
**The Northwestern Center for Water Research
and the Crown Family Center for Jewish and
Israel Studies present**

Water in Israel and the Middle East: Regional Water Sustainability and Resilience

2nd Annual Symposium Proceedings



MAY 24, 2017
Northwestern University
Evanston, Illinois

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Table of Contents

- 1 Symposium Overview**
- 3 Welcoming Remarks**
Aaron Packman
Elie Rekhess
Bruce Carruthers
- 4 Symposium Reflections**
Jean Cahan
Yoram Cohen
Ruth Gavison
- 6 Program Schedule**
- 10 Closing Remarks**
Aaron Packman
- 12 Conference Participants**

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Please visit our website to access the Symposium proceedings:
sites.northwestern.edu/waterannualsymposium2017/

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Symposium Overview

The Northwestern Center for Water Research was created in March, 2016 with an ambitious vision to be a world leader in achieving global solutions for regional and local water challenges. Israel and the Middle East clearly face critical water challenges, inextricably linked with the social, cultural, and political diversity of the region. This has often led to regional conflicts—certainly conflicts of interest, and sometimes political and military conflicts. Water, as a scarce regional resource, has precipitated conflicts, but also served as the basis of collaboration and cooperation, even in times of war. Grounded in Northwestern's tradition of leadership in interdisciplinary studies, the Water Center and the Crown Family Center for Jewish and Israel Studies have developed a partnership to explore and resolve water challenges in Israel and the Middle East. We approach these problems from multiple perspectives: social sciences, natural sciences, technology development, law and policy, and systems analysis. Through Northwestern's unique approach, we seek to realize regional solutions for water in Israel and the Middle East that can be exported globally to provide Water for Peace and Health in arid regions around the world.

Our annual symposium, *Water in Israel and the Middle East*, explores the major themes of water use and sustainability in Israel and the Middle East from scientific, social, and political perspectives. Our second annual symposium took place on May 24, 2017, with a focus on *Regional Water Sustainability and Resilience*. This event was co-sponsored by the Center for Water Research, the Crown Family Center for Jewish and Israel Studies, and the Buffett Institute for Global Studies. We are pleased to share with you the Symposium's key outcomes.

IDENTIFYING CHALLENGES

The central question around which our 2017 symposium speakers framed their discussions was introduced by lead speaker Jean Cahan, Director of the Harris Center for Judaic Studies at the University of Nebraska-Lincoln: "Is water viewed best as a right or a need?" A seemingly obvious conclusion, albeit one that is not universally acknowledged, is that food, water and energy are inseparable. Water is needed for irrigation to grow food in arid regions. We need water to produce energy, and we need energy to produce clean water. It is now recognized that feeding the world is a water challenge, and the security of our energy resources is a water challenge. As we focus on sustainability and resilience, we need to consider the intersection between water for drinking, water for food, water for energy, and water for industry. This understanding is essential to develop solutions from social, political and technological perspectives.

Symposium participants identified a common set of challenges in terms of transboundary water issues: water doesn't respect national boundaries, and people's needs don't align precisely with political boundaries. This presents the dual challenge of water management and social equality: how can we sustainably manage available water resources while achieving social equity both within countries and across borders?

SEEKING SOLUTIONS

We are developing the technological capability to deliver water where it's needed with the quality that is needed for people, industry, and agriculture. This will yield capability to produce clean water where it is needed to grow food crops in the desert, with highly controlled precision irrigation to maximize efficiency of food production. We also have the opportunity to look for greater efficiency, resiliency, and sustainability through system-level solutions, integrating natural resource management, new technologies, and sensible water use. However, technological solutions to the challenges of water resource management in the Middle East are subject to myriad legal, regulatory and political barriers. Further, most countries have made enormous long-term investments in centralized infrastructure, and this infrastructure forms the backbone of water treatment and delivery systems today. New solutions require innovative strategies to mix new methods with old methods, to blend new water from processes such as desalination with established water resources, and to make investments to understand both the opportunities and risks from these new water systems. Ultimately, doing so will greatly expand the resource base, deliver water where it is needed with the quality that is needed, and yield robust and efficient water networks to increase regional security.

The 2017 Symposium on Water in Israel and the Middle East explored diverse perspectives and strategies to achieve increased water sustainability and resilience throughout the Middle East, for the long-term benefit of all of the peoples of the region. This conversation, and the new collaborations that it stimulated, advances the Water Center's mission on Water for Peace and Health. We very much look forward to working with our new partners in Israel and the Middle East to help resolve the world's water challenges.



Aaron Packman

Director, Northwestern Center for Water Research
Professor, Department of Civil and Environmental Engineering



Welcoming Remarks



Aaron Packman
Director, Northwestern Center for Water Research

This symposium is intended to explore broad issues of water resources availability, social and political dimensions of water sharing, and technological and other innovative solutions for increasing the water resource base. The specific theme this year is to explore issues of water resilience and sustainability. This is part of a broader effort of the Center for Water Research to explore not only technological solutions for water, but also to link more widely and use water resources as the basis for improved peace and health. We are also looking to connect across campus to generate opportunities for faculty and students to work together across all disciplines to solve water resources challenges. Today's sessions will address broader issues of cooperation in the Middle East, as well as technological solutions. Our presenters will address these issues from different perspectives, particularly food, water, and climate, then discuss opportunities to develop scientific and technological solutions. So today we will explore potential water solutions for Israel and the Middle East from social, political, and technological perspectives.



Elie Rekhess
Associate Director for Israel Studies, Crown Family Center for Jewish and Israel Studies

While many of my colleagues who are here today represent the exact sciences, I represent the humanities. Two years ago, an idea was born: why not join forces in enhancing the teaching and research on water issues? We then created this collaborative venture between the Crown Family Center at the Weinberg College of Arts and Sciences and the Center for Water Research in the Northwestern Office of Research. Now, the rationale behind it is that we believe, in order to more deeply understand water issues in one of the world's most complex and explosive regions, an interdisciplinary, in fact, a multi-disciplinary approach might be in place.

And what we are seeking is to introduce a methodology that combines social and exact sciences. We thus decided to jointly teach, explore, study, and research water issues in Israel and the Middle East. This cross-campus, cross-school experience seems to be working well thus far. We co-teach an annual seminar to students both from McCormick and Weinberg. We co-sponsor this symposium, our second. We conduct joint research ventures between Northwestern and Israeli university scholars. And we promote student exchange. As head of Israel studies at Northwestern, I'm particularly pleased and proud to watch this venture successfully grow. I believe that Israel Studies is not and should not be limited only to the more common conception of the Israeli-Arab conflict, the military aspect, the armed struggles, suicide bombing, and the like. Israel studies, to us, also means arts, music, culture, media, communication, law, and, not less important, science and technology. Israeli academia has attained impressive achievements in science and technology, and has so much to offer. As we witness on a daily basis, water has become a weapon in internal battles, internal strife, which have torn the Middle East apart in the last five years. This symposium, like the joint collaboration, is an initiative to make interdisciplinary research a priority and to better understand the water issues in one of the world's most complex regions. The combination of humanities studies, technological research and policy implementation will hopefully help make this vision a reality.



Bruce Carruthers
Director of The Buffett Institute for Global Studies

I am very pleased that the Institute has the opportunity to support this event. There are many things about water that fit wonderfully with the profile and the interests of the Buffett Institute. Water is a local issue. Water is a regional issue. And water is a global issue. Thinking about water—and who has it—and water sustainability is simultaneously an engineering problem, a political problem, and a social problem. This symposium really hits all of the different aspects of interdisciplinary and global topical relevance that the Buffett Institute recognizes and in which we like to encourage activity.

Symposium Reflections



Jean Cahan
Director of the Harris Center for Judaic Studies
University of Nebraska-Lincoln

My aim here is to expand on some ideas presented in my edited volume, *Water Security in the Middle East: Essays in Scientific and Social Cooperation* (London: Anthem Press, 2017). There I sought to make the case that, given the extreme water stress of the entire Middle East region, as well as the high and long-running political tensions, scientific and technological solutions cannot be discussed or implemented without taking into consideration social and cultural conditions, precisely those factors studied by the humanities and social sciences. History, cultural anthropology, religious studies and philosophy can all be helpful in the search for fair solutions that are sensitive to the particular needs of each society.

In the paper given at Northwestern University, I focused on philosophical issues presented by the Israeli-Palestinian conflict. With respect to water, the conflict rests on the fact that while Israel has, to a considerable extent, provided itself with an efficient national water system of high quality, Palestinians do not have anywhere near sufficient amounts of water for daily domestic needs, including drinking. Their access to water appropriate for agriculture is also not adequate. Three philosophical concepts or problem-areas recur frequently in negotiations between the parties and in the literature on water scarcity: the problem of power, or Israel's presumed hegemony; the nature of national identity, both Israeli and Palestinian, and the meaning of water for both; and the limited possibilities for cooperation.

Israel's political and military dominance in the region has been much discussed by the London School of water security studies, notably Mark Zeitoun and Jan Selby. In their view, Israel's hegemony makes genuine cooperation impossible. I argue that the concept of hegemony (drawn from Gramsci) as analyzed by the London School is not supported empirically, by history, and also may not be used as Gramsci intended. Doubts about cooperation also rest on a postmodern "hermeneutic of suspicion," where no gesture of solidarity and no scientific proposal for fair allocation of resources is what it appears to be. Scientific objectivity is dismissed as simply a "techno-political" ploy.

Fortunately, this type of epistemological and political skepticism is quite effectively countered by practical, political, as well as scientific work. Especially in Israel, but also in the United States and Europe, universities as well as non-governmental organizations carry out and foster joint research projects—such as advanced mapping techniques for pollution problem—and monitoring activities relating to water management, including transboundary and basin-wide cases, such as the Besor River. Very recently, Israel, Jordan and the Palestinian Authority agreed to a long-discussed project which will replenish the Dead Sea and provide Jordan with greater access to high quality water for all of its needs. The University of Nebraska and Northwestern University are providing scientific support as well as forums for interdisciplinary approaches to questions of sustainability in the Middle East and beyond.



Yoram Cohen
Distinguished Professor of Chemistry and Biomolecular Engineering
University of California-Los Angeles

Since its establishment as a nation, Israel has had to deal with water scarcity. Lack of water resources, while presenting a serious dilemma, has also served to incentivize Israeli ingenuity with respect to both water policy and technology. Israel has become a world leader in water desalination and precision irrigation, and its agricultural industry has provided unique technological advances for new genetically engineered crops and improving crop yield. Israel's centralized approach to water resource management, water use efficiency, water reuse, and sea water and brackish water desalination have proven to be critical elements in its successful quest for water independence. Through advances in water technology, along with its high tech industry and new major natural gas discoveries offshore, Israel now has an unprecedented opportunity to become a regional economic leader. Moreover, partnerships with its neighbors on major water resources development projects, as for example with the planned Red Sea-Dead Sea desalination project, have the potential for improved cross-border relationships. Israel has a clear opportunity—and one may argue the moral responsibility—to do all that it can to work with the Palestinian Authority and provide the technological means to protect existing water resources and develop new alternative water supplies.



Ruth Gavison
Haim H. Cohn Professor Emerita of Human Rights on the Faculty of Law
Hebrew University of Jerusalem

Visiting Professor in Israel Studies at Northwestern University

The water project sponsored at Northwestern illustrates a unique strength of the Israel Studies program there. Israel Studies seeks to integrate within one academic framework a variety of subjects on which Israel can provide a special focus. Often, such programs concentrate on important subjects such as Judaism, Hebrew, the history of Zionism, state and religion issues in the country, and Israel and the Israeli-Arab conflict. However, Israel is more than the ways it relates to all such subjects. It is a vibrant, pluralistic society, whose activities and experiences on issues are extremely relevant to many other states and societies all over the world. When Israelis and people from the US and the region are working together, the result may provide both insight and possibilities of cooperation and understanding across disciplines and urgent practical concerns. This is precisely what happened in the conferences devoted to water issues. They bring together people from many disciplines. Philosophers and historians help us understand the special features of water-based conflicts, with a special emphasis on the Middle East. Scholars and policy people dealing with water and agriculture and urban planning, from Israel and abroad, share information about various ways to improve the quality and quantity of available water to ease managing such conflicts. Such cooperation may make Israel and its relations with its neighbors something that is not only a hopeless zero-sum game. They share serious challenges—and they may benefit from working together to meet them. This is Israel Studies at its best.



Program Schedule

Session One

9:45 AM TO 11:45 AM

Chairperson: Aaron Packman

Professor Jean Cahan

Director of the Harris Center for Judaic Studies
University of Nebraska-Lincoln

*Explaining and Resolving Water Security Tensions in the Middle East: What Can the Humanities Contribute?**

Professor Hussein Amery

Associate Professor of International Studies and Director of the Division of Humanities, Arts and Social Sciences
Colorado School of Mines

Threats to Water Security in the Gulf Arab States

Professor Yoram Cohen

Distinguished Professor of Chemistry and Biomolecular Engineering
University of California-Los Angeles

Advances in Water Treatment and Desalination Technology in Israel: Regional Global Benefits and Challenges



Water and food security are critical to human development, economic growth and political stability. Furthermore, transboundary connections created by globalization, as well as individual empowerment enabled by technological innovations pose certain threats to critical infrastructures and to water supply in the Gulf Cooperation Council countries and beyond. At the *Water in Israel and the Middle East* symposium, the interdisciplinary perspectives of the speakers, and the diversity of voices from the audience were informative, productive, and engaging.

Hussein Amery
Colorado School of Mines



Program Schedule

Session Two

1:15 PM TO 3:45 PM
Chairperson: Elie Rekhess

Professor Naftali Lazarovitch

Associate Professor in the Wyler Department for Dryland Agriculture at the Jacob Blaustein Institutes for Desert Research Ben-Gurion University of the Negev
Irrigation Studies in Arid Environments: From Measurements and Models Towards Sustainable Crop Production

Professor Neda Zawahri

Associate Professor of Political Science
 Cleveland State University
Adapting to Climate Change in the Middle East

Dr. Seth Snyder

Water Initiative Leader at Argonne National Laboratory
 Adjunct Professor of Mechanical Engineering and Chemical and Biological Engineering
 Northwestern University
The State of Technology for Producing Clean Water

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The agricultural sector consumes the majority of accessible freshwater. In the near future, improving agricultural water use efficiency using optimal irrigation and fertilization techniques could support the ever increasing global demand for food. The symposium was an outstanding opportunity to present some key Israeli innovations that improve agricultural productivity while maintaining environmental sustainability.

Naftali Lazarovitch
 Ben-Gurion University of the Negev

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Solutions to water are necessary to meet society's needs. The environment, technology, policy, and social impact must all be considered. Northwestern's *Water in Israel and the Middle East Symposium* was an excellent forum in which to discuss these questions. It was especially valuable in highlighting Israel's progress and how it could impact the region and the rest of the world.

Seth Snyder
 Argonne National Laboratory
 Northwestern University



Closing Remarks



Aaron Packman
Northwestern Center for Water Research

We started today with the perspective of a common framework and common challenges for water with this central question—is water viewed best as a right or a need? Based on the discussion in the afternoon, I would also add the economic issues associated with water as essential to both contention and cooperation.

We can also see, through many of the talks, that food, water, and energy are inseparable. Water is obviously needed for irrigated agriculture in the desert. We heard from Seth Snyder that we also need water to produce energy and energy to produce clean water. So these things cannot be separated.

It is recognized that feeding the world is really a water challenge. Security of our energy resources is a water challenge. We're really looking at the intersection between drinking water, water for food, water for energy, and water for industry.

We also see that there's a common set of challenges in terms of transboundary issues: water doesn't respect boundaries, and people's needs don't align with boundaries. You have a very common challenge to balance water management—how we practically manage the water that's available—and how we achieve some social equity both within countries and then across boundaries.

We have explored some potential solutions for these approaches from a social perspective. We have heard the legal, regulatory, and political barriers to successful management of water to best meet people's needs. And we have also heard some technological solutions that could potentially be implemented to help resolve this problem—all aspects of the problem: to use water efficiently to produce food, to secure energy resources, and to deliver more water to expand the resource base.

So, now we are talking about the opportunity for completely new types of solutions. Not through centralized infrastructure, or through centralized governmental management, which has been the case for the last 100 years in most places around the world. But now having the capability to deliver water where it's needed, with the quality that is needed, and having the opportunity to look for higher efficiency and resiliency and sustainability of solutions.

In principle, this could address some of the challenges that were explored here today. If we can actually enable people to produce clean water where it's needed to grow food, and with precision agriculture to make sure it's used most effectively, that could offer much better equity.

But, of course, we have a huge amount invested in centralized infrastructure. Today we have heard this story for Israel, for elsewhere in the Middle East, and for the U.S. We're now looking at innovation that can integrate new methods with old methods, and coordinate in a much better way to address all of the potential concerns with water. This will enable us to greatly expand the resource base, and to deliver resources where they're needed.

We hope that you have learned something today that's useful—both in terms of your interest in the Middle East, and lessons that are applicable more locally to the U.S. and to Chicago.

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The Water in Israel and the Middle East seminar was a highlight of my academic experience at Northwestern so far. The cross-collaboration between the Jewish Studies and the Civil and Environmental Engineering departments provided a unique opportunity to discuss important social and political aspects of engineered systems. Through readings, class presentations, and discussions, I was able to gain a much deeper understanding of the complex history and present state of water resources within this region. Learning about this fundamental aspect of society through a historical and political lens provided me with a very new academic environment.

Claire Howard
Undergraduate student
Environmental Engineering
Northwestern University

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The Water in Israel and the Middle East seminar (Spring 2017) was one of the most valuable classes I have come across at Northwestern because it brings together students from all parts of the University to exchange ideas in a space that is technically, historically, and ideologically debatable. Never has a class encouraged my engagement more, and been more rewarding as a result.

Benjamin Leibowitz
Undergraduate student
Chemical Engineering
Northwestern University

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The symposium's dual emphasis on human and technical issues was an effective way to expose students to issues of global concern. For undergraduate students, it was a good chance to collect impressions at the intersection of science and society. As an engineering graduate student, it was fruitful for me to attend and learn more about linkages between science and society. Human concerns cannot be thoroughly addressed with calculation. Indeed, the essence of science is to contribute to the whole society. Attending the symposium was definitely a good way to experience this!

Shuolin Li
Graduate student
Civil and Environmental
Engineering
Northwestern University

Conference Participants

Hussein Amery

Hussein Amery is Associate Professor of International Studies and Director of the Division of Humanities, Arts and Social Sciences at the Colorado School of Mines. He had also served as Associate Provost & Dean of Undergraduate Studies and Faculty. He recently published a book titled *Arab Water Security: Threats and Opportunities in the Gulf States*.

Jean Cahan

Jean Cahan is founding director of the Harris Center for Judaic Studies and Faculty Fellow in the Daugherty Water for Food Global Institute at the University of Nebraska-Lincoln. She recently published an edited volume entitled: *Water Security in the Middle East: Essays in Scientific and Social Cooperation*.

Bruce Carruthers

Bruce Carruthers is the Director of the Buffett Institute for Global Studies.

Yoram Cohen

Yoram Cohen is Distinguished Professor of Chemical and Biomolecular Engineering and the Institute of the Environment and Sustainability at the University of California-Los Angeles. He is Director of UCLA Water Technology Research Center, Director of the UCLA Younes and Soraya Nazarian Center for Israel Studies. Dr. Cohen is co-founder and member of the University of California Center for Environmental Implications of Nanotechnology, which received the 2012 California Governor's Award in Green Chemistry.

Naftali Lazarovitch

Naftali Lazarovitch is Associate Professor in the Wyler Department for Dryland Agriculture at the Jacob Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev. Dr. Lazarovitch's main research interests are creating a better understanding of water flow and solute transport in the soil-plant-atmospheric system, increasing agricultural water use efficiency using optimal irrigation and fertigation scheduling and modeling (numerical and analytical), measurements and interpretation of water, heat and solute movement in the root zone.



Aaron Packman

Aaron Packman is Professor of Civil and Environmental Engineering and Director of the Center for Water Research at Northwestern University. His research focuses on water systems dynamics and the transmission of nutrients, contaminants, and waterborne disease in natural and engineered water systems. He has received numerous awards for his work, including a Fulbright Distinguished Chair Award in 2013.

Elie Rekhess

Elie Rekhess is Crown Visiting Professor in Israel Studies and Professor of History at Northwestern University. He is also the Associate Director for Israel Studies at the Crown Family Center for Jewish and Israel Studies.

Seth Snyder

Seth Snyder is the leader of water initiatives at Argonne National Laboratory. Dr. Snyder coordinates work with other U.S. Department of Energy national laboratories to address the Energy-Water Nexus. He also coordinates a regional initiative in water investment in Chicago. Previously he served as Bioenergy Technology Manager and leader of Process Technology Research.

Neda Zawahri

Neda Zawahri is an Associate Professor of Political Science at Cleveland State University working on issues of South Asia over transboundary water resources. She has conducted extensive field research in the Middle East and South Asia. She is currently working on a project about building adaptive capacity to respond to climate change among the riparian sharing the Jordan, Euphrates, and Tigris Rivers.



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