyrouth'.

¹¹³ Verdeil, Féré & Scherrer, 'De la rétroaction'; Makdisi, 'Towards a Human Rights Approach'.

¹¹⁴ Makdisi, 'Towards a Human Rights Approach'; Verdeil, Féré & Scherrer, 'De la rétroaction'.

water distribution is generally smaller than the quota people subscribe to, which further discourages economical water management by consumers.¹¹⁵

Conclusions

As encapsulated by a local researcher, in Lebanon there is little data but lots of opinions about the country's and its capital's hydrological situation, its population, the scope of the problems in the water sector and the best ways to tackle them. Efforts have been made to improve the situation, but the reality is still harsh: the access to clean water in Beirut is already sporadic, the future balance between water supply and demand seems alarming, and the poor water quality causes disease and even premature death.

Based on recent studies addressing different dimensions of the water *problématique* and discussions with local experts, it appears evident that there is no silver bullet for fixing the water supply in Beirut. The hydrological conditions remain challenging, and at least until the Awali-Beirut conveyor is built, the gap between demand and supply will keep widening day by day. An infrastructure ruined by conflicts and lack of maintenance leads to great losses of a precious commodity, while unsustainable governance practices make reconstruction and improvements impossible. A severe lack of hydrological and population data makes any planning of water resources management very difficult, and old-fashioned governance practices combined with wasteful consumption habits only serve to aggravate the parlous situation. The lack of water affects different population groups differently, with those who are already the most vulnerable suffering the most.

With its concrete examples of how the water runs, or does not run, in the metropolitan area and how this affects the lives of its inhabitants, the Beirut case provides an enlightening example of the imbalances and malfunctions of the Lebanese water sector. The multitude of problems indicates that any process designed to improve the situation in Beirut needs to take into account the whole picture of both the supply and demand sides, starting from collecting current

¹¹⁵ Yamout & El-Fadel, 'An Optimization Approach'.

data that can act as a basis for planning and projections, and also tackling the delicate historical issues related to the governance of water.

Adding to this Gordian knot of problems is another threat that will complicate the situation in the future: climate change. Context-specific adaptation measures will be necessary as part of the toolkit for improving the water resources governance in Lebanon. However, the higher the temperatures, the more difficult it will be to adapt to the new situation.

4 Is more enough? The sustainability of additional water projects in Jordan

This chapter presents an overview of Jordan's water security problems and their causes combined with an analysis of two of the government's current supply-side solutions: the additional water supply projects at the Disi aquifer and the Red-Dead Sea. The chapter makes a critical assessment of the sufficiency and sustainability of the current measures on both the supply and demand sides and argues that both strategies are necessary in order to alleviate Jordan's acute water insecurity. However, the country should not rush into supply-side mega-projects before studying their environmental and social effects extremely carefully. Enhancing water-saving schemes, minimizing the share of non-revenue water and reducing irrigation water consumption should be given priority over costly and risky supply-side ventures. Water security should be addressed both in terms of adequate water supply and safe water quality. In order to achieve this, there is also a need for more regional cooperation.

Deficient water balance

Jordan is among the ten water-poorest countries in the world. In 2008, per capita availability was approximately 150 cubic metres¹¹⁶, which is less than one-third of the so-called acute water poverty line of 500 cubic metres per capita per year. Population growth of 2.2%, urbanization and economic development, not to mention climate

¹¹⁶ FAO Aquastat, 'Country Fact Sheet, Jordan'. <http://www.fao.org/nr/water/aquastat/main/index.stm>. Accessed on 7 August 2010.

change, are placing increasing pressure on the already extremely strained water supply.¹¹⁷

Jordan's annual renewable freshwater resources are estimated at approximately 940 million cubic metres (Mm³).¹¹⁸ Demand, however, is considerably higher. In 2007, total water demand reached 1505 Mm³, which meant that water had to be produced by non-conventional means (reusing treated wastewater and desalination) and also heavily rationed. Even so, domestic extraction exceeded the limit of sustainable water use by 73 Mm³.¹¹⁹ Moreover, Jordan's water demand is expected to rise to 2240 Mm³ by 2040.¹²⁰

Precipitation currently stands at only 111 millimetres per year.¹²¹ In comparison, the neighbouring countries, Iraq and Syria, receive annually 216 and 265 millimetres of rain respectively, while the rainy United Kingdom gets 1220 millimetres, or eleven times more than Jordan.¹²² Climate change is expected to decrease Jordan's average levels of precipitation even further while increasing the frequency of exceptionally dry years.¹²³

The scarcity of natural renewable freshwater has forced Jordan to resort to non-conventional means of supplementing its water resources: 74–100 Mm³ of treated wastewater are reused annually, and 5 Mm³ of potable water are produced by desalination.¹²⁴ Due to decreasing freshwater resources and growing demand, the use of

¹¹⁷ CIA, World Factbook 2010, 'Jordan', <https://www.cia.gov/library/publications/the-world-factbook/geos/jo.html>. Accessed on 7 August 2010.

¹¹⁸ FAO Aquastat, 'Water Balance Sheet, Jordan'. Accessed on 7 August 2010.

¹¹⁹ Jordanian Royal Commission for Water, *Water for Life: Jordan's Water Strategy 2008–2022* (2009), pp. 1–4 to 1–6.

¹²⁰ Jordanian Ministry of Environment, *Disi Water Conveyance Project* (undated). http://www.jordanecb.org/pdf/investment/majdev_disi.pdf. Accessed on 2 September 2010.

¹²¹ Aquastat, 'Water Balance Sheet, Jordan'.

¹²² FAO Aquastat, 'Water Balance Sheets, Iraq, Syria and United Kingdom'. Accessed on 7 August 2010.

¹²³ ESCWA, *Knowledge management and analysis of ESCWA member countries capacities in managing shared water resources* (2009), p. 49. According to ESCWA, the amount of rain remained below 50 mm in 2008.

¹²⁴ ESCWA, *ESCWA Water Development Report 2: State of Water Resources in the ESCWA Region* (2007), p. 15; Royal Commission for Water, *Jordan's Water Strategy 2008–2022*, p. 6–1.

non-conventional water is bound to increase substantially in the future.

The country's water scarcity is also severely worsened by poor infrastructure and a high proportion of unbilled water due to inaccurate or non-operational water meters or a lack of them. Water theft is also common in some regions. For example, in June 2010, five cases of professional large-scale water theft were discovered in southern Amman where 20% of water (out of a total loss of 35%) is lost because of illegal abstraction from the main water pipelines.¹²⁵

Climate change arrives on the scene

Jordan's water sector is highly vulnerable in the face of climate change. Weakened water security will have negative impacts, for example, on public health, agriculture, employment and food security. All three climate change scenarios used in Jordan's Second National Communication to the United Nations Framework Convention on Climate Change estimate that the average temperature in the country will rise by approximately 1.0–1.3 degrees Celsius by 2050. During the last 45 years, most parts of Jordan have already experienced decreasing trends in annual precipitation of 5–20%. Climate change is predicted to bring about significant changes in the spatial and temporal distribution of rain and the average level of precipitation is expected to drop. As Jordan's surface and groundwater resources are highly dependent on rainfall, this is projected to result in less groundwater recharge and therefore fewer available water resources. Furthermore, the decrease in water resources is expected to cause deterioration in surface and groundwater quality.¹²⁶

Rising temperatures and decreasing precipitation increase the risk of droughts, which in turn have numerous social and economic consequences. In 1999–2000, rainfall in Jordan dropped by as much

¹²⁵ Jordan Times, 'Large-scale theft posing threat to capital's water supply – Miyahuna' (9 June 2010); *ibid.*, 'Culprits in water theft cases face fines, jail' (21 July 2010).

¹²⁶ Jordanian Ministry of Environment, *Jordan's Second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC)* (2009), p. 98; ESCWA, *ESCWA Water Development Report 1. Vulnerability of the region to socio-economic drought* (2005), p. 39.

as 70% in some regions, which resulted in the lowest agricultural yields and production of the past 40 years. The livelihoods of rural populations were seriously affected as their incomes declined sharply, forcing some into selling property. Small-scale herders and farmers had to move to urban areas to look for work, but many of them ended up unemployed and living in poor conditions.¹²⁷ Recurrent droughts have had a significant impact on the gradual withering of Jordan's agriculture. In 2008, a prolonged drought in Southern Jordan destroyed half of the region's olive harvest and threatened to decimate as many as 30 000 olive trees.¹²⁸ Winter 2009 was the driest in the country since 1995 and insufficient, delayed rainfall put vegetable and cereal yields in jeopardy.¹²⁹

Water policy road map

Jordanian water policy is guided by a water strategy drawn up by the Jordanian Royal Commission for Water in 2008. The 'Water for Life - Jordan's Water Strategy 2008-2022' sets goals and general guidelines for more specific policy programmes to be made by the Ministry of Water and Irrigation in cooperation with other relevant ministries and actors. The strategy has a strong focus on water demand management, and it proceeds from the assumption that two large water supply projects, the Disi Water Conveyance Project and the Red-Dead Canal, will be realized as scheduled.

Key factors in controlling the rising water demand, according to the strategy paper, are reducing irrigation water consumption and promoting public awareness about water issues. In 2007, irrigation consumed more than 64% of all the water used in Jordan, while agriculture's share of the gross domestic product was only 3%.¹³⁰ Importantly, only 2.7% of the population works in the agricultural

¹²⁷ ESCWA, *ESCWA Water Development Report 1*, pp. 30-36.

¹²⁸ IRIN Middle East, 'Jordan: Drought may claim thousands of olive trees' (17 September 2008), <http://www.irinnews.org/Report.aspx?ReportId=80408>. Accessed on 14 September 2010.

¹²⁹ IRIN Middle East, 'Jordan: Persistent drought could devastate crops' (25 December 2008), <http://www.irinnews.org/Report.aspx?ReportId=82091>. Accessed on 14 September 2010; Jordan Times, 'Kingdom braces for drought-like conditions' (1 February 2009).

¹³⁰ Royal Commission for Water, *Jordan's Water Strategy 2008-2022*, pp. 5-2.

sector.¹³¹ Irrigation water has been considerably subsidized or even free of tariffs, which has curtailed efforts to restrain agriculture's water consumption.

According to the strategy, the improvement of irrigation water management and reducing consumption are essential for future water security. On-farm irrigation efficiency and wastewater reuse need to be maximized, the latter naturally within the boundaries of high quality and safety standards. Farmers are also encouraged to switch to less water consuming and higher economic value crops by, for example, removing tariffs on imported crops. Bananas are a classic example of a crop that can be imported much more cheaply than it can be cultivated in Jordan, both in terms of money and water.¹³²

Both water officials and environmental activists aspire to foster a culture of water efficiency and saving among the people. An extra carrot – or stick – in the strategy is provided by raising the water tariffs so that they will encourage people to reduce their water consumption. Water prices will be set on the basis of water quality and the end users. The individual user groups' ability to meet the tariffs and the effects of pricing on economic sectors will be taken into account in setting the tariffs.¹³³

By 2022 the share of non-revenue water should plummet to 25%, of which technical water losses would constitute 15%.¹³⁴ Currently, the water loss is estimated at about 42%.¹³⁵ Technical loss is to be diminished by, for example, optimizing management procedures and rehabilitating water supply infrastructure and systems. Another important step is reforming legislation and imposing sanctions on illegal water pumping. July 2010 witnessed the introduction of new amendments to the Jordanian Penal Code, according to which stealing water, sabotaging networks, illegal pumping or tampering with water meters will result in a prison sentence of three months to one year and a fine of 100–500 Jordanian dinars (110–570 euros).¹³⁶

¹³¹ CIA, *World Factbook 2010*, 'Jordan'.

¹³² Royal Commission for Water, *Jordan's Water Strategy 2008–2022*, p. 8/2.

¹³³ *Ibid.*, pp. 8/1–8/10.

¹³⁴ *Ibid.*, p. 8/3.

¹³⁵ Jordan Times, 'Desalination key to solving Jordan's water woes – expert' (9 September 2010).

¹³⁶ Jordan Times, 'Steal water, go to jail, new campaign warns' (25 August 2010).

Jordan's water strategy also entails various supply-side measures of different scales, one of the boldest being the study of artificial rainmaking technology under the guidance of Thailand's bureau of royal rainmaking and agricultural aviation.¹³⁷ The major schemes to boost the country's water supply are, however, the Disi Water Conveyance Project and the Red Sea-Dead Sea Conveyance Project. In both cases the extra water is to be extracted from a shared water resource and both projects have been subject to long planning phases and fierce public discussion.

Additional water projects – with or without neighbours

Jordan shares most of its fresh surface and groundwater resources with its neighbours.¹³⁸ About half of Jordan's surface water originates from the Yarmouk River, which is shared by Jordan, Lebanon, Palestine and Syria. As the largest tributary of the Jordan River, the Yarmouk marks the border between Jordan and Israel close to the Jordan Valley and further upstream it separates Jordan from Syria. Although Jordan has effective water-sharing agreements with Israel (since 1994) and Syria (since 1986/7) the riparian countries face conflicting interests at the upper part of the river.¹³⁹ Since Jordan is a downstream riparian country of both the Yarmouk and Jordan rivers, its water supply is highly vulnerable to conflicts in the region. Changes in the water abstraction of the upstream countries induced by a diplomatic confrontation could reduce Jordan's water share and an armed conflict might physically limit the country's access to water.

The four major aquifers which constitute about 80% of Jordan's groundwater resources are also shared between neighbouring countries: the Amman-Wadi Sir and Basalt aquifers also deliver water to Syria, the Disi aquifer to Saudi Arabia and the Hamad aquifer to Syria, Iraq and Saudi Arabia.¹⁴⁰

¹³⁷ Jordan Times, 'Jordanian-Thai cooperation to make it rain' (5 September 2010).

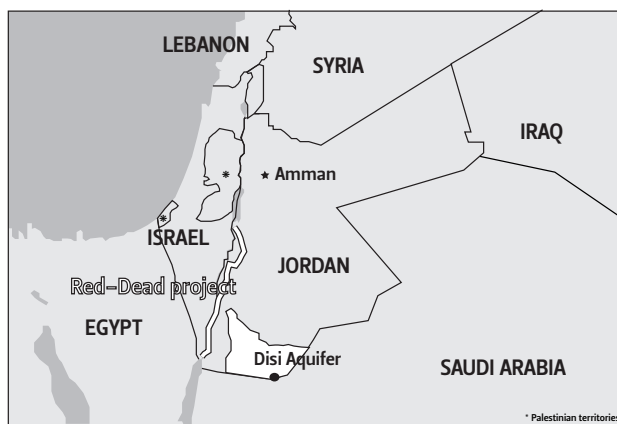
¹³⁸ Iraq, Israel, Lebanon, Palestine, Saudi Arabia and Syria.

¹³⁹ ESCWA, *Knowledge management and analysis*, pp. 49-50.

¹⁴⁰ *Ibid.*, p. 49.

Jordan has big plans for making the most of certain shared water resources. In June 2009, it launched the Disi Water Conveyance Project, which is expected to supply Amman with 107 Mm³ of water annually from the Disi aquifer located in Southern Jordan.¹⁴¹ Another multilateral multi-billion project is the Red Sea-Dead Sea Conveyance Project, which consists of building a 160-kilometre canal and a series of pipelines from the Gulf of Aqaba to the Dead Sea.

A key question is whether there is sufficient team spirit between the parties to realize these projects. The trilateral Red Sea-Dead Sea Conveyance Project is facing obstacles as Jordan, frustrated by Israel's and the Palestinian Authority's slow engagement in the joint venture, started planning a unilateral national project.¹⁴² Israel in particular regards Jordan's solo actions as a bad neighbourhood policy, although Jordan is still also committed to the trilateral project.¹⁴³ Israel's occupation of the West Bank and the legacy of conflict between Israel and Jordan and its fellow Arab countries is a major challenge, if not an obstacle, to the much-needed regional cooperation on water issues.



The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the Finnish Institute of International Affairs or the authors, and are for illustrative purposes only.

Map 5. Jordan: the Red-Dead Sea project and the Disi aquifer

¹⁴¹ Jordan Times, 'Disi project construction in full force' (10 August 2010).

¹⁴² The project is known as the Jordan Red Sea Project or the Jordan National Project.

¹⁴³ Jerusalem Post, 'Raising the dead - Is the 'Red-Dead Sea Conveyance Project' viable?' (27 July 2010).

The Disi aquifer project

The Disi aquifer project consists of over sixty wells and a 325-kilometre pipeline that will eventually carry water from the ancient aquifer located in Southern Jordan to Amman. Construction started in June 2009, after 20 years of planning and delays due to a lack of financial resources. Although the project's implementation has faced difficulties and delays¹⁴⁴, Disi should supply Amman's inhabitants with nearly 30% of their water by 2013. The estimated cost of the project is 600 million US dollars.¹⁴⁵

The Disi project will not solve Amman's, let alone Jordan's, water worries but it will alleviate the capital's severe water deficit. Carrying water from the South is also projected to relieve the upland aquifers, Amman's current main water sources, of long-continued over-use. The Disi project is also estimated to indirectly improve the quality of wastewater, which will eventually lead to better quality treated wastewater for irrigation.¹⁴⁶ However, the amelioration is not without its limits, as the fossil aquifer will only render water for about 50 years.¹⁴⁷ After Disi's water has been depleted, the project planners estimate that the channel can be used to convey desalinated water from the Gulf of Aqaba to the rest of Jordan.¹⁴⁸

The project's proponents say that realizing the expensive endeavour, notwithstanding Jordan's current substantial fiscal deficit and foreign debt, is a necessity in order to supply Amman with uninterrupted and safe drinking water by 2022. Critics would rather see the country emphasize other measures in its water policy. According to some views, it makes no sense investing huge amounts

¹⁴⁴ Jordan Times, 'Major delay in Disi project – Najjar' (29 September 2010).

¹⁴⁵ The European Investment Bank and the French Development Agency have supported the government by extending Jordan soft loans of 100 million US dollars respectively. Jordan Times, 'Disi in full force'.

¹⁴⁶ Ministry of Environment, *Disi Water Conveyance Project*.

¹⁴⁷ Dureid Mahsaneh, 'Bring the people to Disi, not Disi to the people', Jordan Business Magazine (10 January 2007).

¹⁴⁸ Greenprophet.com, 'Jordanian Water Pipeline Construction Starts' (13 December 2009). <http://www.greenprophet.com/2009/12/jordan-water-pipe-disi/>. Accessed on 31 August 2010.

of money in a partial solution that is relatively short-term and both economically and ecologically expensive.¹⁴⁹

Concerns have also been raised about the safety of the Disi water. A group of researchers reported having detected extremely high levels of naturally occurring and carcinogenic radium isotopes in groundwater abstracted from a part of the Disi aquifer. The Jordanian Ministry for Water and Irrigation contested the claims of radioactivity by presenting its own research results, according to which water from Disi is safe to drink, and public discussion on the contradictory results was duly suppressed.¹⁵⁰

In the past two decades, Jordan and Saudi Arabia have quarrelled over the rights to Disi's water. Jordan argued that its neighbour was using more than its fair share of the aquifer's supply¹⁵¹ whereas Saudi Arabia expressed concerns about the Jordanian Disi project's effects on its future water share.¹⁵² In 2002, Jordan declared the Disi venture an issue of national security and the environmental feasibility studies were kept secret. Access to data related to the aquifer's renewability and capacity was also denied between 2002 and 2004.¹⁵³ A settlement was reached in 2008, but it remains to be seen whether Saudi Arabia will remain content with it once the project is operational.¹⁵⁴

The Red-Dead Sea canal project

The Red Sea-Dead Sea Conveyance Project has provoked even more discussion than the Disi project. It aims at carrying between 1000 to 2000 Mm³ of water annually from the Red Sea to the Dead Sea, thereby saving the shrinking salt lake and providing potable water and

¹⁴⁹ Jordan Business Magazine, 'Bring the people to Disi'.

¹⁵⁰ Jordan Watch, 'The Curious Case of Radioactivity in Disi Aquifer' (28 February 2009), <http://www.jordanwatch.net/archive/2009/2/816436.html>. Accessed on 14 September 2010.

¹⁵¹ F. Greco, 'The securitization of the Disi aquifer: a silent conflict between Jordan and Saudi Arabia', *SOAS Water Issues Group Occasional papers* (2005), p. 6.

¹⁵² IRIN Middle East, 'Jordan: Declining rainfall, population growth spur search for water' (23 September 2009), <http://www.irinnews.org/report.aspx?ReportId=86250>. Accessed on 15 September 2010.

¹⁵³ Greco, F. 'The securitization of the Disi aquifer', p. 6.

¹⁵⁴ IRIN Middle East, 'Jordan: Declining rainfall'.

electricity to Jordan, Israel and the Palestinian Authority controlled West Bank. As delays have dragged on, Jordan initiated the planning of a national project. The analysis below, however, will focus on the trilateral Red-Dead project due to its potential to foster cooperation between the parties involved. Compared to the Jordanian national scheme, the trilateral project also faces better financing prospects, thanks to the commitment of the World Bank.

The Dead Sea is shrinking by a metre a year and faces the threat of total demise in the next 50 years. The salt lake's riparian countries for their part suffer from acute current or projected water scarcity. In May 2008, after over a decade of discussions and planning, a comprehensive rescue plan was taken under study by the World Bank. The project's final feasibility report is due out in May 2011, whereas the environmental and social impact assessments should be completed by October 2011.¹⁵⁵ The venture under scrutiny includes building an approximately 160-kilometre canal and a series of pipelines from the Gulf of Aqaba to the southern end of the Dead Sea, equipped with a desalination plant and a hydropower plant.

Estimates of the time and money required for realizing the scheme vary, but in any event it would be neither quick nor cheap: building the canal with all its facilities could take up to 20 years and cost 15 billion US dollars.¹⁵⁶ However, the desalination plant is expected to yield 310 Mm³ of potable water as early as the 2020s.¹⁵⁷ The final maximum capacity of the desalination plant would be 850 Mm³ per year. Around 2050, the level of the Dead Sea is projected to have been elevated from -433 metres, the level it is estimated to stand at by the time the project could start, to a sustainable level and stabilized at that level.¹⁵⁸

The beneficial by-products of the project, which is often portrayed by the governments principally as an environmental rescue scheme,

¹⁵⁵ Jordan Times, 'Water officials to discuss future of Red-Dead project' (17 August 2010).

¹⁵⁶ Jerusalem Post, 'Raising the dead'.

¹⁵⁷ Coyne et Bellier with Tractebel Engineering & Kema, *Options Screening and Evaluation Report*. Executive Summary. Red Sea-Dead Sea Conveyance Project Study Program Feasibility Study. Report No. 12 147 RP01 (29 January 2009), p. 19.

¹⁵⁸ Coyne et Bellier et al., *Options Screening and Evaluation Report*, p. 4. A sustainable water level for the Dead Sea is estimated at between -410 metres and -420 metres.

would be divided among Jordan, Israel and the Palestinian Authority. But if saving the Dead Sea were the primary goal, there would be other strategies at hand. According to environmentalists, the Dead Sea could be revived by restoring the Lower Jordan River's original flow by a minimum of 30%. Currently, only 2% of the river's original flow reaches the Dead Sea as the riparian countries exploit it as a major freshwater source.¹⁵⁹

For Jordanian policy-makers, the project is at least as much about drinking water as anything else. The country's water strategy is based on the assumption that the Red-Dead project's desalination plant will be operational by the 2020s.¹⁶⁰ Jordan would be the biggest beneficiary of the potential plant since Israel and the West Bank have few areas to which pumping water from the canal would be economically and ecologically feasible.¹⁶¹ In 2050 Jordan could expect to receive 462 Mm³ of drinkable water, which would solve the estimated water deficit in the Greater Amman area at that time.

However, the project entails various environmental and technical concerns. One big technical risk lies in the fact that the canal is planned within an active seismic zone: there is a high risk of a major seismic event taking place during the project's life span. Another concern is that saline water could leak from the pipelines and contaminate the region's aquifers.¹⁶² According to the project's consultants, these challenges can be tackled by careful lineation of the canal, technical safety measures and the correct construction materials.

In addition, ecological concerns have been raised by environmentalists and scientists involved in studying the effects of mixing water from the Red Sea with the highly saline water of the tiny Dead Sea. Studies conducted to date indicate that mixing the waters might negatively affect the unique mineral composition of the Dead Sea's water. However, the current method of study is being criticized for being too small in scale for acquiring more conclusive results. Massive water pumping from the Gulf of Aqaba could also harm the Red Sea's unique coral reefs. Another point of criticism

¹⁵⁹ Jerusalem Post, 'Raising the dead'.

¹⁶⁰ Royal Commission for Water, *Jordan's Water Strategy 2008-2022*, e.g. p. 7/2.

¹⁶¹ Coyne et Bellier et al., *Options Screening and Evaluation Report*, pp. 4-14.

¹⁶² Ibid.

has been the relatively tight schedule of the project's environmental impact assessment due to which reliable results are said to be difficult to achieve.¹⁶³

Conclusions

Although Jordan's water use is somewhat lavish and distribution between irrigation and other purposes is skewed, it would be unreasonable to expect the country to resolve its acute water problems without resorting to any supply-side measures. Water officials have taken water demand management seriously and are determined to introduce a water-saving mentality throughout Jordanian society. Water-saving programmes, improvements in water management and the existing infrastructure, maximizing water reuse, capping agriculture's water consumption, promoting public awareness, and drastically reducing the share of non-revenue water are of paramount importance and should be used as primary means to combat water scarcity and increase the sustainability of water use. A 'less is more' stance towards water is also the most suitable one in adapting to the future effects of climate change.

Regarding the big water supply projects, their sustainability is still a question mark. The results of the environmental and social impact assessments of the Red-Dead Sea project will determine whether rescuing the endangered ecosystem from drying up can be viably combined with producing freshwater and hydropower. Thorough feasibility studies and impact assessments are indeed at the core of a sustainable approach to water. Discussions regarding the Disi project and the conflicting results concerning the water's high radioactivity versus safety imply that the project's assessment process could and should have been conducted more carefully and openly. Going ahead with a multimillion-dollar venture that might eventually end up risking environmental sustainability and people's health is not the best example of project planning. Therefore, lessons learned from the Disi project need to be applied in the Red Sea-Dead Sea project.

¹⁶³ Jerusalem Post, 'Raising the dead'.

The most ecologically sustainable way to save the Dead Sea would be to rehabilitate the Jordan River, but since Jordan in particular is relying heavily on the project's by-products, water and electricity, the Red-Dead venture is unlikely to be dropped from the agenda, unless proven unfeasible or too expensive. The environmental and water security risks posed by seismic activity, and the possible contamination of aquifers because of saline water leaks are substantial, not to mention the possibility of harming or even destroying the unique ecosystems of the respective seas. An ecologically more sustainable, less risky and less costly strategy for Jordan would be to give priority to wide-scale water-saving schemes both in agriculture and households, reducing non-revenue water by improving the water infrastructure, and controlling illegal water abstraction and introducing feasible water tariffs in order to change people's water consumption. These measures would need to be supported by smaller supply-side measures, developing wastewater reuse and importing virtual water.

Another open question is whether the Red-Dead project will promote cooperation or sow the seeds of additional tensions between the parties involved. While Jordan seems determined to go through with the project, even unilaterally, the extraction of water from shared resources might lead to conflicts between the region's increasingly water-poor countries. Given the conflict-torn history of Israel and Jordan, mutual suspicions towards getting involved in such a megaproject are understandable. This applies even more to the Palestinians, who have lived under Israeli occupation for over 60 years. The probability of skirmishes arising from any future joint projects would be high. Still, there is hope for the much-needed cooperation to deepen, even though the direct Israeli-Palestinian peace negotiations, which resumed in September 2010, were at the time of writing at risk of being suspended before the parties really got down to business. Perhaps coming to terms with the fact that cooperation with one's neighbours would be helpful, if not necessary, in tackling the challenges posed by climate change and increasing water insecurity might encourage the parties to reach agreement on high politics issues such as borders and refugees' rights as well.

5 The management of water resources in Syria and Lebanon: shortcomings and challenges

This chapter discusses the current state of evaluating, planning and governing water resources in Syria and Lebanon and offers some recommendations for the future. It is pointed out that not only external factors, such as population growth, increasing water demand and climate change, but also the chronic mismanagement of water resources, pose mounting problems for the water supply in these two countries. First, the chapter discusses the monitoring and evaluation of water resources and argues that they appear to be inadequate for planning purposes. Planning the use and protection of water resources, also analysed in the chapter, seems to differ in the two countries, although the need to develop integrated water resources management is common to both. Finally, an analysis of water-related governance structures shows how water administration and jurisdiction are, on the one hand, convoluted and overlapping in both Syria and Lebanon and, on the other hand, centralized, especially in Syria, thereby hindering the enforcement of legislation and the management of water resources.

The uneven water scarcities of Syria and Lebanon

In Syria, water resources vary a great deal spatially. In the dry Badia region, rainfall may be less than 200 mm per year, while precipitation on the mountains can be over 1000 mm per year. The annually available amount is about 16 billion m³ per year. The figures differ depending on the source, but they all speak volumes about water scarcity.¹⁶⁴ In recent years, as a result of a negative water balance, groundwater levels have receded, several springs have dried up

¹⁶⁴ Personal correspondence; Barnes, 'Managing the Waters'.

and a large number of rivers have become seasonal or converted to wastewater canals. In many areas, especially near Damascus, the groundwater is polluted, and fields lie abandoned as a consequence of water shortages. It is estimated that due to climate change, water requirements for agriculture will further increase while productivity decreases.¹⁶⁵

Lebanon is rich in water when compared to Syria. The mean annual rainfall varies significantly, from 200–600 mm in the northern part of the Bekaa Valley to 1000–1400 mm in the mountains.¹⁶⁶ Lebanese water resources are under increasing stress, and in most cases already polluted.¹⁶⁷ Climate change is expected to increase temperatures and reduce rainfall.¹⁶⁸ The consequences of the diminishing water resources are already visible in the Bekaa valley, characterized as ‘criss-crossed with tribal, sectarian and political fault lines, which water scarcity can easily provoke’.¹⁶⁹ A reduction in the amount of water and increased exploitation would have an influence on the groundwater in particular.¹⁷⁰ Undesirable metals and contaminants in springs would become more concentrated and an increase in salinity would spoil the coastal groundwaters.¹⁷¹

In both Syria and Lebanon, population growth and rising standards of living are already major factors influencing water scarcity and security. The mismanagement of water resources, namely illegal pumping and lack of proper wastewater disposal and recycling, not

¹⁶⁵ Yousef Meslmani and Muhammad Fadel Wardeh, *Strategy and Action Plan for Adaptation to Climate Change in Syria (2010)* (Damascus: Ministry of State for Environment Affairs, UNDP, 2010), p. 19.

¹⁶⁶ K. J. Sene, H. A. Houghton-Carr, A. Hachache, ‘Preliminary flood frequency estimates for Lebanon’, *Hydrological Sciences. Journal*, 46 (5) (2001) p. 661.

¹⁶⁷ Bou-Zeid & El-Fadel, ‘Climate Change and Water Resources’, p. 353.

¹⁶⁸ Bassam Jaber, ‘Water pollution in Lebanon: proposed solutions and case studies. Regional conference on water demand management, conservation and control’, *Lebanon Proceedings*, 26 (2010), p. 221.

¹⁶⁹ IRIN news, ‘Climate change and politics threaten water wars in Bekaa’ (1 February 2009), <http://www.irinnews.org/Report.aspx?ReportId=82682>. Accessed on 10 September 2010.

¹⁷⁰ Lebanese Ministry of Environment, *Lebanon’s First National Communication for the UNFCCC* (1999).

¹⁷¹ Bassam Jaber, ‘Water pollution in Lebanon’, p. 218.

to mention the threat of climate change, are likely to worsen the situation.

Inadequate monitoring and evaluation practices

Monitoring provides information on the state and quality of water resources essential for understanding the hydrological cycle and pollution processes. It is necessary to become acquainted with the present situation before any forecasts, for example, on climate-related changes, can be made.

Syria

There are seven drainage basins in Syria. The Barada & Awij basin constitutes an important water supply for the capital city, Damascus.¹⁷² The drainage basin is located in a karstic¹⁷³ area, like most of the Syrian groundwater reservoirs, and therefore the aquifer is characterized by high productivity.¹⁷⁴ At the same time, the area is very sensitive to pollution, which is a major problem due to the rapidly developing urban areas. The discharge from the Barada basin has diminished since 2002 due to a decrease in precipitation and overpumping from the aquifer in the Ain al-Fijeh and Barada springs.

At the Ain al-Fijeh drainage basin there have been plans to monitor the snow cover by satellite images as one step in a Syrian-German technical cooperation project, which aims to better calculate the water balances.¹⁷⁵ The discharge from the Ain al-Fijeh spring, 2-25 m³ per second, is measured manually in a measuring weir on a daily basis. Legislation prohibits the monitoring of the groundwater level

¹⁷² INECO Studies and Integration Consulting, *Institutional framework and decision-making practices for water management in Syria. Towards the development of strategy for water pollution prevention and control in the Barada River Basin, Greater Damascus area.* (INECO, 2009), p. 25.

¹⁷³ A terrain of limestone characterized by surface hollows, depressions and fissures, collapsed structures, and an extensive subterranean drainage network.

¹⁷⁴ A. Al-Charideh, 'Environmental isotope study of groundwater discharge from the large karst springs in West Syria: a case study of Fijeh and Al-sin springs' *Environmental Earth Sciences* (26 July 2010), p. 3.

¹⁷⁵ Anonymous environmental engineer, Ain al-Fijeh, 16 May 2010.

and quality in the Ain al-Fijeh basin, which is a major hindrance. Added to this, the mountainous terrain complicates monitoring.

Reliable estimates concerning water availability and use are very hard to obtain. Because the use of water, especially groundwater, is partly illegal, it cannot be measured accurately. Precipitation is measured in villages but not in the mountains. As early as 1990, remote sensing techniques were discussed for defining the hydrological situation of the Damascus area's groundwater. Nevertheless, to date, there has been no improvement in this direction. Observational data should be the basis for the evaluation, planning, and management of water resources, but many observational networks (and even laboratories) are lacking.¹⁷⁶

The governance of water evaluation is highly dispersed.¹⁷⁷ Three ministries are in charge of drinking water analyses and one, namely the Ministry of Irrigation, is in charge of surface water and groundwater analyses, although only surface waters have a comprehensive monitoring programme. The Directorates for Water Pollution Abatement in the river basins, which are under the authority of the Ministry of Irrigation, periodically monitor the quality of surface and groundwaters, too.

Wastewater treatment in Syria is undeveloped. Water pollution is caused by wastewaters that are discharged unpurified into bodies of water or onto the ground. There are quality standards for discharge in the water environment,¹⁷⁸ but the permitted standard concentrations of pollution are relatively high. Attempts to purify wastewaters, for example in the town of Adra, located in a new industrial area in northern Damascus, have met with difficulties because of uncontrolled industrial wastewater flow without pre-treatment to the treatment plant.¹⁷⁹

¹⁷⁶ Khaled Mawed, Imad Al Deen Khaleel, Mohammed Eido, and Imad Al Deen Lahaam, *Vulnerability Assessment and Adaptation of Climate Sector in Syria* (Syria's initial National Communication to UNFCCC, Report No.: INC - SY_V&A_Climate - En., 2008), p. 45.

¹⁷⁷ INECO, *Institutional framework*, pp. 12-17.

¹⁷⁸ Ibid. p. 53.

¹⁷⁹ Ibid. p. 29; Fabrice Balanche and Ghaleb Faour, *Water Management Programme. Zoning for Ecological Priority Areas. Rural Damascus and Damascus city* (GTZ and Syrian Ministry of Local Administration and Environment, 2008), p. 63

Lebanon

There are 40 major rivers in Lebanon, about 17 of which are perennial, and over 2,000 springs.¹⁸⁰ Despite the seemingly abundant water resources, it is predicted that the country will experience a water deficit within 15 years. On the other hand, flash floods have increased in the northern part of the country, which are also believed to be a consequence of climate change. As in Syria, karstic limestone prevails in the rock foundations, and therefore the non-existent wastewater treatment constitutes a threat to water supplies.

Deficiencies in meteorological and hydrological monitoring, basin characteristics, as well as a lack of data on water demand, hinder the use of advanced methods like hydrological models for evaluation and forecasting purposes.¹⁸¹ Moreover, the civil war severely obstructed data collection, as monitoring was suspended during 1975–1990. The proper evaluation of problems and future trends on a national and regional scale requires improved basic information.

The Lebanese water governance structure is convoluted: four ministries are in charge of monitoring the state of the environment. Since 2002, regional administration has been unified so that four Regional Water Establishments (RWE) are now responsible for all water and sanitation projects.¹⁸²

The Ministry of Environment has launched a study to assess the status of national systematic observation networks based on the United Nations Framework Convention on Climate Change reporting guidelines to the Global Climate Observing System (GCOS). The study team recommends the improvement of systematic monitoring from the maintenance and operation of equipment to data reporting.¹⁸³

¹⁸⁰ Georges Kamar, *Lebanon Water Sector Overview* (Beirut: Parliamentary Commission on the Environment, Lebanese Parliament, visit of a Finnish group of professionals, May 2010), p. 3; Makdisi, 'Towards a Human Rights Approach', p. 372.

¹⁸¹ Anon 2002, *Climate Change Enabling Activity (Phase II). Capacity Building in Local and Regional System Observation Networks*. Final Report. (Climate Change Enabling Activity Project. UNDP, 2002), p. 29; Bou-Zeid & El-Fadel, 'Climate Change and Water Resources', pp. 343–355; Makdisi, 'Towards a Human Rights Approach', pp. 381–382.

¹⁸² Kamar, *Lebanon Water Sector Overview*.

¹⁸³ Anon, *Climate Change Enabling Activity*, p. 10.

As in the case of Syria, the monitoring and treatment of wastewaters are undeveloped.¹⁸⁴ Most of the wastewaters are dumped in the sea or in rivers.

Management of water resources lacks comprehensive planning

The planning of water resources is based on knowledge of the target area as well as the needs of the stakeholders. The planning process should be participative. The goal of the process is to discover measures that fulfil the population's needs without spoiling the resources. This is challenging in countries like Syria and Lebanon where water resources are locally overexploited.

Syria

During dry seasons, the Damascus area experiences disruptions to its water supply. During the driest periods, many people are forced to rely on the polluted groundwater. Some measures have already been taken to improve the situation. Previously, network losses had posed a major problem: between Ain al-Fijeh and Damascus, 20% of the water disappeared. The quality of the water also deteriorated as it ran through the old pipelines. As a result of a rehabilitation of the tunnels, the loss subsequently decreased to less than 5%. The Ain al-Fijeh spring drainage basin area has been protected since 1989 and building in the area has been restricted.¹⁸⁵ Old risk factors, such as oil tanks and stores of chemicals, have been eliminated and the water quality is good.

A study of water management in Syria concluded that 'the treatment of wastewater is currently one of the main priorities of the state for ensuring environmental protection'.¹⁸⁶ So far, water purification efforts have failed either because of the lack of comprehensive planning or poor enforcement of legislation, as in the case of Adra, as explained above.

¹⁸⁴ Kamar, *Lebanon Water Sector Overview*, pp. 10-12.

¹⁸⁵ Anonymous environmental engineer, Ain al-Fijeh, 16 May 2010.

¹⁸⁶ INECO, *Institutional framework*, p. 11.

At present, many suburbs and rural areas are forced to rely on polluted groundwater. Wastewaters from landfills that dot the roadsides are also a pollution risk. A comprehensive land use plan for the region of Damascus that takes into consideration environmental factors has been proposed in a project funded by the German development cooperation agency, GTZ, and the Syrian government.¹⁸⁷

The implementation of the integrated water resources management concept (IWRM), an approach for ensuring the optimal management of water resources, could be used for defining a new water policy. Interaction between key stakeholders and planners was implemented by INECO, a regional EU-supported coordination project, in the Barada River Basin in 2007–2009.¹⁸⁸ The interaction helped in ‘identifying potential deficiencies of measures taken and developing supporting options to deal with the pollution problem’. The enhancement of public involvement, however, encounters problems due to differing levels of awareness among diverse social groups. Awareness campaigns are also needed to garner support from the local people.¹⁸⁹

Lebanon

As in Syria, the optimal use of water resources has been hindered by a lack of comprehensive planning and implementation. Because the demand is locally outstripping the water supply and due to the non-existent wastewater purification, Lebanon has drafted a 10-year national strategy to meet these problems.¹⁹⁰ The main aim is to store winter water by building dams and artificial lakes. Drinking and irrigation water as well as wastewater and water quality problems have also been taken into account.

The plan to build up to 28 dams for storing fresh water has been largely criticized because water does not stay in reservoirs in karstic areas, recreational and ecological sites get destroyed, and because

¹⁸⁷ Balanche and Faour, *Water Management Programme*, p. 63.

¹⁸⁸ INECO *Institutional framework*, p. 51.

¹⁸⁹ Maher Salman and Carlos Garces, *Symposium Proceedings on: “Irrigation Modernization: Constraints and Solutions”*, Damascus, Syria 28–31 March 2006 (Rome: International Programme for Technology and Research in Irrigation and Drainage (IPTRID), FAO, 2006), p. 15.

¹⁹⁰ Makdisi, ‘Towards a Human Rights Approach’, p. 374.

the government has not considered other possibilities.¹⁹¹ In 2010, local NGOs were working towards an alternative plan. According to officials, the Ministry of Agriculture will undertake environmental impact assessments (EIA) when the dams are planned in more detail.¹⁹²

Agriculture in Lebanon suffers from the risk of flash floods in the north and drought in the upper Beka valley.¹⁹³ As a countermeasure, the government has started flood risk management, and a national risk assessment was ongoing in 2010.

In addition to the lack of wastewater purification, there are also very few maps of existing wastewater networks.¹⁹⁴ Wastewater plants have been built without the associated sewer systems and, for example, all of Beirut's wastewaters are dumped into the sea. A master plan for wastewater treatment has been prepared by the Ministry of Energy and Water. So far, Lebanon has not shown any interest in the reuse of wastewater in irrigation because of the availability of traditional water resources.

When it comes to climate change, Lebanon's government is working in close cooperation with local NGOs and, according to some estimates, public awareness is good, due to the many awareness campaigns.¹⁹⁵ In the case of water, however, more campaigns are still needed, according to state officials.

In the case of both Syria and Lebanon, the challenges posed by water shortages and climate change should be taken into account in agricultural and community planning. It is necessary to adopt policies aimed at eliminating water resource overexploitation, improving the efficiency of water use and the utilization of sewage water in agriculture. Emphasis should be placed on 'water productivity

¹⁹¹ IRIN News, 'Reduced rain window threatens water crunch' (13 August 2009), <http://www.irinnews.org/Report.aspx?ReportId=85698>. Accessed on 13 August 2009.

¹⁹² Anonymous environmental expert at the Lebanese Ministry of Environment, Beirut, May 2010.

¹⁹³ IRIN news, 'Reduced rain window'.

¹⁹⁴ Kamar, *Lebanon Water Sector Overview*, p. 12.

¹⁹⁵ Anonymous environmental expert at the Lebanese Ministry of Environment, Beirut, May 2010.

as opposed to land or crop productivity'.¹⁹⁶ In Syria's agricultural strategy this point of view has already been taken into account.

Enforcement of water-related legislation and management plans is inadequate

The administration should be streamlined so that there is no overlapping or shortcoming in jurisdiction. The decisions should be backed up by good arguments and be understandable to the general public.

Syria

The complexity of the Syrian administrative system applies not only to water monitoring, but also to governance.¹⁹⁷ The Ministries of Health, Housing and Construction, and Local Administration and Environment are responsible for drinking water and the Ministry of Irrigation for irrigation, while the Ministry of Agriculture and Agrarian Reform is in charge of the application of modern agricultural techniques.

Despite the fact that Syria's water resources are limited, the government has gone to great lengths to expand irrigation, according to many authors because the ruling Ba'th party relies largely on the support of agrarian people.¹⁹⁸ It is argued that the prevailing irrigation policy should be changed as suggested in a symposium on irrigation modernization in 2006, which concluded that there is a need for 'a clear and concerted strategy for irrigation modernization supported through appropriate policy and legal considerations'.¹⁹⁹ The introduction of cost recovery policies, the regulation of agricultural water use and crop production patterns should be key elements in the agricultural policy, as pointed out in a report by INECO.²⁰⁰

¹⁹⁶ Meslmani and Wardeh, *Strategy and Action Plan for Adaptation*; Salman and Garces: *Irrigation Modernization*.

¹⁹⁷ Ibid., INECO, *Institutional framework*, p. 68.

¹⁹⁸ Barnes, 'Managing the Waters', pp. 510-530.

¹⁹⁹ Salman and Garces, *Irrigation Modernization*, p. 14.

²⁰⁰ INECO, *Institutional framework*, p. 68.

Another important proposal put forward by both the 2006 symposium and INECO has been to consider appropriate addenda to the water law ‘to overcome its shortfalls, in particular those related to its high degree of centralization and its lack of clear mechanisms of enforcement’.²⁰¹ One example of centralization can be found in the area of reuse of wastewater in irrigation: a plantation located about 1.8 km to the south of Qara city uses 90% of the wastewaters originating from the city, which are purified by natural lagooning. The project is privately funded and, according to local stakeholders, due to changes in the law, it is likely to be the first and last private project to date. However, similar projects run by the state could materialize.²⁰²

An example of the difficulties in enforcement is the drainage basin area of Ain al-Fijeh spring. The Damascus Water Supply and Sewerage Authority has complained to the government about illegal building in the protected area to the government, but according to stakeholders, no measures have been taken. Agriculture and small-scale industry are both important employers in the country not least due to its rapid population growth, which makes it difficult to enforce environmental regulations in both public and private sectors.

Lebanon

Despite Lebanon’s sound environmental law framework, poor governance of the water sector leads to problems in maintenance and, consequently, unsatisfactory performance.

Since the early 1970s, the government of Lebanon has sought to restructure the water sector’s administration and institutions. An administrative reform was introduced via laws in 2000. A reorganization process between municipalities and Regional Water Establishments (RWE) is currently ongoing. However, only two of the four Regional Water Establishments are operating because of a lack of funding.²⁰³ Recently, the United States Agency for International Development (USAID), in coordination with the Ministry of Energy

²⁰¹ Salman and Garces, *Irrigation Modernization*; INECO, *Institutional framework*.

²⁰² Personal communication with Rashad Kahwaji, ELARD.

²⁰³ Anonymous Lebanese politician, Beirut, May 2010.

and Water, has decided to support the Litani River Authority so that it can operate as a real river basin agency.²⁰⁴

The Ministry of Environment, responsible for the protection of water resources, was established in 1993 and is therefore still considered a young institution with little authority. In addition, the enforcement of environmental laws is stymied by the fact that the ministry operates without local administrations. Funds for the establishment of regional offices have not been allocated in the state budget so far.²⁰⁵

Major problems in the implementation of reform packages have been caused by the appointment of officials to the new institutions, as each large community in Lebanon wishes to be represented.²⁰⁶ Therefore, it is very hard to make changes in the prevailing organization, which would lead to changes in the balance between social and economic interests in water use.

Lebanon's water problem is not only a question of sufficiency of supply; water pollution is a major part of the problem. A plan has been made by the government for wastewater purification, but it lacks funding.²⁰⁷ Ways in which the private sector can participate in the financing and operation of the water supply and wastewater treatment should be considered. So far, the private sector has not taken any role in investments.²⁰⁸ Recently, however, the government has enacted legislation to initiate privatization in the sector.²⁰⁹

²⁰⁴ Euro-Mediterranean Information System on know-how in the Water sector, 'Lebanese Ministry of Energy and Water and US Government signed \$27.5 million memoranda of understanding for assistance to water sector' (26 August 2010), <http://www.emwis.org>. Accessed on 1 September 2010.

²⁰⁵ Mohammed Rahal, Lebanese Minister of Environment, Beirut, May 2010.

²⁰⁶ Kamar, *Lebanon Water Sector Overview*. Emmanuelle Kunigk, 'Policy Transformation and Implementation in the Water Sector in Lebanon: The Role of Politics', *Occasional Paper No 27. Water Issues Study Group*. (University of London, SOAS, 1999); Makdisi, 'Towards a Human Rights Approach', p. 382.

²⁰⁷ Anonymous environmental expert at the Lebanese Ministry of Environment, Beirut, May 2010.

²⁰⁸ Kunigk, 'Policy Transformation and Implementation', p. 19.

²⁰⁹ Makdisi, 'Towards a Human Rights Approach', p. 383.

Conclusions

In both Syria and Lebanon, groundwater and surface water supplies have diminished, mainly because of increased exploitation due to expanding irrigation, population growth and increasing standards of living and because of diminishing precipitation and increasing temperatures due to climate change. Syria has already been hit by water shortages, which are also expected to occur in Lebanon in the future.

In both countries, meteorological, hydrological and water quality monitoring are insufficient. Modern evaluation methods require not only data, but more research into the domestic hydrological features. The reason for this insufficiency in both countries seems to be the lack of resources in the environmental administration. In addition, the lack of funding affects the water infrastructure.

Wastewater treatment in both Syria and Lebanon is undeveloped, which leads to a deterioration in the quality of water. In Lebanon, a plan for wastewater treatment has been drawn up by the Ministry of Energy and Water during the last strategy period of the Ministry. Similar planning should be undertaken in Syria, too. Wastewater purification needs to be planned in its totality, taking into account the wastewater producers, the sewer network and the treatment facilities, as well as the recipients. To meet the water demand, the use of wastewater in irrigation should be increased, at least in Syria.

The rapid population growth is leading to an increase in water demand in densely populated areas. Lebanon has also witnessed migration from restless areas to the suburbs of Beirut. Part of the ongoing construction in these suburbs is illegal and difficult to control. In the case of the Damascus area, a comprehensive land use plan that takes into consideration environmental factors has been elaborated. This kind of planning could be effectively put to use in other rapidly growing areas in Syria. The participation of NGOs in planning should be developed in Syria, where the centralized administration is not used to engaging in dialogue with stakeholders and local people.

The implementation of the integrated water resources management concept (IWRM), an approach for ensuring the optimal management of water resources, could help in defining a new water policy that also contains climate change preparedness, mitigation and adaptation.

Data management and distribution is still a major issue hampering water governance in both countries. Water data are usually delivered as soft copies and, due to the disintegrated administration, information is difficult to obtain. The development of a common database for the use of all parties involved in water use, planning, and control, which has been suggested in Lebanon, is a good idea. Educating people to better understand the countries' water shortage and pollution problems is an important ongoing task. In Syria in particular, the training of farmers in irrigation and water use is needed. Awareness-raising might also help in the enforcement of environmental regulations.

Reducing centralization and the overlap between different bodies and governmental agencies in Syria has been suggested by many authors. The enforcement of legislation in both countries also needs to be strengthened. In Lebanon, the situation is difficult because changes in the administration might shift the prevailing power balance, which is not seen as desirable by the government due to internal stability considerations.

6 Water governance under reform: are the Arab societies ready for change?

The Levantine countries²¹⁰ share many features with the entire MENA region.²¹¹ Besides many cultural and socio-economic similarities, this region is exceedingly deficient in water. Among the world's macro regions, the MENA has by far the lowest supply of renewable water resources per capita. Its population, comprising 5% of the world's total, has access to a mere 0.8% of the planet's renewable water.²¹² Therefore, it is hardly surprising that the water sectors within the region are under extreme pressure when it comes to meeting the demands of their soaring population and fragile water-stressed ecosystems.

These challenges have recently been juxtapositioned in various studies²¹³ highlighting the vulnerability of the region to the threats of climate change, which may even jeopardize the region's political and social stability.

The governance structures of water resources in the MENA countries are undergoing hefty reform processes, which aim at improving the sector's efficiency, both in terms of water exploitation

²¹⁰ In this chapter, the following countries are included in the definition of the Levant: Occupied Palestinian Territories (Palestine), Syria, Lebanon, Jordan and Iraq.

²¹¹ Besides those above, the Middle East and North Africa (MENA) region includes the following countries: Morocco, Algeria, Tunisia, Libya, Egypt, Iran, Saudi Arabia, Kuwait, Qatar, Bahrain, United Arab Emirates (UAE), Oman and Yemen. Israel is not included in this analysis because its water governance and its externalities differ drastically from those of the other countries in the region.

²¹² World Bank, *World Development Indicators on CD* (World Bank: Washington D.C., 2006).

²¹³ Oli Brown and Alec Crawford, *Rising Temperatures, Rising Tensions: Climate Change and the Risk of Violent Conflict in the Middle East* (Winnipeg: The International Institute for Sustainable Development, 2009); Tolba and Saab, *Arab Environment: Climate Change*.

and human resources.²¹⁴ The public organizations such as ministries are very large, and often criticized for being overstuffed.²¹⁵

Water supply within the region can be augmented by only a relatively limited volume²¹⁶ and the focus in water management is moving towards the management of water demand and the conservation of water resources. Water demand management is seen as a solution for various economic, social and environmental purposes. This entails facets such as a fee structure for water services, recycling approaches, regulation policies, improvements in water distribution networks, irrigation technologies and so forth.

Crucial to all of these is the human component. The technological and institutional developments underlying the various possibilities to manage water demand are all preconditioned and linked to the 'human dimension' of the water sector, much more so than has been the situation with regard to the conventional supply management. Therefore, this chapter investigates the various facets related to this dimension.²¹⁷ The scope of the chapter is the entire MENA region, as

²¹⁴ Olli Varis, *Water management by 2030: Drivers, critical issues and policies for the MENA Region*. Water Governance in the MENA Region: Critical Issues and the Way Forward. An International Conference in Cairo, Egypt, 23–27 June 2007; E. Rached and D.B. Brooks, 'Water Governance in the Middle East and North Africa: An Unfinished Agenda'. *International Journal of Water Resources Development* 26:2010, pp. 141–155.

²¹⁵ Egypt's Ministry of Water Resources and Irrigation has over 70,000 employees. This Ministry is only one among the dozen ministries that are mandated to govern water issues in the country. With its sizeable public sector – which is increasingly argued to be seriously overstuffed, bureaucratic and inefficient – Egypt is not that different from the other 22 MENA countries.

²¹⁶ World Bank, *Making the Most of Scarcity: Accountability for Better Water Management in the Middle East and North Africa*. MENA Development Report (World Bank: Washington D.C., 2007).

²¹⁷ This article is based on the series of analyses that were made within the context of annual regional fora, organized by InWEnt capacity Building International Germany, Arab Water Council, and various regional partners since 2006. The fora have been summarized in the following documents: InWEnt, *Water Governance in the MENA Region: The Current Situation*. Extended Report (Bonn: InWEnt Capacity Building International Germany, 2006); O. Varis and C. Tortajada, *Water Governance in the MENA Region: Critical Issues and the Way Forward*. Extended Report (Bonn: InWEnt, 2007), Bonn; O. Varis and C. Tortajada, *Water Governance in the MENA Region: From Analysis to Action*. Extended Report (Bonn: InWEnt, 2009); O. Varis and C. Tortajada, *Water Governance in the MENA Region: Policies and Institutions*. Extended Report. (Bonn: InWEnt, 2010).

most of the features scrutinized are common to the whole region, with the Levant being no exception.

First, the demographic and socio-economic characteristics and related problems are scrutinized within the context of water resources management. After that, the chapter discusses two cultural aspects that function as determinants of the 'human component', namely: power distance and individualism vs. collectivism. These aspects are drawn from the model by Geert Hofstede²¹⁸, widely used in cultural comparisons and in the analysis of organizational cultures. Finally, the chapter concludes that the water governance structures in the MENA region exhibit much inertia in these aspects, which has been largely neglected in the contemporary discussion on water reform, as well as in the recent water sector policy documents of the region that operationalize the reform.

The external environment: changes and challenges

The MENA countries, including those in the Levant, are undergoing a speedy transition process, both in terms of demography and socio-economic development. The population is still growing much faster than in most parts of the world, with the exception of Sub-Saharan Africa. In addition, the MENA region is characterized by the concentration of people in relatively small geographical areas, usually located around water resources, and extremely rapid urbanization.

In the years between 2000 and 2030, the region's urban population is expected to roughly double from around 200 to 400 million, while the rural population will remain fairly stable. Urban growth is faster in the Middle East than in North Africa. In Syria, Iraq and Jordan, the urban population is expected to grow 2.2-fold within that period. In Palestine, growth will approach 3-fold whereas in Lebanon, it will be a modest 1.4-fold.²¹⁹

Consequently, the age structure poses particular challenges to social and economic development, including water sector

²¹⁸ G. Hofstede, *Cultures and Organizations: Software of the Mind* (Harper Collins Business: London, 1994).

²¹⁹ UN, *United Nations World Population Prospects: the 2004 Revision* (UN Population Bureau, New York, 2006).

development. Due to the soaring population growth rates, the proportion of young people is exceptionally high. Also, the size of the working-age population (15-64 years) keeps growing very quickly; by more than 5 million per year. Illustrative of the dimensions of this growth is the fact that the region's working-age population is growing much faster in absolute numbers than that of China, although the latter's economy is growing much more rapidly and the total population is four times the size of that of the MENA region.

Consequently, the economy should be able to expand accordingly and provide urban jobs for these new entrants. So far, the region has not been successful in this endeavour, and unemployment has been escalating for some decades. With few exceptions, the official unemployment rates are double-digit, rising to over 30% in some cases. Moreover, the actual rates may be notably higher because of statistical biases.

The region suffers from a low level of investment, which is a significant contributory factor in the unemployment problem.^{220 221} Net exports are negative; domestic demand exceeds production and the region exports less than it imports. Industrial production has grown by 1 to 4% per year since 2000 but the growth has been slower than the growth of consumption.

Economic development has not kept pace with the growth of the labour market nor with the overall global tendency, and the region's economy can be regarded as stagnating. From 1980 to 2005 the region's GDP per capita did not grow whereas the world average more than doubled. Trade, investments and industrial value added have all developed more slowly than the population has grown. Only environmental degradation has been growing rapidly, much faster than the world average or the region's population.²²²

The harsh equation of creating economic growth and employment is further convoluted by the generally low education level,

²²⁰ B. Lewis, 'Free at last? The Arab world in the twenty-first century'. *Foreign Affairs* 88 (2): pp. 77-88.

²²¹ World Bank, *Middle East and North Africa Region 2007 Economic Developments and Prospects* (Washington D.C.: World Bank, 2007).

²²² O. Varis and K. Abu-Zeid, 'Socio-economic and environmental aspects of water management in the 21st century: trends, challenges and prospects for the MENA region'. *International Journal of Water Resources Development*, 25 (2009), pp. 507-522.

which resembles that of Sub-Saharan Africa. Slums and social marginalization are on the increase. The average urban slum incidence in the region is 30.7%, but varies a lot between countries, being at its highest in Yemen (65%).²²³

Water is being utilized in large quantities for low-value uses in agriculture while urban areas keep mushrooming.²²⁴ In most countries, agriculture accounts for over four-fifths of all water withdrawals but contributes from only a few per cent to a maximum of one-fifth of the countries' GDP. Even so, the level of self-sufficiency in agricultural products is far from possible due to the arid climate. Apart from its relatively small contribution to the national economy, agriculture, however, performs an important social function, providing rural employment, political stability and self-reliance in certain food items, but in macroeconomic terms it poses an enormous challenge.

A clear example is Syria, where the Ba'thist regime has heavily promoted water-intensive agricultural production for over four decades, not investing sufficiently in education or other economic sectors.²²⁵ Consequently, water use is exceedingly high and the country faces serious water-related shortages and challenges. At the same time, the economic development has stagnated.

Another example is the MENA region's water-scarcest country, Jordan, where the agricultural sector accounts for 75% of all water consumption and produces a mere 2% of the GDP.

Increasing the volume of imports of agricultural products²²⁶ requires exports of goods and/or services to a greater extent in order to reach an exchange balance. Hence, the productive sector would require a strong growth trajectory. Therefore, we should ask how to develop the water sector so as to make the MENA region's countries more attractive targets of productive investments and less dependent

²²³ UN-Habitat, *Slums of the World: The Face of Urban Poverty in the New Millennium?* (Nairobi: UN Habitat, 2003).

²²⁴ Most of the endorsed issues by reform proponents such as decentralization, cost recovery, economic instruments, implementation of laws, private sector involvement, stakeholder participation, adaptation of costly, non-conventional water technologies such as recycling and desalination, and many others often have totally different shades in the informal sector than in the formal sector.

²²⁵ Barnes, 'Managing the Waters'.

²²⁶ The region imports over 50% of its food. See: Brown and Crawford, *Rising Temperatures*.

on natural resources, such as water. As the region's industrial development has suffered from stagnation in the past decades, there is certainly room for new industries²²⁷: one Malaysian or one Finn currently produces as many exportable high-tech products as 280 MENA citizens.²²⁸

Water sector under reform pressures

As the water sector's external environment changes rapidly, the sector should react and, better still, be proactive and lead the policy progress and reform within the region. The performance of the sector is currently progressing²²⁹, but does not yet comply with internationally set targets.²³⁰ The ability of the governance systems to live with the present dynamism and to master change is a crucial element in the attempt to speed up the progress.

Given the momentous external pressures and drivers that will affect water sector development in the MENA countries in the next few decades, various aspects that call for water sector reform are equally diverse. At present, the attention is shifting simultaneously on many levels (see below). While the scale of relevance and importance of these identified factors varies by country, they appear to be generally applicable within the region's countries. Typical is the unhurried progress in almost every country²³¹:

- Towards stronger enforcement of laws and policies
- From rural to urban
- From centrally planned to market-oriented
- From low-value uses to high-value uses
- From public sector to inclusion of private sector and civil society
- From centralization to decentralization

²²⁷ World Bank, *Making the Most of Scarcity*.

²²⁸ World Bank, *MENA 2007 Economic Developments and Prospects*.

²²⁹ Rached and Brooks, 'Water Governance in the MENA'.

²³⁰ O. Varis, 'Right to Water: The Millennium Development Goals and Water in the MENA Region'. *International Journal of Water Resources Development*, 23 (2007), pp. 243-266.

²³¹ InWent, *Water Governance in the MENA Region*; Varis and Tortajada, *From Analysis to Action*.

- From supply provision to demand management
- From water quantity to inclusion of water quality
- From traditional to modern
- From fragmented to more coordinated policies and inter-disciplinarity
- From unclear to clear and coordinated responsibilities
- Towards increasing reuse and water conservation.

Tackling these shifts successfully is challenging, particularly due to technological shortcomings, insufficient data and information, especially in terms of reliability, accessibility and sharing, and the lack of public awareness and political will. In this respect, the capacity-building requirements are enormous.

Are power structures and societal rules evolving to allow modernization?

Water-related challenges are not only painfully evident but also rapidly increasing in the region's countries. Obviously, a thoroughgoing water sector reform is called for: institutions and organizations need extensive reform, and organizations and their staff should function in an efficient, adaptive and coordinated manner. But how ready are the societies to change?

It is crucial to recognize that a governance system is not synonymous with a government. The water sector governance system includes the entire society with various stakeholders, administration units, individuals, households, traditional communities, and business corporations. The civil society in the region is underdeveloped, and cannot exert development pressure on the state in any of the MENA countries²³², so this aspect deserves particular attention.

Along with the rapid urbanization process and the parallel shift from a traditional agrarian society to modern occupations, the entire MENA region is undergoing a profound societal transition. This has

²³² B.S. Al-Najjar, 'Civil Society in the Arab World: A Reality That Needs Reforming'. *Contemporary Arab Affairs*, 1 (2008), pp. 43-54.

its implications for the prevailing societal rules, consisting of ethical and moral codes, laws, customary laws, commitments, and so forth.

Power structures are also undergoing change in this transition.²³³ The growing emphasis on issues such as participation, stakeholder involvement, open information flows, decentralization, a smaller role for the government, from top-down management to strategic policy development, are some indicators of this. As Olli Varis and Cecilia Tortajada argue, ‘training has to be looked at as a right to further develop the capacities of a person to perform better and to advance in his/her professional career rather than as a patronistic reward mechanism’.²³⁴

In his model on organizations and cultures, Geert Hofstede²³⁵ distinguishes between ‘high power distance’ and ‘low power distance’ types of behaviour (see Table 2). The characteristics of the former are very common to contemporary water sector organizations in the MENA countries, whereas the reform processes and vision exercises call for the prevalence of the latter, as shown above. Whether the societies are ready to accept and carry out such a very profound paradigm shift is a big and open question.

Table 2. Differences between societies characterized by high and low power distance

High power distance	Low power distance
Might prevails over right	The use of power should be legitimate
Centralization is popular	Decentralization is popular
Subordinates expect to be told what to do	Subordinates expect to be consulted

Equally open and big is the question of the willingness of traditional collectivist societies to adapt to essentially more individualistic values. The individualist vs. collectivist dimension of Hofstede (see Table 3) is thus of particular interest within the process for modernization of the MENA countries. He defines this dimension in the following way:

²³³ Varis and Tortajada, *From Analysis to Action*.

²³⁴ Varis and Tortajada, *Critical Issues and the Way Forward*.

²³⁵ Hofstede, *Cultures and Organizations*.

*Individualism pertains to societies in which the ties between individuals are loose: everyone is expected to look after himself or herself and his or her immediate family. Collectivism as its opposite pertains to societies in which people from birth onwards are integrated into strong, cohesive in-groups, which throughout people's lifetime continue to protect them in exchange for unquestioning loyalty.*²³⁶

Cultures in different parts of the world differ considerably along this axis, but typically, traditional societies are regarded as being dominated by collectivist behaviour whereas wealthier and more educated societies tend to behave more in the individualistic manner.²³⁷ The traditional Arab society has very strong collectivist values²³⁸ and presumably this cultural feature is reflected within the contemporary institutional set-up of governments in the MENA region.

Table 3. Differences between collectivist and individualist societies

Collectivist	Individualist
People belong to extended families or other in-groups that continue to protect them in exchange for loyalty	Everybody grows up to look after him/herself and his/her immediate (nuclear) family only
Identity is based on the social network one belongs to	Identity based on the individual
Purpose of education is learning how to do	Purpose of education is learning how to learn
Relationship prevails over task	Task prevails over relationship
Laws and rights differ by group	Laws and rights are supposed to be the same for all
Dominant role of the state in the economic system	Restrained role of the state in the economic system

²³⁶ Neumann, Mikel, *Home Groups for Urban Cultures* (Pasadena: William Carey Library, 1999), pp. 32-33.

²³⁷ R. Veenhoven, 'Quality-of-life in individualistic society'. *Social Indicator Research*, 48:2 (1999), pp. 159-188; V. Miroshnik, 'Culture and International Management: A Review'. *Journal of Management Development*, 21:7 (2002), pp. 521-544; K. Hutchings and D. Weir, 'Understanding Networking in China and the Arab World: Lessons for International Managers'. *Journal of European Industrial Training*, 30:4 (2006), pp. 272-290.

²³⁸ E. Feghali, 'Arab Cultural Communication Patterns'. *International Journal of Intercultural Relations*, 21:3 (1997), pp. 345-378; M. I. Ayish, 'Beyond Western-Oriented Communication Theories: A Normative Arab-Islamic Perspective'. *The Public*, 10:2 (2003), pp. 79-92.

The water sector institutions in the MENA region seem to be under considerable pressure for a profound paradigm shift from a collectivistic organizational culture towards a more individualistic one, as the urban, better-educated and economically well-off echelons of society grow in volume and importance. A vision analysis for the region's water sector by Varis and Tortajada argues that, 'as a prerequisite there must be a change in philosophy and mentality at the manager's level [so that] people with the respective capacity for a certain job are employed – not those who have good connections'.²³⁹

The 'collectivistic', gigantic public sector organizations need to streamline their operations. Responsibilities should be made clear; the level of education and organizational accountability as well as transparency should be radically improved. Corruption should be kept in check, along with the power of influential in-groups. Otherwise there is not much hope for the success of the thoroughgoing reforms which are so badly needed in the region's water sector.

The prevailing mental and institutional landscape has deep cultural roots, and it is therefore not easy to change it through a governance reform such as the one envisaged for the water sector. Ziad Hafez²⁴⁰ has pointed out the continuing importance of power struggles between factional groupings in the landscape of Arab societies. Gaining absolute power over competing groupings is seen as far more important than development or economic progress, which is a very clear collectivistic behavioural feature. Hafez argues that factionalism controls practically all aspects of Arab society, from political to cultural, and concludes by saying:

No political and economic reform will succeed if there is no will to transform the factionalist-based political system into a participative system involving all segments of society and the rent-based economy into a production-based one where accountability and responsibility would sanction performance.

Changes are called for, but are those in power comfortable with all the insecurities and challenges that those changes will bring?

²³⁹ Varis and Tortajada, *Critical Issues and the Way Forward*.

²⁴⁰ Z. Hafez, 'The Culture of Rent, Factionalism, and Corruption: A Political Economy of Rent in the Arab World'. *Contemporary Arab Affairs*, 2 (2009), pp. 458-480.

Concluding remarks

The governance of the MENA water sector is currently labouring under the multi-dimensional pressures of a paradigm shift. At the same time, the mindsets of the people are evolving due to improving educational levels, urbanization, transformation to an increasingly dynamic and individualistic modern society, and the ongoing political and social reform processes.

The MENA region is facing some particularly interesting dilemmas within its water sector development:

- Water is scarce, but most water is utilized for relatively low-value purposes.
- The urban population is growing rapidly, but the urban productive sector is not sufficiently addressed by water policies in comparison to agriculture, for instance.
- Notable governance shortcomings exist and they may be more significant than the physical scarcity.
- Water sector organizations are massive in terms of the number of employed people, but everybody seems to agree that human resources development and capacity-building are extremely important. Inertia is rife throughout the system and changes are difficult to carry out.

It is obvious that the mindsets of professionals, the institutional and organizational set-up, as well as the entire power structures within the countries need reconsideration if these dilemmas are to be successfully resolved.

It may happen that if the institutions are modernized too rapidly, the gap between the educated individuals in such a modern sector and the still large traditional part of the society will grow so big that the institutions will be at risk of losing their ownership among the traditional societal echelons.

Another risk is the potential dissatisfaction that emerges from unemployment and weakening social security in the event that the public sector organizations decrease their workforce due to the streamlining of organizations and the outsourcing of activities. The stagnating economy is doing nothing to help the already inflamed situation.

A third risk is that the power structures in the countries are simply too unyielding and rigid to allow any considerable changes, unless the internal or external socio-political pressure starts to challenge the stability of the country, and the subsequent changes are driven by the tactics of the powerful elite to stay in power rather than the need to solve the dilemmas outlined above.

Navigating the stormy waters between these three risks won't be easy. Those powerful within the governance systems of the water sector in the MENA region countries should, in the author's view, pay more attention to the continuous changes that take place in the societies as a whole as well as within the water sector itself. The success of any long-term vision on water governance for the MENA region will thus require proper understanding of the immense modernization-related challenges and changes that are likely to be faced in the coming years.

The governments need to define the ways in which these can best be understood and addressed for the overall socio-economic benefit of the region. This will not be an easy task, but one that must be undertaken in order to avoid the further accumulation of pressures for change on the region's societies. It remains to be seen whether the societies as well as those in power are ready for this.

7 Islam and water: Islamic guiding principles on water management

Islam is a recognized power both politically and socially in most of the Middle Eastern states. Of the states in the region that have written constitutions, only Lebanon and Turkey are without an established religion.²⁴¹ Islamic values should therefore not be underestimated as far as the masses are concerned, especially when the contemporary trend in the Muslim world has been towards increasing historical and religious self-assuredness.²⁴² Thus, when dealing with water questions in the region, it is also crucial to understand the Islamic guiding principles concerning water.

This chapter is divided into two parts. In the first part, general Islamic environmental aspects and water-related guiding principles, such as water priorities and water ownership, are presented. The second part illustrates the importance of Islamic values and the potential for their practical application in contemporary Muslim societies through the presentation of examples from the areas of international law and education. In the case of international law, the chapter suggests that solutions derived from Islamic principles could play a role in settling disputes. The chapter also argues for an emphasis on education and public-awareness programmes as possible methods of changing environmental attitudes and raising environmental awareness in these countries. In Islam, everyone is responsible for education, from the family level to the whole society. Due to the importance of Islamic values, it is argued that they should be better taken into account in future changes affecting Muslim societies.

²⁴¹ Bernard Lewis, *What Went Wrong? The Clash between Islam and Modernity in the Middle East*, (London: Weidenfeld & Nicolson, 2002), p. 108.

²⁴² Mawil Izzi Dien, 'Islam and the Environment: Theory and Practice', *Journal of Beliefs & Values*, 18:1 (1997), p. 54.

Islamic environmental and water philosophy

Before becoming the general term for law, the Islamic law, sharia, meant ‘the law of water’. Therefore, it is hardly surprising that the Quran and the *hadiths* contain a remarkable number of specific statements about water.

Islam is often described as a value system, which prescribes a way of life that goes beyond the performance of religious rituals. The Arabic word for religion, *dīn*, appears 90 times in the Quran and, in essence, it describes an integrated code of behaviour which deals with various topics. Islam provides a holistic approach to existence and it does not distinguish between the sacred and the secular. Therefore, there is also no differentiation between human beings and nature.²⁴³ The Arabic word *ma’*, water, is mentioned 63 times in the Quran and has a specific religious significance for Muslims through *wudu*, ablution, and *ghusl*, bathing.²⁴⁴

In the ethical foundation of Islam there are three basic principles which can collectively be seen as providing the basis of an Islamic conservation practice. They are *tawhid*, *mizan* and *khalifa*. *Tawhid* means unity of the Creator and His creation and forms the basis of the holistic approach. *Mizan* is the principle that every aspect of creation holds together because there is a balance. Maintaining natural systems (mentioned in the Quran in verses 13:8, 15:21 and 25:2) can therefore be understood as maintaining *mizan*. *Khalifa* has generally been understood by Muslims to mean ‘vice-regent’, thus referring to stewardship or trust, *amanat*, and identifies the responsibility and the role of the human being as a vice-regent of the earth. Within the hierarchy of creation, the Quran accords humans a special status as God’s *khalifa*. The Quran states that ‘all that is in the earth’ has been subjected to humans (22:65) and that ‘it is He who has created for you all things that are on earth’ (2:29). A significant difference between humans and other beings is that humans alone possess free

²⁴³ Fazlun M. Khalid, ‘Islam and the Environment’, in Peter Timmerman (ed.) *Encyclopedia of Global Environmental Change*, Volume 5, Social and Economic Dimensions of Global Environmental Change, (Chichester: John Wiley & Sons, 2002), pp. 332–339.

²⁴⁴ Hussein A. Amery, ‘Islam and the Environment’, in Naser I. Faruqui, Asit K. Biswas, and Murad J. Bino (eds.) *Water Management in Islam* (Tokyo: United Nations University Press, 2001), pp. 39–48.

will (*taqwa*) and are thus accountable for their actions. Humans will accordingly be held accountable for any acts of destruction committed against the earth (2:205, 7:85). Wastefulness, overconsumption and hoarding are also forbidden (7:31). The protection and regulation of water and watercourse are central requests in the Quran and are to be regarded as common property (54:28).²⁴⁵

Among the important *hadiths* concerning water are Prophet Muhammad's prohibition to his followers to waste water, even in situations where it is abundant or when it is used for holy purposes (Musnad ii, 22), and his saying: 'Muslims have [a] common share in three things: grass (pasture), water and fire (fuel)' (Abu-Dawood 3470) is telling.²⁴⁶ Prophet Muhammad also decreed that no more than an ankle depth of water could be taken for irrigation. One ankle was to be sufficient for one season. According to the *hadith* of Muslim (553), Muhammad forbade urination into stagnant water. Muslim scholars have annexed penalties to the misuse of water, including the pollution or degradation of clean water. This could lead to the punishing or fining of acts of pollution through modern contemporary legislation.²⁴⁷

General concepts in sharia with explicit references to the environment are *harim* and *hima*. The institution of the protected zone, *harim*, prohibits the development of certain areas, mainly riverbanks, for the purposes of protecting watersheds. A related institution is preservation, *hima*, which usually entailed the protection of trees and wildlife. Some traditional *harims* and *himas* still exist today, but they are greatly reduced from former times and are on the wane.²⁴⁸

There are two clear principles regulating water demand management in the Quran. The first is that the supply of water is fixed (40:18) and the second is that water should not be wasted (7:31). The interpretation is that water demand must at some point be managed because supplies cannot be increased indefinitely. There are two *hadiths* which illustrate this even more clearly. According

²⁴⁵ Richard C. Foltz, 'Ecology and Religion: Ecology and Islam', in Lindsay Jones (ed.) *Encyclopedia of Religion*, Second Edition (Detroit: Thomson Gale, 2005), pp. 2651-2654.

²⁴⁶ Naser I. Faruqi, 'Islam and Water Management: Overview and Principles', in Faruqi et al. (eds.) *Water Management in Islam* (Tokyo: United Nations University Press, 2001), pp. 1-32.

²⁴⁷ Faruqi, 'Islam and Water', pp. 3-4.

²⁴⁸ Foltz, 'Ecology and Religion', p. 2652.

to al-Bukhari (1.200), the Prophet used to perform ablution with one *mudd* (approximately two-thirds of a litre) and used to take a bath equal to 2-3½ litres. Water was not to be wasted even when the ablution was performed on the bank of a large river (al-Tirmidhi 427). Considering these clear references, contemporary Muslim societies could promote water conservation more widely.²⁴⁹

Water distribution priorities

Over time, three specific water rights have been established. The first of these is the law of thirst or the right of humans to drink or slake their thirst; the second is the right of cattle and household animals; and the third is the right of irrigation. The legal texts contain detailed instructions on the distribution of water resources.

In the Levant, water allocation patterns are heavily biased: 80% to the agricultural sector, 10% to industry and 10% to the domestic sector. Despite heavy and often inefficient irrigation, the reality is that most countries in the Levant do not have sufficient water for national food self-sufficiency. According to Naser I. Faruqi, one of the world's leading researchers in the field of water management, the priority should therefore shift from national food self-sufficiency to national food security or to regional food self-sufficiency. The link to Islamic law is the rule that irrigation comes third in the hierarchy, after humans and cattle. As the rapid population growth in the region forces states to renegotiate their water priorities, intersectoral reallocation of water according to Islamic law would be one option.²⁵⁰

The low coverage of water supplies in the MENA region is problematic also from the Islamic point of view. The reliance on informal supplies of water bought from private vendors increased the water price in the 1990s from ten to twenty times more per litre than the rates paid by residents receiving a piped water service. In some municipalities the price rose in the 1990s to eighty or one hundred times more than regular water rates. This is due to informal settlers in and around cities that live in unplanned communities, as well as the legal or political restrictions imposed on public utilities. The strong

²⁴⁹ Faruqi, 'Islam and Water', pp. 5-6.

²⁵⁰ Ibid., p. 16.

sense of equity in Islam is clearly not being fulfilled and the right to slake one's thirst (*haq al shafa*) is being compromised.²⁵¹

Water distribution has clear-cut legislation in Islam. In general terms, the rules are based on the principle of benefiting all those who share the watercourse, which includes groundwater and wells. Water rules are laid down according to the origin of the water source and these are divided according to the size of the source, the kind of water it provides and its usage. The sources are divided into rivers, water springs, wells and rainwater. Rivers are divided into natural rivers, large and small rivers, human-dug canals and irrigation channels. Large public rivers (*anhūr 'amma*) such as the Tigris, the Euphrates and the Nile belong, according to the standard textbooks of Islamic law, to the entire community and everyone can benefit from them, providing that no harm is caused to others. The right of flowing water (*haqq al-majra*) is recognized and protected in Islam.²⁵²

Water ownership

Water cannot be privately owned in its natural state since it is considered common property and a gift from God. Restrictions on common use increase with the growing scarcity but possessors with usufruct rights, according to Islam, may not withhold water that is surplus to their own needs. Farmers who develop land for irrigation agriculture have the right to a fair share of the available water. Irrigation water may not be withheld from livestock unless damage to irrigation facilities or failure of crops is likely to result.²⁵³

Even though water cannot be privately owned in the strictest sense, three categories of water ownership have developed based on the conclusions of Muslim scholars. Since it is better according to a *hadith* (Muslim 1727) to go to the woods and cut and sell timber than it is to beg people for help, individuals and groups have the right to use, sell and add value costs to most categories of water. If the water

²⁵¹ Ibid., pp. 4–5.

²⁵² Dien, 'Islam and the Environment', pp. 55–56.

²⁵³ Othman Abd-Ar-Rahman Llewellyn, in Richard C. Foltz, Frederick M. Denny & Azizan Baharuddin (eds.) 'The Basis for a Discipline of Islamic Environmental Law', *Islam and Ecology. A Bestowed Trust* (Cambridge: Harvard University Press, 2003), pp. 185–247.

is in personal containers, treatment plants, distribution systems or reservoirs, it is considered private property and the owner has the right to use, sell or trade it. The second category of water ownership is restricted private property, which includes lakes, streams and springs located on private land. The owner has special rights and can trade water within these limits, but also has certain obligations towards others. Public property is the third form of water ownership and refers to the water in rivers, lakes, glaciers, aquifers and seas, and from snow and rainfall. This kind of water in its natural state cannot be bought or sold. However, if infrastructure and knowledge have been invested in withdrawing it, then the water becomes private property.²⁵⁴

Since recovering costs for providing water is allowed in Islam, a problematic question is what a fair tariff would then be. According to Islam, a fair tariff will lead to greater equity across society. At the same time, full-cost pricing is allowed in accordance with the religion. Different countries have solved this in various ways and, for example, in Iran irrigation water must be sold at the average cost price with both operation and maintenance costs and capital depreciation included.²⁵⁵

In Islam, riparian landowners have senior usufruct rights in the case of a naturally occurring water source that is not sufficiently plentiful to allow unrestricted use. The upstream riparian user may take the amount of water allocated to his crops and release the surplus water to the next user downstream, who in turn releases his surplus to the next and so on until the needs of all farms are satisfied or the flow has been exhausted. If a new farm is cultivated upstream, the farms that were first established take priority and the new farm receives a share only after the previously established farms have been irrigated. This is meant to ensure that future users will not harm a farmer's investment in the resource.²⁵⁶ It does not, however, mean that upstream riparian states can ignore downstream states. When it comes to large public rivers, all communities along the river have the right to benefit from the water.

²⁵⁴ Faruqui, 'Islam and Water', p. 12.

²⁵⁵ *Ibid.*, pp. 13-14.

²⁵⁶ Lewellyn, 'The Basis for a Discipline', pp. 204-205.

The owner of a well has senior usufruct rights similar to those of riparian landowners. The well owner may not withhold surplus water beyond his needs, nor may he pollute or deplete it to the extent that he causes previously established wells to fail.²⁵⁷

Islam and international law

Water management principles should not only guide interactions between individuals but also between sovereign states due to the simple fact that water does not follow national boundaries. On an international level, the International Law Commission (ILC) drafted an outline of thirty-three articles concerning global water management, which was approved by the United Nations General Assembly in 1997. The Convention on the Law of the Non-Navigational Uses of International Watercourses (A/RES/51/229) is still awaiting ratifications by member states before it can enter into force. Among its central principles are the equitable and reasonable utilization of international rivers (article 5), the avoidance of significant harm and compensation (article 7), cooperation among riparian states (article 8), and the protection and preservation of international rivers and associated eco-systems (articles 5, 8, 20 and 21).²⁵⁸

These international law principles are in accordance with Islam because they are based on universal values. Moreover, the selfsame values are embodied in the Islamic understanding of water as a gift from God and hence that all creatures have the right to drink, that water should be apportioned equitably for other uses, and that no one has the right to withhold surplus water from others. The concept of avoiding significant harm to others is illustrated by the *hadith* ‘he who eats to his fill while his neighbour goes without food is not a believer’ (Shu’ab Al-Imam-Baihaqi), which can be applied to drink as well as food. The word ‘neighbour’ here can be understood as an individual or a neighbouring state. If harm occurs, according to Islamic law, it carries a liability and the one against whom it is committed must be compensated. In addition, relevant universal values are embodied

²⁵⁷ Ibid., p. 205.

²⁵⁸ Faruqi, ‘Islam and Water’, p. 21.

in the emphasis of Islam on protecting and preserving water and its ecosystems by avoiding *fassad* (mischief or harm).²⁵⁹

However, universal values and international conventions can at best only serve as non-enforceable guidelines when states decide to act otherwise. Many international water-sharing conflicts currently exist, including the disputes between Syria, Iraq and Turkey on the sharing of the Euphrates and the Tigris. Because international law-based water management principles are strongly and explicitly supported by Islam and since Islam can be argued to be a potentially important basis for settling disputes, an Islamic council authorized to mediate and judge in such cases could be a viable option for predominantly Muslim nations to consider, as Faruqui has suggested. Islamic law has a considerable amount of legislation that could provide a possible basis for international arbitration when disagreements and disputes arise.²⁶⁰

Islam in environmental education

Surveys on environmental education in Muslim societies indicate that ordinary Muslims prefer being educated about environmentalism by their religious leaders. In a Jordanian survey from the early 1990s, the majority of the respondents (64%) believed that Imams should take an active role in environmental education and public awareness, while a third (34%) felt that Imams were already doing so. According to Atallah, Khan and Malkawi, it is common in the Eastern Mediterranean region to promote human well-being in all aspects of life, including education, through the use of Islamic concepts. By this approach, education systems based on Islamic principles offer forums for delivering Islamic teachings, and the mosque, as is well known, is one of the most efficient places to reach the public in all topics concerning daily life.²⁶¹ It should, however, always be kept in mind that a purpose-oriented application of Islamic principles does

²⁵⁹ Ibid., pp. 21-22.

²⁶⁰ Ibid., p. 22.

²⁶¹ Sadok Atallah, M. Z. Ali Khan & Mazen Malkawi, 'Water Conservation through Public Awareness Based on Islamic Teachings in the Eastern Mediterranean Region', in Faruqui et al. (eds.) *Water Management in Islam*, (Tokyo: United Nations University Press, 2001), pp. 49-60.

not come without its problems. As is well known, by focusing on selected parts of Islamic teachings, local mosques have been used, for example, as forums for spreading radical Islamism.

Local policymakers are becoming increasingly cognizant of the value of including religious and cultural aspects in public awareness and education strategies. Islamic teachings on water conservation are also beginning to be included in water demand management strategies in Muslim countries. As early as the 1990s, in a joint programme between the Ministries of Water Sources, Awqaf and Islamic Affairs, imams in Amman were educated on water scarcity in Jordan and on the need for public cooperation.²⁶²

Atallah, Khan and Malkawi also argue that promoting the conservation of the environment within the Islamic faith is productive: using the Islamic educational system to raise public awareness has a beneficial effect on the level of environmental knowledge. Therefore, they accentuate the fact that for public awareness programmes to be as efficient as possible they need to be holistic and multidisciplinary, and include both religious and social aspects.²⁶³ According to Imfadi abu-Hola, Associate Professor in environmental ethics at Yarmouk University in Jordan, environmental education and multi-cultural education share several similarities through emphasizing values such as the importance of education, empowerment and active citizenship. Further common features are valuing diversity, respect and compassion. Also, both have a global perspective.²⁶⁴

Water protection principles that heed the local religious context are, according to Hussein Amery, likely to be more effective than imported, foreign environmental principles. Amery, an expert in Levantine water issues, goes on to say that Islamic teachings embrace possibilities to develop water and environmental protection, which is in accordance with Islam through the capacity of humans as *khalīfa*. It is part of the obligation of humans to protect and care for the environment.²⁶⁵ Since Islam has an influence on people's perceptions,

²⁶² Faruqui, 'Islam and Water', p. 6.

²⁶³ Atallah, Khan & Malkawi, 'Water Conservation through Public Awareness', pp. 49-50, 57.

²⁶⁴ Imfadi abu-Hola, 'An Islamic Perspective on Environmental Literacy', *Education*, 130:2 (2009), pp. 195-211.

²⁶⁵ Amery, 'Islam and the Environment', pp. 39-41.

religious values and rules are among the most effective factors affecting and shaping individuals' behaviour and attitudes towards various issues of life.²⁶⁶ There is a growing environmental awareness in the Levant that can be observed, for example, in the teachings in mosques and religious schools. Some scholars argue that these forums constitute an effective domain for reaching people. However, environmental awareness programmes should not be confined to this domain, but should also extend to the education system as a whole.²⁶⁷ Literacy, including water management and environmental literacy, is a never-ending process, which should be continuously promoted and encouraged at all levels and in all sectors. If environmental literacy were understood in a broader sense, through the inclusion of the social, cultural and ecological dimensions, this would also work for the goals of effective education.²⁶⁸ Unfortunately, this method has not been efficiently used. Water conservation must involve everyone and requires a change in behaviour, which involves social and financial costs. Isolated projects or activities will not achieve the required results.²⁶⁹

Concluding remarks

As a recognized political and social power in the Levant, Islam as a holistic approach is best attained when considered in its local context. For example, according to the Iraqi scholar Mawil Izzi Dien, the main environmental problems in the Middle East are caused by a disruption of the prevalent value system due to a decline in morals: when spiritual or ethical values are not recognized as commercially important, this leads to a severe cultural rupture that takes people further away from their natural associations with the environment. In order to reverse the alienation from this natural relationship, Dien suggests reverting to the traditional Islamic relationship between

²⁶⁶ Abu-Hola, 'An Islamic Perspective', p. 198.

²⁶⁷ Faruqi, 'Islam and Water', p. 7.

²⁶⁸ Abu-Hola, 'An Islamic Perspective', pp. 198 and 210.

²⁶⁹ Atallah, Khan & Malkawi, 'Water Conservation through Public Awareness', p. 53.

humans and the earth²⁷⁰ while bearing in mind that Islam is not a magic word that can be uttered to solve all problems. As Dien writes:

*Islam as a religion has many difficulties when it comes to practice, not to mention those that have developed over the last fourteen centuries due to misunderstandings, misinterpretations, and misappropriation. Islam can only make sense if it is taken as a system and utilized in such a way that makes it applicable within the notion of 'submission' to the paradigm of tawhīd that governs the whole.*²⁷¹

Even though not all states in the Levant are outspokenly Islamic in their constitutions, it does not mean that Islam as a religion or social and political force would be diminished. On the contrary, it is argued here that Islam is one of the key elements shaping a common identity between the states in the Levant. This shared identity could then become beneficial in resolving not only the region's environmental problems, but also issues related to water distribution. Most of the countries in the Levant consider water distribution pivotal in solving many of the economic problems, such as those related to industry and irrigation.²⁷²

This chapter has presented general Islamic principles regarding environmental and water management and governance, based on the Quran and *hadiths*. It has emphasized Islam as a social and political power, as well as its possible role in helping to resolve transboundary water issues and increase awareness of water conservation. While the chapter has sought to demonstrate the versatility and universality of these religious principles and has given examples of their potential practical applications, the extent to which Islam actually influences practices in Muslim societies is a largely uncharted area. In general, there has to date been very limited research on the impact of Islam on environmental practices. In order to conceptualize the contemporary environmental situation in this regard, further research and fieldwork is of immediate interest.

²⁷⁰ Dien, 'Islam and the Environment', p. 56.

²⁷¹ Ibid.

²⁷² Ibid., p. 54.

8 Mobilizing funding in the water sector: the potential for private sector participation and desalination in the Levant region

The four neighbouring countries of the Levant, Jordan, Lebanon, Syria and Israel, are suffering serious consequences as a result of their water scarcity. At the same time, their water infrastructure is, excluding Israel, in a defective condition. As a consequence, the countries are planning massive investments in their water infrastructure over the next decade. The limited availability of public funding resources, however, is one of the most significant obstacles to developing the necessary water and sanitation services. To this end, this chapter argues that there is an urgent need to introduce increased private sector participation into the water and wastewater utilities sectors in these countries. The role of financing mechanisms becomes even more critical for communities in which expensive desalination remains the only drought-proof water supply alternative. This chapter discusses the role of desalination as one component of water infrastructure and the potential for private sector participation in water investments in this area.

Technical water management measures

Unlocking water scarcity calls for a focus on integrated water resources management, which entails taking into account both social, environmental and technical aspects. Since most of the renewable water resources in the Levant region are transboundary and originate outside of the region, integrated water management and adequate legal measures are of even greater importance. Most countries, however, suffer from weak water and environmental policies and a lack of management capacity. Also characteristic of

the Levant region is the fact that political aspects are inextricably intertwined with technical water management measures.

Technical water management measures can be divided into demand-side and supply-side measures. On the demand side, the measures include diminishing losses, technical measures to improve water efficiency, and the control or reallocation of water consumption.²⁷³ The two basic demand-side levers for balancing water use at a sustainable level are increasing the price of water and restricting the quantity available for use. Pricing mechanisms can be effective at reducing urban demand but are politically and technologically challenging in agriculture.²⁷⁴

Supply-side measures include, for example, more efficient use of existing resources, water harvesting, wastewater recycling, water imports, and desalination: a method for purifying salty water by removing dissolved salts via distillation or membrane separation. The emphasis in the Middle Eastern countries has long been on mobilizing new water supplies, while water use efficiency has received less attention. For example, Lebanon's domestic water consumption, over 200 litres per capita per day, is about 25% higher than in Finland.²⁷⁵

According to a report by the 2030 Water Resources Group²⁷⁶, closing the water gap through traditional supply measures, such as aquifer recharge and water transfer, would in many cases be costly: up to more than 0.10 USD/m³, which in many cases is more than the current cost of water production. The most expensive supply measures, like desalination, reach a cost of 0.50 USD/m³ or more. Alternatively, the cheapest measures for bridging the water gap would typically be efficiency measures in agriculture, such as totally

²⁷³ M. Mohsen, 'Water strategies and desalination in Jordan', *Desalination*, Vol. 203, pp. 27-46 (2007).

²⁷⁴ Venot, J-P, et al., *Irrigated Agriculture, Water Pricing and Water Savings in the Lower Jordan River Basin (in Jordan)*, Agriculture. Research Report 18. (International Water Management Institute Sri Lanka, 2005).

²⁷⁵ The Daily Star, 'Lebanon goes thirsty as municipalities fail to deliver water supply promises' (08 September 2010); Aquastat, 'Country Profiles, Lebanon'.

²⁷⁶ The 2030 Water Resources Group, *Charting Our Water Future*. Economic frameworks to inform decision-making (2009). The Members of the 2030 Water Resources Group include McKinsey & Company, the World Bank Group, and a consortium of business partners.

free irrigation scheduling or drip irrigation, costing typically 0.01–0.04 USD/m³.

Ultimately, implementing almost any water management measure requires political will as well as transparent, accountable, communicative, integrated and participative governance.²⁷⁷

The role of desalination in enhancing water security

Ocean water desalination is already a vast and important water source in water-scarce countries that are affluent. However, in the coming decades the Middle East will be up against such a dire water shortage that investing in desalination technologies may be inevitable. Thus, despite the high price of desalination, demand is growing steeply as it remains the only drought-proof alternative for many communities.

The international water market journal, *Global Water Intelligence*²⁷⁸, anticipates that global desalination capacity will almost double by 2016, from 68 million m³/d in 2009 to 130 million m³/d. The Middle East currently accounts for about 75% of global desalination capacity, Saudi Arabia being the largest desalinating country in the world. The relatively high energy consumption, 2–8 kWh/m³, and cost of desalination have not posed as big a challenge to the oil-rich countries of the region as they do to the lower-income Middle Eastern states, like those in the Levant.²⁷⁹

In general, electricity consumption and cost are the most critical factors when considering the viability of desalination. In addition, transport costs may be significant if the distance between water source and users is long or if the altitude difference is substantial.

²⁷⁷ Ahmad Wagdy and Khaled AbuZeid, 'Challenges of Implementing IWRM in the Arab Region' (CEDARE, 2006), <http://water.cedare.int/cedare.int/files15%5CFile2289.pdf>. Accessed on 15 September 2010.

²⁷⁸ GWI, *DeSal Markets 2010*, <http://www.desalmarkets.com/>. Accessed on 15 September 2010.

²⁷⁹ R. Denga et al, 'Integration of thermal energy and seawater desalination', *Energy Article in Press*, Corrected Proof (2009); S. Lattemann et al., 'Global Desalination Situation', *Sustainability Science and Engineering*, 2 (2010), pp. 7–39

Environmental externalities, like brine disposal, are not usually considered in the cost calculation.²⁸⁰

The cost of desalinated water is typically 1–2 USD/m³. At the most modern plants, like the Ashkelon reverse osmosis plant in Israel, the cost of desalinated water can be around 0.5 USD/m³.²⁸¹ One of the main development targets of desalination technologies is to reduce unit costs. This can be done by improving energy efficiency and recovery of energy. In the future, renewable energy solutions²⁸² and new technologies, such as nano-engineered and biomimetic membranes, may bring down the price. A new concern are the environmental costs, like low impact brine, a desalination by-product, and disposal systems, which raise the price of desalinated water.

The United Nations Economic and Social Commission for Western Asia (ESCWA) has made full cost calculations for desalination in selected cities in the region.²⁸³ In the case of Amman and Damascus, the transport distances are long (270 and 180 km), and altitude differences considerable (890 and 680 m). The estimated costs (including capital, operation and transport costs) are about 2.6 USD/m³ for Amman and 2.5 USD/m³ for Damascus. In comparison, the full cost in Gaza City on the seaside is clearly lower, 1.5 USD/m³.²⁸⁴

As Table 4 shows, the desalination capacities of Jordan and Israel have grown significantly during the past decade, whereas the capacity increase in Lebanon and Syria has been slight.

²⁸⁰ ESCWA, *Role of desalination in addressing water scarcity*, ESCWA Water Development Report 3. E/ESCWA/SDPD/2009/4. (New York: United Nations, 2009).

²⁸¹ Watertechnology.net, 'Ashkelon Seawater Reverse Osmosis (SRWO) Desalination Plant, Israel', <http://www.water-technology.net/projects/israel/>. Accessed 7 September 2010; The 2030 Water Resources Group, *Charting Our Water Future*.

²⁸² Although the cost of, for example, solar power in many parts of the world is higher than that of fossil energy, it is expected to be more competitive in the future.

²⁸³ According to ESCWA (*Role of Desalination*), the data are quite varied because there are no standardized models for cost estimates.

²⁸⁴ ESCWA, *Role of Desalination*.

Table 4. Desalination capacity and increase from 2000 to 2008²⁸⁵

Country	Installed capacity, thousands of m ³ /day		Capacity increase (%)
	2000	2008	2000–2008
Jordan	14	227	1550
Lebanon	26	28	9
Syria	12	13	17
Israel	100	440	340

The need for private sector participation in desalination

Private sector participation in water investments is sought by Middle Eastern countries mainly due to the expertise of the private sector and the lack of public sector funding. The water and sanitation sector has been chronically under-financed, which has resulted in water scarcity, inefficient use of water, and infrastructure deterioration. The Islamic Development Bank estimates that Arab countries may need to invest up to 200 billion USD in water-related infrastructure over the next decade. In order to plug this huge gap in financing in the short and medium term, access to repayable funds like private financing is critical.²⁸⁶ Project finance and public-private partnerships (PPPs) are already widely used in some parts of the MENA region: in particular, the Gulf states, Morocco and Israel have shown support for PPPs. Most PPP projects in the MENA region have been, and continue to be, in the power-generation and desalination sector.²⁸⁷

In the case of desalination, private sector participation (PSP) is needed not only for raising funds for the capital-intensive plants, but also because the latter require specific high-tech knowledge. Therefore, in the case of many current large projects, investments by private international water companies are desirable, or even necessary. So far, European water giants like Veolia Water, Suez

²⁸⁵ ESCWA, *Role of Desalination*.

²⁸⁶ OECD, *Innovative Financing Mechanisms for the Water Sector* (Paris: OECD Publishing, 2010).

²⁸⁷ Jennifer Deane, 'Private sector participation in desalination in the Mediterranean Middle East (MME) - past, present and future', *Desalination* 152:1-3 (2003), pp. 57-66.

Energy International and RWE, have been active players in Middle Eastern desalination markets. In many countries, popular solutions with regard to private sector participation in the desalination sector have been the BOT (Build, Own, Operate, Transfer) and BOO (Build, Own, Operate) or a similar approach. In practice, private sector participation in desalination projects has reduced the need for water subsidies and has increased transparency.²⁸⁸

However, expectations for private sector participation in the Middle East have not always been fulfilled, in particular with regard to the anticipated growth in private investment flows. Among the reasons often listed are: complex civil service organization, the limited creditworthiness of the water sector, the shortcomings in the investment environment, poor risk management tools, regulatory capacity in the host countries, and difficulties in increasing tariffs to cover costs, as water may be viewed as a free commodity.²⁸⁹

Private sector participation potential in Jordan, Lebanon, Syria and Israel

In light of the changing climatic and demographic conditions, water institutions must become more efficient, transparent and dynamic. Institutional reforms are of great importance, especially in Jordan, Lebanon and Syria, which have severe deficiencies in their water infrastructure and are facing huge investment needs due to water shortages in the near future. Also, international financial institutions, like the World Bank, are important sponsors in the region and they are eager to see more private sector participation so as to improve performance. Thus, the private sector is likely to play an increasingly important role in incoming water sector investments in these countries. The following sections describe how the administrations of Jordan, Lebanon, Syria and Israel support the participation of the private sector in water sector investments. The prevailing PSP legislation and climate is also linked to possible

²⁸⁸ Jacques van Paassen et al. 'Optiflux® - from innovation to realisation', *Desalination* 178:1-3(2005), pp. 325-331.

²⁸⁹ OECD, *Innovative Financing Mechanisms*.

desalination investments, which are potentially one component of water infrastructure.

Jordan: water as a strategic challenge

Jordan differs from the other Arab countries of the Levant in that it recognizes on a strategic level the economic value of water. Due to the extreme water scarcity and lack of funding, the measures taken so far have not solved the problems. Although most of the renewable water resources have already been taken into use, the distribution of household water, for example, still needs to be strongly regulated. In Amman, households receive water for only a few hours a week. This, coupled with the expected rapid growth in water demand, have forced Jordan to start planning new large-scale water supply improvement projects, which will be possible only with the support of international funding organizations and the development of PPP. The planned future projects would multiply the country's current desalination capacity and reduce reliance on underground water.²⁹⁰

The water scarcity has been reflected in a relatively strong institutional and legal framework. In 1983, Jordan established the Water Authority, which is responsible for water supply, wastewater treatment and overall water resources planning.²⁹¹ It also drafts national water master plans, on the basis of which the local authorities plan their measures. The National Water Strategy, launched in 2009, is one of the administrative measures which proves that Jordan has recognized the necessity of investing in water. The strategy includes an action plan for a total investment of 8.24 billion USD over a period of 15 years, which corresponds to more than 160% of the country's GDP. The strategy also identifies a role for private sector participation (PSP).²⁹²

In the first instance, Jordan has been looking for supply-side measures to improve water management and water services. These include new water supplies through increased wastewater treatment

²⁹⁰ Arab Environment Watch., 'Jordan spared water crisis this year, but in the future?' (5 June 2009). <http://www.arabenvironment.net/archive/2009/6/887658.html>. Accessed on 15 September 2010.

²⁹¹ Water Authority of Jordan, *General Information*, <http://images.jordan.gov.jo/>. Accessed on 15 August 2010.

²⁹² Royal Commission for Water, *Jordan's Water Strategy 2008-2022*.

and desalination capacity, and large-scale plans are underway to increase clean water production. However, the supply-oriented instruments are not sufficient, and one of the most significant demand-side measures would be the minimization of water losses, still about 50%, from the supply network.

Jordan's experience in PPPs in the water sector began with major policy reforms in 1997, which endorsed the use of demand management strategies and public private partnerships. Jordan chose to begin the PPP process with management contracts. The first project was the management of Amman's water supply, whereby a public bidding process was organized to select the private sector partner. The operations started in 1999.²⁹³ Jordan's first BOT contract for wastewater treatment was the as-Samra plant in 2004, which has a capacity of 60 Mm³ per year.²⁹⁴ Another example of private sector participation is the new Karameh Dam desalination plant which was constructed on a BOT basis by a local company.²⁹⁵ The plant, which was brought into operation in May 2010, produces about one million cubic metres of drinking water per year, and in the second phase the capacity is set to rise to 4 million m³ per year.

PPP projects in Jordan have resulted in decreases in government expenditure, improvements in water utility performance, reductions in unaccounted-for water, increases in water revenues, and lower operating costs. Other benefits have included extensive staff training and the use of geographic information systems and information technology. Because of the encouraging experiences, future private sector participation is expected for operation and maintenance contracts for water and wastewater treatment plants as well as near-term megaprojects, which include The Disi Water Conveyance project, The Red-Dead Sea Canal project, and the desalination of seawater at the Red Sea port of Aqaba.

To attract private participation, Jordan is developing a new framework for private investment in infrastructure. The public-

²⁹³ Bayoumi Attia, 'Public Private Partnerships, Managing water demand: Policies, practices and lessons from the Middle East', *IWA Publishing* (2005), pp. 39-47.

²⁹⁴ Waterlink International, '95% energy self-sufficient waste water plant' (2009). <http://www.waterlink-international.com>. Accessed on 9 July 2010.

²⁹⁵ Jordan Times, 'Karameh Dam desalination plant eases Jordan Valley water woes' (14 May 2010).

private partnership (PPP) law has been drafted and was submitted for review in 2010. The law covers the building, rehabilitation, financing, operation and maintenance of public infrastructure.²⁹⁶ One of the main aims is to encourage private sector initiatives by identifying the roles and responsibilities of stakeholders in defining procurement procedures and the general framework of contacts.

So far, most investments in the Jordanian water and sanitation sector have been financed through grants and soft loans from external public donors. In the coming 15-year period, the private sector is likely to play an increasingly important role. Thus, even if actual investments remain somewhat below those planned, the market outlook for Jordan's water sector is becoming attractive.

Syria: slowly opening up

The existing institutional framework conditions in Syria contribute to the ineffective and unsustainable management of water resources. In addition, inadequate, unsafe and sometimes restricted data compound the challenges. Currently, Syria is collaborating with the German technical cooperation organization, GTZ, to develop its water sector institutions. The programme focuses on the implementation of integrated water resources management and on strengthening public administration through organizational and capacity development.²⁹⁷

The government of Syria has long emphasized the supply side of water management. As a consequence, the country has been active in controlling surface flows by building new dams and creating multi-purpose reservoirs. Irrigation schemes have also been devised and agricultural activities greatly expanded in order to achieve self-sufficiency and food security. However, water demand is rapidly increasing and easily mobilizable resources have already been exploited. In addition, Syria has suffered severe droughts since 2006 and, as a result, the long-term availability of water is in jeopardy.

Syria is planning several alternative solutions to the crisis, including the re-allocation of water from irrigation to household use, applying water-saving measures and locating new water supplies. Among the options for new water supplies are inter-basin

²⁹⁶ Jordan Times, 'Private businesses to submit views on PPP draft law soon' (7 July 2010).

²⁹⁷ GTZ, 'Factsheet, Institutional Support to the Syrian Water Sector' (2007). http://www2.gtz.de/dokumente/bib/070658_2.pdf. Accessed 29 August 2010.

transfers from the Euphrates River or the Mediterranean coast and the desalination of available brackish water in the Eastern region.²⁹⁸ However, in order to supply the capital, Damascus, the water would have to traverse the high lands, which would involve costly infrastructures.

The desalination of seawater and brackish water has long been considered a necessity in many arid and semi-arid regions of Syria. Thus, the Ministry of State for the Transfer and Development of Technology resolved in 2000 to form a Scientific National Desalination Commission to evaluate the country's needs for water desalination, identify the most appropriate technology, and suggest an integrated programme enabling Syria to optimize its investments in brackish and seawater desalination. At the present time, Syria's desalination capacity is negligible, but there are intentions to construct seawater and/or brackish water desalination plants in Eastern Syria.²⁹⁹ However, differences in opinion among policymakers make the plans very uncertain.

Syria still has significant scope for reducing its water usage prior to desalination. There is potential for this particularly in the agricultural sector, where irrigation losses have been estimated at over 50%. Furthermore, the Damascus water network leaks up to 60% of the water it carries. An expansion of wastewater reclamation for secondary use is also a planned and necessary measure.³⁰⁰ According to a study by Japan's International Cooperation Agency, Syria will have to spend billions of dollars to prevent a severe water crisis in Damascus. This includes, for example, replacing leaking water pipeline systems and a water transportation project from the Euphrates to Damascus.

At present, due to massive investment needs in the infrastructure sector, among others, Syria is increasingly willing to open up the economy and facilitate the realization of PPPs. The country is currently in the process of drafting PPP legislation and reviewing legislation covering contracts in the country. It has established a

²⁹⁸ Elie Elhadj, 'The Household Water Crisis in Syria's Greater Damascus Region'. *SOAS Water Research Group Occasional Paper 47*. (SOAS and King's College, University of London, 2004).

²⁹⁹ ESCWA, *Role of Desalination*; S. Wardeh et al., *Desalination for Syria*. (School of Civil Engineering, the University of Nottingham, 2009).

³⁰⁰ GTZ, 'Institutional Support'.

PPP unit under the direct supervision of the deputy prime minister as well as separate ministerial PPP agencies to oversee projects in the targeted areas of transportation, electricity, housing, agriculture, health and education.³⁰¹

PPPs in the infrastructure sector are, however, still in their infancy. The first positive experience with PPP in the water sector was undertaken with the GTZ and consisted of a small wetland wastewater treatment plant at Jdidet Yabous. The lack of progress in regulatory reform, the absence of a PPP track record, and difficulties in cost recovery in water utilities decelerate private sector participation in water investments. It is likely to be a long, drawn-out process until such time as the water sector in Syria is ready for significant private sector participation.³⁰²

Lebanon: weak management hindering investments

In Lebanon, the water sector is seriously underdeveloped. There is a great need for private or international funding, but political instability, weak management and poor transparency seriously hinder private investments. Despite relatively extensive water resources, the lack of water management measures has led to limited water supply in several areas during the dry season. In addition, it is estimated that water demand will increase by more than 80% by 2025, mainly due to the growth of Lebanon's population, expected to reach 7.6 million the same year.³⁰³

Although the water shortage problem is readily acknowledged in Lebanon, the value of water and its significance for the national economy and the well-being of citizens is not yet generally recognized. The inadequate municipal water supply capacity and insensitivity to potential future problems has led to the uncontrolled

³⁰¹ Oxford Business Group, 'Syria focuses on PPP for growth', *Emerging Voice Blog* (2009). <http://www.myemergingvoice.com/blog/2009/12/02/syria-focusses-on-ppp-for-growth/>. Accessed on 14 September 2010.

³⁰² J. Deane 'Private sector participation in desalination in the Mediterranean Middle East (MME) - past, present and future', *Desalination* 152:1-3 (10 February 2003), pp. 57-66.

³⁰³ IRINnews, 'LEBANON: Climate Change and politics threaten the water wars in Bekaa' (1 February 2009), <http://www.irinnews.org/Report.aspx?ReportId=82682>. Accessed on 17 September 2010.

digging and overuse of private wells, which in turn is leading to a decline in the groundwater table.

To meet the demand, small companies providing additional water have emerged, some of which produce bottled water in smaller desalination plants. Nevertheless, most of Lebanon's desalination capacity is used in the production of cooling water for two power plants. No new desalination plants are planned, although unofficially it is estimated that a plant for producing drinking water for Beirut will be indispensable within 10-15 years. A report by the World Bank³⁰⁴ argues that, in the case of Lebanon, due to the limited economic resources of the public sector, improving the efficiency of the water sector is more viable than constructing desalination capacity. The following measures should therefore be prioritized, according to the Bank: loss reduction through network rehabilitation and the installation of meters; the expansion of water storage facilities; and the expansion of water facilities to produce 24-hour service.

In accordance with the recommendations of the World Bank, the Lebanese government is planning to construct dams and hill lakes for water storage. So far, two dams have been constructed, but there are also plans to build up to 28 surface and subsurface dams over the next 10 years, aiming to capture up to 900 Mm³ of fresh water. The estimated costs are 2.5-3 billion USD. Because of their location, the dams would mainly produce water for irrigation. According to local sources, the environmental aspects have come under discussion, but the most significant potential constraint is the lack of funding.³⁰⁵

Increasing the wastewater treatment capacity in line with the water supply is also an important feature of a functioning water management system. Lebanon has just one big and a few smaller wastewater treatment plants in operation.³⁰⁶ For example, wastewater from Beirut is discharged untreated into the sea. Some plants have been constructed, but there is no capacity to operate them.

Private and international funding are prerequisites for the development and implementation of the planned water projects, and the government has set the promotion of PPP as one of its strategic

³⁰⁴ World Bank, *Lebanon, Water Sector*.

³⁰⁵ *Ibid.*

³⁰⁶ Kamar, *Lebanon Water Sector Overview*.

targets.³⁰⁷ The main focus is currently on the telecommunications and electricity sectors. However, according to Ziad Hayek, Secretary General of the Higher Council for Privatization, PPP will play a central role in other fields, including the water sector as well.³⁰⁸ Private participation is also expected to improve the weak performance and inadequate staffing of the four Regional Water Establishments.³⁰⁹

In spite of the political will, there are only a few cases of private sector participation (PSP). From the perspective of financing organizations, Lebanon's weak institutional and legal framework, problems in the management of public financing, and lack of written action plans are serious obstacles complicating project funding decisions. The poor transparency and accountability of public institutions at all levels also thwart the economic health of the municipal waterworks. Furthermore, applied fixed water tariffs for domestic and agricultural use make cost recovery challenging.

The above-mentioned problems are evident in the case of Tripoli: the Tripoli Water Authority and the French company Ondéo-Liban signed a four-year management contract in 2002. The project was financed by the French Development Agency AFD and included tasks such as the operation, maintenance and organization of the billing system, and the collection of water tariffs. The contract ended in 2007 without a continuation. According to the operator, the main reason was the uncertain institutional environment, which, among other things, did not allow the operator to increase bill collection to the cost-recovery level.³¹⁰

An original feature in Lebanon, which could be better exploited, is the existence of small-scale water providers. Private water supply accounts for 75% of the total market revenues, and small-scale private operators are already active in wastewater collection.³¹¹ While off-network private solutions currently prevail, small-scale network private operators could be a viable solution in areas where the cost of a network connection is prohibitive. Thus, in the short-term,

³⁰⁷ Ibid.

³⁰⁸ Marcopolis, 'Lebanese Privatization' (7 June 2010), <http://www.marcopolis.net/lebanon-privatization.htm>. Accessed on 15 August 2010.

³⁰⁹ Kamar, *Lebanon Water Sector Overview*.

³¹⁰ World Bank, *Lebanon, Water Sector*.

³¹¹ Ibid.

partnerships with small-scale domestic private operators could also support the water authorities in the operation and management of parts of the water supply network.

Although the Lebanese government has expressed its willingness to increase private sector participation in the water sector, the institutional uncertainty and poor accountability hinder the economic health of waterworks. This does not encourage international private companies to enter into PPP contracts. Moreover, the procedures for creating the partnerships lack clarity. Tangible improvements in the current management and legal framework are required in order to attract private funding. Meanwhile, cooperation with small-scale domestic private operators could be a partial solution in some areas.

Israel: the high-tech model student

Israel recognized the need for water management as early as 1959 when a comprehensive water law was passed. The law made water resources public property and regulated their exploitation and allocation, as well as pollution prevention and water conservation. Despite investments and relative success in water management, Israel, too, has faced water crises. Currently, about half of the water the country consumes is taken from its neighbours: the Palestinian territories and the Golan Heights. It is possible that as water supplies dwindle, tension between Israel and its neighbours, and between Arab states, will intensify.

Israel is technologically the most advanced state in the region and has an ambitious emergency programme to address the country's growing water shortage. It has invested heavily in desalination, and already has over 30 desalination plants. Three of these are huge, with a capacity of over 1000 m³/d, and operate through seawater reverse osmosis. While in 2010 Israel will produce a total of 0.77 Mm³/d of desalinated water, it has set a target of 2.1-2.7 Mm³/day by 2020. In 2012, nearly 80% of household demand should be met by desalinated water.³¹²

In addition to desalination, Israel is adopting other management measures, such as fixed water quotas, water-efficient practices and the upgrading of wastewater treatment capacities in order to increase the recycling of wastewater. Water is charged by consumption and

³¹² S. Latteman et al., 'Global Desalination Situation'.

prices have risen dramatically in recent years, mostly to pay for the investments.³¹³

Israel has recognized that state funds alone will not suffice in supporting the necessary infrastructure investments. The government is currently promoting infrastructure projects using private sector participation like BOT. Numerous PSP projects are ongoing and the government has established the Division of Public Private Partnership Projects, a government company, to coordinate these activities.³¹⁴ Private funding was also exploited in the latest huge desalination projects, which were built on a BOT and BOO basis.³¹⁵

Israel is also aiming to reap some benefits from the consequences of its water scarcity, namely the technical expertise it has accumulated: in 2006, the government launched NEWTech, a national programme promoting the country's water technology sector, and allocated substantial resources towards strengthening the foundation of its water technology cluster. The NEWTech programme includes actions ranging from training to deepening cooperation with multinational bodies. It also aims to connect companies and projects with different funding sources.

Israel has set its sights on dominating the global advanced water technology sector by 2011 and, as a result, it expects to export 2.5 billion USD in water technologies during the same year. Indeed, water technologies have become one of the country's key export sectors. Thus, besides having an interesting market outlook for the water sector, the country is becoming a leading player in the global water industry.

Conclusion

The four countries of the Levant examined in this chapter are faced with extremely challenging water resource conditions. They are confronted by challenges stemming from increasing water

³¹³ Ibid.

³¹⁴ Shay Sohlberg, 'PPP/PFI Projects in Israel' Tel Aviv Metropolitan Mass Transit System (2004). http://80.70.129.175/data/SIP_STORAGE/files/6/646.pdf. Accessed on 23 September 2010.

³¹⁵ Y.Dreizin, et al., 'Integrating large scale seawater desalination plants within Israel's water supply system', *Desalination* 220:1-3(2008), pp. 132-149.

demand, young and growing populations, recurring conflicts, high investment needs and, with the exception of Israel, weak policies, lack of management and low technical capacity. In Israel and Jordan, the two countries with the most serious water deficit, the value of water has already been recognized and this has been reflected in the development of more comprehensive legal and institutional frameworks for water management than in the case of Syria, and especially Lebanon. Israel has even realized that the huge challenge can be turned into an opportunity and is aiming to benefit from the consequences of water scarcity through technology exports. Compared to Israel, Jordan has made slow progress in the introduction of new technological solutions. One reason for this is its deficient capability to finance and acquire financing for investments.

The main focus for most Middle East countries in addressing the water challenge has been, and still is, on the supply side. Raising water prices and an improvement in water efficiency through network rehabilitation and the installation of meters and irrigation scheduling in agriculture should be elements in a sustainable solution.

In most cases, an improvement in water efficiency will not suffice, and countries will still need to invest in supply-side measures such as desalination. Despite its relatively high unit costs, desalination can provide an inexhaustible water supply to municipalities located on the coast. The high water transport costs are an additional obstacle in the inland cities, but in countries with a severe water shortage, like Jordan, the transportation of desalinated water from the seaside may be the only viable solution. Although future developments in desalination technology and related renewable energy applications will probably reduce the cost of desalination, they will obviously not be able to address all water shortages. Of the four countries examined, Israel and Jordan have invested in increasing their desalination capacity during the last decade, and both have set targets to further increase the capacity by 2020. In Syria and Lebanon, future plans remain uncertain, although it is estimated that there will soon be no other options for satisfying the growing water demand. This applies particularly to Beirut.

The water sectors in Israel, Syria, Jordan and Lebanon need strategic financial planning to attract sufficient funding for their massive water infrastructure investments. They need to become more innovative in adopting and integrating different financing mechanisms from tariffs

to development assistance and private investments. The role of private sector investments is assuming particular significance in enhancing investments, which all four countries have already realized. Israel, and to a lesser extent Jordan, have already gained positive experiences with PPP. In Syria, and especially in Lebanon, the sector is still not attracting significant interest due to weak legal frameworks and the poor transparency and accountability of the management system. Although Syria seems to be willing to open up its water sector to private participation, and Lebanon already has a parallel off-network private market, the development of an adequate framework for PPP is likely to be a long process in both countries. In contrast, Jordan has already recognized the necessity of creating clear procedures and a sufficient legal framework to encourage private sector participation. One can expect that the new PPP legislation for its part will increase the attractiveness of the water sector and even contribute to the implementation of the planned water megaprojects.

Conclusions – Multiple challenges ahead

Towards enhanced water security?

As this report has demonstrated, the list of pressures confronted by Levantine, and more generally Middle Eastern, governments is long and growing. Challenges range from dwindling fossil fuel and water resources, growing and young populations, political instability and conflicts, unsustainable natural resource consumption patterns and growing demand, the need to create economic growth and employment, and the necessity for economic and political liberalization to, more generally, dealing with the broader forces of modernization and globalization. Since in most states the main driver of policymaking tends to be internal stability and regime survival and since the region's water-related problems are so pervasive, it is argued that water security should be at the top of state agendas. However, water is still, in many cases, secondary to other policymaking issues.

Indeed, many of these society-wide pressure dynamics bear important linkages to water security and sustainability: the lack of cheap energy makes desalination an expensive option; growing populations demand increasing amounts of water; low economic growth and a one-sided economy restrict the amount of funding resources available for investments in the water sector; the lack of democratic stakeholder engagement in the water sector, including NGOs and other interest groups leads to ineffective and undemocratic water governance; while a general distrust in the government fosters a culture of negligence towards water conservation measures. Equally importantly, modernization entails adopting modern water management practices and shifting the focus from supply to demand.

The list of necessary improvements for local governments is therefore equally long: strategic planning in the water sector should be increased and a cross-sectoral approach that involves all the different ministries working on water issues should be adopted. Increased

cooperation and coordination among authorities and stakeholders is needed, too. New technology in the areas of desalination, wastewater treatment, and additional supply projects is also in demand, as is increased capacity, in the form of scientific studies and water sector capacity-building. The sharing of up-to-date government statistics and studies locally and internationally is essential for better planning and proper policies. Demand-side management should be instilled in government thinking and water tariffs with cost recovery should be installed, notwithstanding the potential political costs of this. Current national food self-sufficiency policies should also be seriously reassessed with regard to their negative impacts on water security.

Engaging citizens and extending participation beyond government institutions can also contribute to improved water security. Awareness-raising on water conservation should be promoted both top-down, by the governments, and bottom-up, by NGOs and possibly even religious organizations, in order to root out the prevailing culture of wasting water. In general, an expanded role for water-related civil society actors is needed for water policies to be as equitable as possible. While keeping this principle in mind, the economies, in many cases, need to further open up and allow for private sector participation so as to mobilize funding for the necessary infrastructure investments.

Finally, the countries of the Levant need to build up regional cooperation, in water issues and beyond, with an eye on preventing water scarcity from becoming an element that tips the scales in favour of increased instability within and among the region's states. As one of our training course participants, Anna Savolainen, pointed out during our trip to Lebanon: in the Middle East, most problems are linked to water, but at the same time, these problems are not solved with water alone. In other words, fixing the Levant's water insecurity needs to be part of broader societal reform and regional integration processes, and vice versa.

Climate change multiplies the existing challenges

The Middle East is regarded as one of the regions in the world most vulnerable to the potential negative consequences of climate change. Resource-scarce, poor and weak states will bear the brunt in particular. Moreover, climate change is expected to interact with existing problems and pressures, multiplying these and further complicating an already complex situation.

As already noted by regional experts, water is the first victim of climate change in the Middle East; it is the medium through which climate change will hit the region's populations the hardest. As a consequence of decreasing precipitation and changes in the spatial and temporal distribution of water, the existing scarcity is expected to deteriorate further, leading to and interacting with increasing pressures on both human security and state stability.

At present, in Jordan, the world's fourth water-poorest country, the situation is already so severe that the country's Minister of Environment has described water scarcity as the 'single most important constraint to the country's growth and development'.³¹⁶ According to the UN Economic and Social Commission for West Asia, acute water scarcity and deteriorating quality of water, as well as profligate consumption patterns, are among the Middle East's main climate change-related sustainable development challenges. Other challenges are similarly linked to water and they include rapid population growth (2.3% on average), political instability, and environmentally unsustainable production and consumption patterns of energy. Also, low institutional and legislative capacity and competitiveness, fragmented social policies, and lack of financial resources act as obstacles to sustainability.³¹⁷ Water and climate change-related challenges in the region are therefore inextricably linked when it comes to solving either one of the two.

Since around 2007, climate change has been described in Western security literature as a 'threat multiplier' that has the potential to complicate pre-existing problems and instabilities, thereby inducing

³¹⁶ Minister Khalid Irani at the Ministry of Environment of Jordan, *Jordan's Second National Communication to the UNFCCC* (2009), foreword.

³¹⁷ Presentation by Tarek Sadek, 'Climate Change and Sustainable Development in the ESC-WA Region', UN-ESCWA. Presentation for the course's participants in Beirut (21 May 2010).

‘multiple chronic conditions’.³¹⁸ In the case of the Middle East, rising temperatures are expected to pose the worst direct threat to the region’s development and stability. According to projections, climate change in the Middle East is expected to lead to an average temperature rise of 2.0–3.7°C by the 2050s or 3.2°C by the 2070s, while precipitation is generally projected to decrease, albeit with large spatial variability. An increase in extreme temperatures and incidences of extreme weather events is also considered possible.³¹⁹ If this materializes, it will have a number of physical, socio-political and economic consequences for water security.

Firstly, a rise in average temperatures will decrease water availability and increase demand, particularly in irrigation agriculture, as well as cause desertification. Climate change is also expected to directly and indirectly impact on both the quantity and quality of water supplies. Adverse effects will be felt in both groundwater and renewable water resources, such as rivers, and may even extend to desalination plants. Other significant consequences are increased flooding and a rise in the sea level, which in the case of the Levant would mainly reduce the groundwater quality through increased seawater intrusion in countries like Syria and Lebanon.

This, in turn, according to recent studies on the Levant region, could potentially lead to a number of negative social consequences, including increased internal and external political tensions and instability stemming from migration, unemployment, poverty, and health risks, among others. Climate change is likely to accelerate the speed at which the region’s governments need to solve their looming water insecurity, and the inability to provide water for their populations would seriously undermine the legitimacy of any government, democratic or authoritarian. The militarization of water resources is also mentioned in the existing literature as a related threat. Anticipated economic impacts in turn range from agricultural

³¹⁸ CNA Corporation, *National Security and the Threat of Climate Change* (Alexandria, VA, 2007), p. 6.

³¹⁹ Cruz, R.V., Harasawa, H., Lal, M. & Wu, S., ‘Chapter 10: Asia’ in M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, (eds.) *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge: Cambridge University Press, 2007); Met Office, *Climate Change and the Middle East* (2009).

losses to damage to coastal settlements, infrastructure and tourism.³²⁰ In other words, the negative consequences of climate change on water will not only be an issue of environmental policymaking, but a society-wide challenge.

However, as some regional experts have reiterated, pre-existing water problems, such as high demand, low quality and over-pumping are currently more serious threats to the water supply than climate change.³²¹ Distribution problems, untreated wastewater, high agricultural use due to food self-sufficiency policies, and an almost exclusive emphasis on supply management instead of demand, are currently posing threats to both the populations and the environment of the Levant.

Water is the region's weak spot in the fight against climate change. Hence, the countries of the Levant need to prepare for it. This is best done by drafting adaptation strategies based on sound scientific data and implementing preventive adaptation measures both society- and sector-wide. It is evident that the better the states manage their water scarcity, the better they will be prepared for weather climate change, too. In other words, taking immediate action to enhance the adaptation capacity of states in the Middle East is not only justifiable by the precautionary principle, but by present-day water security challenges.

Lessons to be learnt?

To end on a positive note, as this report has shown, there are already many promising developments and practices in the region that neighbouring states could learn from. The remarkable recovery of Turkish-Syrian relations during the last decade offers hope for a peaceful solution to bilateral water scarcity-related problems in the future as well. Regional cooperation and integration in the Levant is still in its infancy and mainly led by Turkey, a non-Arab state, but the

³²⁰ Sadek, 'Climate Change and Sustainable Development'; Hamed Assaf, 'Governments should practice "water demand management" to rescue region's water resources', *Issam Fares Institute Research and Policy Memo No. 2*, American University of Beirut (January 2009); Brown and Crawford, *Rising Temperatures*.

³²¹ Assaf, 'Governments should practice'.

experiences of the Gulf Cooperation Council have proved that even in a conflict-prone region like the Middle East, peaceful coexistence and cooperation are possible. Also, the trilateral efforts of Jordan, Israel and the Palestinian Authority on the Red Sea-Dead Sea canal, if realized, can function as a top-down confidence-building measure among the parties. More interestingly, although frequently delayed, this project is a prime example of seeking to reconcile environmental sustainability and additional water supplies that could serve as a positive example for other countries as well.

Jordan's past water sector reforms, its current water strategy and the new tariff system are also steps in the right direction. Water consumption will only be curbed if it is felt in the pockets of consumers, naturally taking into account the user's ability to pay. Israel's water technology exports, in turn, are an example of how a liability, water scarcity, can be turned into an asset. Islam, a social and political force not to be ignored, is another example of seeking solutions from within the region: the potential for turning the water-related guiding principles of Islamic law into a positive force to raise awareness on environmental sustainability is already a talking point for environmentalists region-wide.

Finally, in Lebanon, Jordan, and Syria, not to mention Israel, awareness of the potential negative consequences of climate change is rising rapidly. Lebanon's vibrant civil society, Jordan's acute water shortages and Syria's recent droughts have helped to raise the issue in the media and to get it on government agendas. The sooner governments start preparing for the already unavoidable consequences of climate change, the better equipped they will be to provide adequate and reliable water supplies for their citizens.

What Finland can do

Despite the geographical distance, Finland and Finnish actors can play an important role in enhancing water security in the Levantine Middle East. Finland is globally known for its water-related expertise and there are countless ways in which it could be employed to meet the needs of the water-scarce Levantine region.

The issue has been taken up recently by Finnish authorities, as in 2009 three ministries published a strategy that provides the guidelines for the international activities of Finland's water sector. Titled the International Strategy for Finland's Water Sector (*Suomen vesialan kansainvälinen strategia*), the document defines the promotion of water security as the main area in which Finland should seek to make its water sector known internationally.

Because of the country's small size, Finland cannot seek to become an expert in all areas of water security, nor in all regions of the world. The strategy therefore recommends building long-term partnerships and concentrating on a few focal areas, namely: Integrated Water Resource Management (IWRM), water institutions, the negative impacts of climate change on water systems and adaptation needs, water protection, and water-related security issues, both internal and transboundary. To implement the strategy, the Finnish Water Forum was established in 2009.

It is argued here, however, that there are still two important challenges facing the Finnish water sector, which are also common to internationalization efforts in the Middle East in general: Finland needs to make itself known in the region, and for this, a sustained presence and knowledge on the local societal contexts is required. This was also noted by a regional investment seminar organized by the Ministry for Foreign Affairs in August 2010. An understanding of the local dynamics and future trends can only be achieved through a consistent and continuing building of region-specific expertise, based on sufficient periods of work and presence on the ground. Of course, to facilitate this, both public and private funds are needed. In this sense, this pilot project comprising a short training course and this FIIA report, seeks to be a small-scale example of what could be achieved through this kind of approach.

Of relevance for this report, the Finnish water strategy also stresses the importance of understanding the local context, including the social and political processes related to water, particularly in regions like the Middle East. The strategy sets education and capacity-building among all local stakeholders as a prime objective. In Finland, in turn, the strategy calls for more emphasis on water-related social research for a better understanding of the partner countries' dynamics, problems and needs. The ability to 'read situations and react accordingly' is perceived as increasingly important, as are

comprehensive approaches and case-based tailored applications instead of sector-specific and individual technical solutions.

Hopefully, this report has helped to arouse the interest of both its contributors and its readers towards further examining the possibilities for Finland to participate, both bilaterally and as part of the international community, in promoting sustainable water security in the Levantine Middle East.

Annex 1. A Situational assessment of water in Jordan, Lebanon, Syria, Turkey and Israel³²²

Jordan

Jordan, one of the world's water-scarcest countries, consists almost entirely (92%) of desert.³²³ The annual per capita water share, 153 m³, is far below the generally accepted per capita water poverty line of 1000 m³ per annum. Jordan only receives 111 mm of precipitation per year, which is the lowest amount in the region. In regional terms, Jordan is an average-size country, with a slightly larger population (5.9 million) than Finland. Population growth is, however, the highest in the Levant region, standing at 3.22% in 2008. The country's groundwater resources, some of which are non-renewable, are overexploited: in 2007, 90% of actual freshwater resources were withdrawn, which makes water use highly unsustainable. Water utilized originates from various sources, including renewable and non-renewable groundwater, surface water in the form of baseflows and reservoirs, treated wastewater not flowing into reservoirs, and a part of the additional water guaranteed by the 1994 peace treaty between Jordan and Israel.³²⁴ A third of Jordan's renewable freshwater resources originates outside its borders. Due to the scarce water supply, withdrawal rates are the lowest in the region, approximately 160 m³ per capita. While agriculture constitutes two thirds of all withdrawals, it only produces around 3% value added to Jordan's GDP.

³²² The Palestinian territories are not discussed in this report. Figures, if not referenced, are from Table 5.

³²³ Brown and Crawford, *Rising Temperatures*, p. 17.

³²⁴ Zeyad S.Tarawneh, Nidal A.Hadadin, & Ahmad N. Bdour, 'Policies to Enhance Water Sector in Jordan'. *American Journal of Applied Sciences* 5:6 (2008), pp. 698-704.

Lebanon

Lebanon is known to be richer in water resources than most of its neighbours, but these resources are unevenly distributed. On average, the Lebanese have a per capita supply of around 1000 m³ per year, which places the country on the verge of water scarcity. Precipitation varies from 1500 to 2000 mm per year in the mountains to about 250 mm in the Beqa'a area.³²⁵ Most of the rainfall occurs during the winter season. The main water supply of Lebanon (as well as that of Syria's Damascus region) consists of the melting snow from the mountains on the border of the countries, which feeds the aquifers, rivers and seasonal streams. Lebanon's population is relatively small (4.2 million in 2008), and growth rates are the region's lowest, at 0.75%. There is practically no dependency on external water resources and the withdrawal rate is around 30%. While agriculture absorbs 60% of all water withdrawals, its value added to the GDP is only around 5%.

Syria

Syria is not among the water-poorest countries in the Middle East, but its per capita availability of renewable water resources (791 m³ in 2008) is below the water scarcity limit. A water crisis has been building for years and most of the country has been suffering from droughts for the past five years. The only exceptions are the coastal region and the Euphrates basin, which carry surplus water. The average annual rainfall varies from 1000 mm in the northern coastal area to less than 200 mm in arid regions. Total renewable freshwater resources are around 16 Mm³ per year. At the moment Syria consumes much more water than is replenished naturally, with the deficit coming from groundwater and reservoirs.³²⁶ Syria's water-use patterns are highly unsustainable, as over 80% of actual freshwater resources are withdrawn annually. The country's population is relatively large in regional terms (20.6 million in 2008), and fast growing, with a growth rate of 2.45% in 2008. The large populations of the main cities, Damascus and Aleppo, are located away from direct water sources. Syria therefore has an alarming water

³²⁵ Karim Makdisi, 'Towards a Human Rights Approach', pp. 369-390.

³²⁶ M. Salman & W. Mualla, 'Water Demand Management in Syria: Centralized and Decentralized Views', conference paper (2008), ftp://ftp.fao.org/agl/iptrid/conf_egypt_03.pdf. Accessed on 5 September 2010.

deficit looming on the horizon.³²⁷ Some regions, however, have large reserves in underground brackish water.³²⁸ Characteristic of Syria is the continuing importance of agriculture for the economy: value added in 2008 was 20%. However, wasteful irrigation techniques and water-intensive crops take their toll, and almost 90% of all water withdrawn is used by agriculture. At the same time, Syria is highly dependent on external renewable water resources, mainly flowing from Turkey, with a dependence ratio of 72.

Turkey

Turkey, the largest country in the Levant both in terms of territory and population (73.9 million in 2008), currently has abundant water resources by regional standards. Per capita water availability (2890 m³ in 2008) was clearly above withdrawals (549 m³ in 2007), and the water withdrawal rate of all freshwater resources is only around 20%. Turkey also receives more rainfall than most of its neighbours. Annual average precipitation is 593 mm. Furthermore, the country is in the fortunate position of not depending on the renewable resources of its neighbours. It is the upstream riparian of the Euphrates and Tigris Rivers, where it has built a number of dams, including the famous Atatürk Dam, as part of the Southeastern Anatolia Project (GAP). About 89% of the Euphrates' waters and 52% of those of the Tigris originate in Turkey.³²⁹ Similarly to the other Levantine states, agriculture is a major consumer of water, at 74% of all withdrawals in 2007, and its value added contribution is roughly a tenth of the GDP.

Israel

Similarly to Jordan, Israel is a highly water-scarce country, with a renewable water availability of only 252 m³ per capita in 2008. The country receives an average of 435 mm of precipitation annually. Temporal and spatial variations are remarkable. Rainfall decreases from north to south and from west to east. About 80% of the water potential is in the north and only 20% in the south of the country. The main freshwater resources in Israel are: the Sea of Galilee, the Coastal

³²⁷ Ibid.

³²⁸ S. Wardeh et al., *Desalination for Syria*.

³²⁹ Mehmet Tomanbay, 'Turkey's Approach to Utilization of the Euphrates and Tigris Rivers', *Arab Studies Quarterly*, 22:2 (2000), p. 79.

Aquifer along the coastal plain of the Mediterranean Sea, and the Mountain Aquifer under the central north-south (Carmel) mountain range.³³⁰ The country's population growth is relatively rapid, 1.78% in 2008. Israel's external water resources constitute close to two-thirds of its total renewable resources, and agriculture absorbs 58% of all water withdrawals.

Table 5. Water resources and related statistics for the Levantine Middle East³³¹

	Average annual precipitation (mm)	Average annual renewable water resources availability (m ³ /a)	Total water withdrawals in 2007 (m ³ /capita)	Share of total actual freshwater resources withdrawn in 2007 (%)	Total population in 2008 (million)	Population growth in 2008 (%)	Agricultural water use in 2007, (% of total withdrawals)	Municipal water use in 2007, (% of total withdrawals)	Agriculture's value added in 2008 (% of GDP)	Dependency on external renewable water resources (%)
Israel	435	252	282	88	7.309	1.78	58	36	n/a	58
Jordan	111	153	159	90	5.906	3.22	65	31	2.9	27
Lebanon	661	1074	315	28	4.194	0.75	60	29	5.3	1
Occupied Palestinian Territories	402	202	104	49	4.147	3.20	45	48	n/a	3
Syria	252	791	814	83	20.581	2.45	88	9	20.0	72
Turkey	593	2890	549	18	73.914	1.24	74	15	8.7	1

³³⁰ Jewish Virtual Library, 'Israel's Chronic Water Problem', <http://www.jewishvirtuallibrary.org/jsource/History/scarcity.html>. Accessed on 5 September 2010.

³³¹ FAO, Aquastat, 'Country Fact Sheets: Israel, Jordan, Lebanon, Syria and Turkey' (27 August 2010), <http://www.fao.org/nr/water/aquastat/main/index.stm>. Accessed on 24 September 2010; FAO, *Aquastat online database*, <http://www.fao.org/nr/water/aquastat/dbase/index.stm>. Accessed on 25 September 2010; World Bank, *World Development Indicators* (April 2010); population data for Palestine: United Nations Statistic Division, *World Statistics pocketbook. Occupied Palestinian Territory* (2010), <http://unstats.un.org/unsd/pocketbook/>. Accessed on 25 September 2010.

Annex 2. Training course on Water, Security and Climate Change in the Levant, spring 2010

What follows is a short summary of the training course for professionals that was jointly organized in the spring of 2010 by the Finnish Institute of International Affairs (FIIA) and the Finnish Institute in Damascus, and supported financially by the Foundation of the Finnish Institute in the Middle East and FIIA. The course, under the title Water, Security and Climate Change in the Levant, was the first wider cooperative effort between the two institutes. It consisted of two parts: an introductory part, and a week-long trip to Syria and Lebanon. This FIIA Report is the main outcome of the course, as it is written by the course participants and builds on not only written material acquired before, during and after the trip, but also the many conversations that were held with local stakeholders during the trip to the Levant.

The course had three objectives: (1) to familiarize the participants with the current water-related challenges of the Levantine part of the Middle East, including the projected negative consequences of climate change for water security; (2) to establish contacts with Lebanese and Syrian peer groups, with an eye on paving the way for future cooperation; and (3), through both networking and dissemination of this report, to play its part in improving the region's capacity to manage the present and future challenges of water and climate change.

The fourteen course participants were selected from experts and professionals with diverse backgrounds and at various stages of their careers. Professions represented included researchers and PhD candidates, civil servants, parliamentary advisors and journalists from the following institutions: Aalto University, the Universities of Helsinki, Turku and Tampere (TAPRI), Åbo Akademi University, The Finnish Funding Agency for Technology and Innovation (TEKES), The Finnish Environment Institute (SYKE), the Technical Research Centre

of Finland (TKK), the Ministry for Foreign Affairs, the Finnish and European Parliaments, Ajatuspaja e2 think tank, the Finnish National Broadcasting Company YLE and the newspaper *Vihreä Lanka*.

In March–April 2010, the participants received introductory material that consisted of scientific and policy articles covering regional and local issues such as the socioeconomic and environmental aspects of water management; the interdynamics of climate change and water and climate change and conflict; the internal politics of water scarcity; the debate on water wars and water cooperation; water as a human right; and regional-level water and climate politics.

The main part of the course took place on 15–23 May 2010 in Syria and Lebanon. Stakeholder meetings in Syria took place on 16–18 May and were organized by the Finnish Institute in Damascus. The schedule on the Lebanese part of the trip, on 19–21 May, was arranged by the dynamic and incredibly well-networked local NGO, IndyACT – the League of Independent Activists.

During the trip, the participants met with a number of representatives from Lebanese and Syrian peer institutions, with whom the local water security problems, in particular management, governance and politics-related issues, as well as the projected impacts of climate change on the future water supply, were discussed in round-table-type sessions. The trip also included a number of field trips. Some of the scheduled meetings and one field trip were cancelled during the Syrian segment of the trip at the last minute due to what could be termed as the side effects of choosing a politically sensitive topic for the course in an extremely challenging political system.

In Syria, the participants visited the Ain al-Fijeh spring, which provides water for the capital, Damascus, and a privately-owned small-scale wastewater treatment plant in the nearby town of Qara. Round-table meetings were organized in the beautiful premises of the Finnish Institute in Damascus in Old Damascus. Speakers included representatives and experts from the UNDP, the Damascus Water Supply and Sewerage Authority, the EU-funded INECO water management project, a local environmental NGO and the Faculty of Political Sciences of the University of Damascus.

In Lebanon, the course participants were introduced to a broad selection of local water stakeholders: round-table meetings were held

with water and climate experts at the American University of Beirut, the Lebanese UNDP and the UN Economic and Social Commission for West Asia (ESCWA), with representatives of IndyACT, a local NGO working on regional climate change policy among a number of other societal issues, and with local environmental journalists. The most prominent meetings included sessions with the Environment and Energy and Water Committees of the Parliament and H.E. Mr Mohammed Rahal, the Minister of Environment. In addition, participants visited the Shabrouh dam in the Qana Plateau of Mount Lebanon near Beirut, completed in 2007.

While the conversations and notes from the meetings will remain only in the memories and notebooks of the participants, this FIIA Report raises and discusses most, if not all, of the main issues that surfaced in our interactions.



Course participants at Shabrouh Dam, Lebanon, May 2010

Photo: Noora Jussila

List of tables and maps:

Table 1. Urbanization in Lebanon	52
Table 2. Differences between societies characterized by high and low power distance	93
Table 3. Differences between collectivist and individualist societies	94
Table 4. Desalination capacity and increase from 2000 to 2008	113
Table 5. Water resources and related statistics for the Levantine Middle East	137
Map 1. The Levantine Middle East	10
Map 2. Syria and its provinces	25
Map 3. The Tigris-Euphrates basin	38
Map 4. Lebanon	55
Map 5. Jordan: the Red-Dead Sea project and the Disi aquifer	66

Previously published in the series:

- Christer Pursiainen & Sinikukka Saari:
Et tu Brute! Suomen Nato-optio ja Venäjä.
UPI-raportti 1/2002.
- Christer Pursiainen & Sinikukka Saari:
Et tu Brute! Finland's NATO Option and Russia.
FIIA Report 1/2002.
- Hiski Haukkala:
Kohti ulottuvuuksien unionia.
Itälaajentumisen vaikutukset pohjoiselle ulottuvuudelle.
UPI-raportti 2/2002.
- Hiski Haukkala:
Towards a Union of Dimensions. The effects of eastern enlargement on the Northern Dimension.
FIIA Report 2/2002.
- Hanna Ojanen:
EU:n puolustuspolitiikka ja suhteet Natoon: tervetullutta kilpailua.
UPI-raportti 3/2003.
- Arkady Moshes:
Ukraine in tomorrow's Europe.
FIIA Report 4/2003.
- Arkady Moshes (ed.):
Rethinking the Respective Strategies of Russia and the European Union. Special FIIA -Carnegie Moscow Center Report 2003.
- Soile Kauranen & Henri Vogt:
Piilopoliittisuudesta poliittisuuteen. Afrikan, Karibian ja Tyynenmeren valtioiden ja Euroopan unionin yhteistyön kehitys.
UPI-raportti 5/2003.
- Hanna Ojanen (ed.):
Neutrality and non-alignment in Europe today.
FIIA Report 6/2003.
- Toby Archer:
Kansainvälinen terrorismi ja Suomi.
UPI-raportti 7/2004.
- Toby Archer:
International Terrorism and Finland.
FIIA Report 7/2004.
- Linda Jakobson:
Taiwanin kiistanalainen asema. Tulevaisuudennäkymät ja niiden vaikutukset EU-Kiinasuhteisiin.
UPI-raportti 8/2004.
- Linda Jakobson:
Taiwan's Unresolved Status: Visions for the Future and Implications for EU Foreign Policy.
FIIA report 8/2004.
- Hiski Haukkala & Arkady Moshes:
Beyond "Big Bang": The Challenges of the EU's Neighbourhood Policy in the East.
FIIA Report 9/2004.

Kristi Raik & Teemu Palosaari:
It's the Taking Part that Counts: The new member states adapt to EU foreign and security policy.
FIIA Report 10/2004.

Hu Angang, Linda Jakobson & Shen Mingming:
China's Transforming Society and Foreign Policy.
FIIA Report 11/2005.

Grzegorz Gromadzki, Raimundas Lopata & Kristi Raik:
Friends or Family? Finnish, Lithuanian and Polish perspectives on the EU's policy towards Ukraine, Belarus and Moldova.
FIIA Report 12/2005.

Hanna Ojanen:
EU ja YK: Yhteinen tulevaisuus.
UPI-raportti 13/2005.

Hanna Ojanen:
The EU and the UN: A shared future.
FIIA Report 13/2006.

Hanna Ojanen (ed.):
Peacekeeping -Peacebuilding: Preparing for the future.
FIIA Report 14/2006.

Sergei Medvedev:
EU-Russian Relations: Alternative futures.
FIIA Report 15/2006.

Toby Archer & Tihomir Popovic:
The Trans-Saharan Counter -Terrorism Initiative: The US War on Terrorism in Northwest Africa.
FIIA Report 16/2007.

Charly Salenius-Pasternak (toim.):
Joidenkin puolustamisesta monen turvaamiseen: Naton tie puolustusliitosta turvallisuusmanageriksi.
UPI-raportti 17/2007

Charly Salenius-Pasternak (ed.):
From Protecting Some to Securing many: Nato's Journey from a Military Alliance to a Security Manager.
FIIA report 17/2007.

Minna-Mari Salminen & Arkady Moshes:
Practise what you preach - The prospects for visa freedom in Russia-EU relations
FIIA Report 18/2009.

Anna Korppoo & Alex Luta (ed.):
Towards a new climate regime? Views of China, India, Japan, Russia and the United States on the road to Copenhagen
FIIA Report 19/2009.

Kristian Kurki (ed.):
The Great Regression? Financial Crisis in an Age of Global Interdependence
FIIA Report 20/2009

Tarja Cronberg:
Nuclear-Free Security: Refocusing Nuclear Disarmament and the Review of the Nuclear Non-Proliferation Treaty
FIIA Report 21/2010

Louise Wiuff Moe:

*Addressing state fragility in Africa:
A need to challenge the established
'wisdom'?*

FIIA Report 22/2010

Toby Archer, Timo Behr, Tuulia

Nieminen (editors):

*Why the EU fails - Learning from past
experiences to succeed better next time*

FIIA Report 23/2010

Tapani Paavonen:

*A New World Economic Order:
Overhauling the Global Economic
Governance as a Result of the Financial
Crisis, 2008-2009.*

FIIA Report 24/2010

Managing Blue Gold

*New Perspectives on Water Security
in the Levantine Middle East*

Mari Luomi (editor)

Water security, namely the ability of governments to secure a sustainable water supply for their populations, is becoming increasingly questionable in the Levantine countries of the Middle East. Lebanon, Syria, Jordan, Turkey, the Occupied Palestinian Territories and Israel not only share a history of conflict but also a challenging, mostly arid climate, and scarce water resources in comparison to the levels of consumption. This report is a multidisciplinary endeavour to understand the present dynamics and shed light on the future challenges of water security in this part of the Middle East. Through five case studies and three thematic chapters, the report illustrates the complexity and multi-dimensional nature of the region's water issue.

A central outcome of the articles contained in the report is that the region is in dire need of sound water management policies and practices that are based on multi-stakeholder engagement and transboundary cooperation. Internal and external pressures such as growing populations, modernization, economic liberalization, Islam, and climate change will also have to be taken into account and managed. Without a proactive approach that breaks with the current wasteful consumption patterns, the countries of the Levant will not achieve water sustainability, with potentially disastrous ramifications in the near future.

ISBN 978-951-769-282-3

ISSN 1458-994X