AUB American University of Beirut
الجامعة الأميركية في بيروت

ISSAM FARES INSTITUTE
FOR PUBLIC POLICY
AND INTERNATIONAL AFFAIRS

Climate Change and Environment in the Arab World

May 2009

Research and Policy Memo #4

Mark Saadeh, PhD

Dr. Mark Saadeh received his PhD in Hydrogeology at RWTH Aachen University in Germany. In his doctoral thesis he focused on seawater intrusion in the Greater Beirut area and its impact on water quality. He is currently a consultant to the Litani River Authority. He was project manager of the Litani Water Quality Management Project (LWQM) from 2004 to 2005, funded by USAID. Currently, Dr Saadeh is an instructor at Université Saint-Esprit de Kaslik (USEK), Lebanon. His interests are in hydrogeology, seawater intrusion and its implications on groundwater quality.

Water mismanagement responsible for high levels of saline and chloride in Greater Beirut groundwater

Seawater intrusion in the coastal aquifers of Greater Beirut has largely been a direct consequence of decades of water mismanagement – exacerbated by a civil war lasting more than fifteen years, according to Dr Mark Saadeh, consultant to the Litani River Authority. Concurrent urban growth and repeated natural drought conditions have also amplified this phenomenon.

Dr. Saadeh presented two lectures at AUB, as part of the Research and Policy Forum on Climate Change and Environment in the Arab World, at the Issam Fares Institute (IFI), on his findings into a four-year research dissertation on the effects of seawater intrusion in the municipalities of Beirut, Baabda, and Aley.

Unconventional means needed to combat seawater intrusion in Beirut

Lebanon is the only Mediterranean country without a monitoring or mitigation program for seawater intrusion along its coast. Legal and illegal wells along the coast over extract fresh water from aquifers. This increases the mix between fresh and salt water, which raises saline and chloride levels in groundwater.

> “With limited technical means and political will, reversing the effects of seawater intrusion in Lebanon is almost impossible”

Fresh-salt water mixing in wells across Greater Beirut is at least five times the accepted scientific threshold for public use, according to Saadeh’s research, “rendering ground-water virtually useless.”

There are international limits on the amount of saline and chloride in water acceptable for use across sectors: in cement mixing for industrial use, in irrigation for agriculture, and in drinking water for public consumption.

Collected between 2004 and 2005 from 20 to 30 mostly-private wells across Greater Beirut, Saadeh’s data shows the problem of groundwater salinity is extensive in the southern suburbs of Beirut, but minor moving in to its northern suburbs. Public wells, belonging to Beirut’s water authority, have the highest salinity, although the problem will continue to increase dramatically across private wells.

“With a government that seems incapable of supplying Beirut with more fresh water sources,” said Saadeh, “people will continue to take matters into their own hands and turn the wells on for longer periods, illegally.”

There are conventional ways to combat the effects of seawater intrusion - including hydrological techniques such as groundwater reinjections - but cases like Beirut, which have passed a critical threshold, require different, more immediate countermeasures, said Saadeh.

The Issam Fares Institute for Public Policy and International Affairs (IFI) at the American University of Beirut (AUB) was inaugurated in 2006 to harness the policy-related research of AUB’s internationally respected faculty and other scholars, in order to contribute positively to Arab policy-making and international relations. IFI is a neutral, dynamic, civil, and open space that brings together people representing all viewpoints in society. It aims to: raise the quality of public policy-related debate and decision-making in the Arab World and abroad; enhance the Arab World’s input into international affairs; and, enrich the quality of interaction among scholars, officials and civil society actors in the Middle East and abroad.

The Research and Policy Forum on Climate Change and Environment in the Arab World provides a mechanism that brings together AUB professors, other academics and researchers, civil society, the private sector and policymakers. By promoting close interaction between researchers and policymakers, it aims to help formulate more effective environmental policies in the Arab World, and to mitigate the impact of expected climate change scenarios and other environmental challenges. The AUB-IFI Climate Change Forum comprises lectures, research, publications, comprehensive regional databases of scholars and research, and regular workshops, seminars and conferences.

Rami G. Khouri *IFI Director*
Dr. Nadim Farajalla *Faculty Research Director*
Sarine Karajerjian *Program Coordinator*

You can listen and watch the lecture on Youtube on IFI website:
http://staff.aub.edu.lb/~webifi/

Immediate countermeasures

The Ministry of Energy and Water (MoEW) is the authority responsible for the management of water resources in Lebanon, including the coastal aquifers of Greater Beirut. This ministry should therefore set and implement a clear strategy for immediate mitigation into the phenomenon of seawater intrusion along the entire Lebanese coast, not just in Beirut.

For the time being however, the most important and immediate measures for staving off seawater intrusion, include the following:

- Addressing Beirut's water losses - network leakages account for 50% of the loss, whilst over 20% is due to illegal tapping. Saadeh thinks this is a core reason for over-pumping. "We can only minimize these losses, never cancel them out," he said, "but once we do that, we can then address the issue of budget versus consumption." In 2005, Beirut's water budget had a demand deficit for water of 35 percent in the winter and over 50 percent in the summer."

"The phenomenon of seawater intrusion could impel Lebanon to one certain outcome if left unchecked - desalination of seawater."

- Creating a "buffer zone" along Beirut's coast to curtail groundwater abstraction by suspending new well permits. "Then and only then can we proceed with the conventional recommendations," Saadeh said, the foremost of which should be the creation of a national groundwater metering system. Lebanon has a pay-as-you-go electricity system that charges according to consumption, but is one of few countries in the world that does not have the same metering system for water. The lack of such a system "is conducive to tampering by individuals, and instills a sense of disrespect in nature and the importance of water in our country."

With the ongoing trend of abstracting subsurface water beyond the safe yields of Lebanon's coastal aquifers, concurrent with repeated periods of drought, the phenomenon of seawater intrusion could impel Lebanon to one certain outcome if left unchecked - desalination of seawater. ■

Issam Fares Institute for Public Policy and International Affairs
American University of Beirut

408 Diana Tamari Sabbagh
(DTS) Building
PO Box 11– 0236, Riad el Solh
Beirut 1107 2020, Lebanon
Tel: 961–1–350000, x 4150
Fax: 961–1–737627
e-mail: ifi@aub.edu.lb

Issam Fares Institute Website
staff.aub.edu.lb/~webifi/

AUB Youtube Channel
www.youtube.com/AUBatLebanon

AUB website:
www.aub.edu.lb

Lectures in the Research and Policy Forum on Climate Change and Environment in the Arab World 2008 Lecture Series:

"Climate Change and Carbon Emissions Trading in the Arab World: A Realistic Answer to the Dangers Ahead?" Jad Chaaban, Assistant Professor of Economics, AUB and Souheil Abboud, Middle East Regional Director, EcoSecurities Group plc.

"Post- Kyoto Policies: How Can Arab Countries Meet Climate Change Challenges after 2012?" Wael Hmaidan, Executive Director of IndyAct - The League of Independent Activists

"Are Changes in Insect Patterns in the Lebanese Mountains Evidence of Climate Change?" Nabil Nemer, Research Associate at the Faculty of Agricultural and Food Sciences, AUB

"The Tripod of Academia, Government and Private Sector: From Science to Policy Making" Berj Hatjian, Director-General of the Directorate General of the Lebanese Ministry of Environment