Groundwater and Hydropolitics in Israel Under Climate Change

Introduction

The conflict between the Israelis and Palestinians is without a doubt one of the most well-known and drawn-out in modern history. The conflict has involved numerous battles and much bloodshed. Both sides claim ancestral and historical rights to the land currently known as Israel. Much of the history of the Israel-Palestine conflict is beyond the purview of this paper, but can be tangentially or directly related to water. Water in Israel, as will be discussed later, is intensely scarce and unevenly distributed. As such a limited resource, water management has become highly politicized and inexorably tied up in the conflict. Though much attention is focused on the surface water resources of the country, more than half (Feitelson, 2005) of Israel (including areas under Palestinian control) relies upon groundwater for basic needs. The location of the main aquifers under Palestinian controlled territories adds another layer of complexity to the issue. Thus, this paper will be focused on groundwater, and the hydropolitics surrounding its extraction and use.

Hydrogeology

Groundwater supplies in Israel are derived from two main aquifer systems. The first, which is known as the Coastal Aquifer, underlies much of the Mediterranean coast of Israel, including the Gaza Strip. This aquifer is mainly sandstone in composition. Within the Palestinian-controlled Gaza Strip, the safe yield from this aquifer is estimated at 55 million cubic meters per year (MCM/yr) (Zeitoun, 2008). The second major aquifer is known generally as the Mountain Aquifer, and is split into Western, Eastern, and Northern portions. Collectively, these aquifer sections provide a safe yield of approximately 630 MCM/yr (Libiszewski, 1995). The Mountain Aquifer system is generally composed of fractured limestones and dolomites, and is recharged by precipitation falling in the mountainous regions of eastern Israel. The Mountain Aquifer underlies, and is the most important water resource for, the entirety of the West Bank. This aquifer is also vital for artificial recharge purposes; surplus flows into Lake Kinneret are stored within the Mountain Aquifer.

Water Demand

Israel is effectively out of water, and has been for some time. This does not mean that basic water needs for its population are not met, but it does mean that its annual water requirements easily outstrip the annual natural renewable water resources available. In practice this has been dealt with in three ways: Over
pumping of groundwater, reuse of wastewater or desalinization of seawater, and the use of virtual water. In the Gaza Strip, groundwater is typically extracted at a rate of 135 MCM/yr (Zeitoun, 2008), which is far above the sustainable rate. The situation is similar in the West bank region. In both cases, over pumping has lead to significant decreases in static water levels. This, in turn, has caused some serious water quality issues, which will be discussed later. Desalination and wastewater reuse have recently become important methods for provision of additional water, but the Palestinian controlled regions lack the capacity to make use of this technology in any significant way. Virtual water has long been an important method for dealing with the water deficit in Israel. While agriculture is still the main water user in the country, domestic farmers do not produce the entirety of the food demanded. Instead, Israel imports a great deal of its crops, and is able to provide its population with food without directly using the water that would be required to produce it.

**Water Quality**

Numerous threats to quality of water in both of the major aquifer systems exist today, all of which are exacerbated by the over pumping problem. Growing populations exist directly in the recharge zones for both aquifers. Without adequate environmental protection, this has lead to rising levels of a variety of contaminants, including nitrates and heavy metals. Seawater intrusion is of major concern in the Coastal Aquifer, though the Mountain Aquifer is not immune to intrusion of brackish water. Over pumping has the dual impact of reducing the quantity of water into which pollutants would normally be dispersed, and encouraging the intrusion of seawater or brackish water from other formations into stores of previously potable water.

**Hydropolitics**

It should come as little surprise that there is much contention over such a limited resource in an area already in the middle of an intensely heated conflict. In particular, the Mountain Aquifer is the source of much debate, as the majority of its extent is located under the West Bank. Given the deteriorating quality of the Coastal Aquifer from seawater intrusion and other pollution, the Mountain Aquifer stands as the most reliable and secure water resource of reasonable quality in the country. Thus, Israel has significant interest in maintaining control over the majority of the water from the aquifer. Currently, though numerous shallow groundwater supply wells exist within Palestinian territory, deep-completion, Israeli controlled wells pump a much larger quantity of water. Combined with the constant encroachment into formerly Palestinian territory by Jewish settlers, this has lead to a rather unbalanced water allocation; the Palestinians control the land, but the Israelis have control over much of the water. The Oslo II Interim Agreement of 1995 established Palestinian water rights and a Palestinian Water Authority, but the extraction amounts guaranteed to each side are far from equitable.
Climate Change

Predictions related to future climate in Israel are somewhat dire. It is expected that precipitation will decrease overall, while simultaneously occurring in more intense events. Over time, this could not only significantly reduce the water availability, but severely impact water quality. Higher intensity events increase surface runoff, and allow less water to infiltrate into the subsurface. Decreased water levels will have the effect of further concentrating pollutants in the groundwater. Rising sea levels will cause even greater seawater intrusion issues in already degraded aquifers. Essentially, climate change is expected to severely compound already serious water quantity and quality issues.

Solutions

It is difficult to envision any simple solutions to a problem that is so intertwined in such an intense and long fought conflict. Given the scarcity of water in the area and the contested nature of the most stable resources, it seems likely that an increase in water supply is required. This will most likely be in the form of further desalination and wastewater reuse. Additionally, political solutions designed to equitably manage the water in the Mountain Aquifer and protect the water in the Coastal Aquifer would be ideal, but seem unlikely at this point.

References


