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Transboundary Water Resources

North American Transboundary Groundwater Management Under Climate Change

Introduction

While much attention has been focused on internationally shared surface-water resources, transboundary groundwater resources are of great importance in many regions of the world. Moreover, the flow of water in the subsurface is by its very nature somewhat more complex and less predictable than the flow of surface water. Over-pumping may significantly reduce groundwater levels over time, and pollution may linger in an aquifer for decades. Careful management is necessary to ensure the long-term viability of a groundwater resource, especially when the resource is shared by neighboring countries. As will be discussed below, transboundary aquifer management is a concern that has been addressed by a number of international organizations and numerous individual countries. The United States shares significant groundwater resources with both Mexico and Canada. This paper will present an overview of internationally proposed policies, and focus specifically on the current state of shared aquifer management in North America.

International Aquifer Management

Several guidelines and agreements have been drafted for the purpose of managing internationally shared aquifers. The International Law Association’s 1966 Helsinki Rules on the Uses of the Waters of International Rivers is perhaps the earliest example of documents of this type. This particular document was prepared simply as an international guideline, and is not legally binding in any way. Further, it only addresses aquifers that are hydraulically connected to international surface water resources, and does not directly address the management of all transboundary aquifers. The same organization addressed groundwater more explicitly in its 1986 Rules on International Groundwaters, and its 2004 Berlin Rules on Water Resources. The general point of these rules was to assert each nation’s right to an equitable share of the transboundary resource, and to mandate the protection of said resource.

The United Nations International Law Commission began work on a document partially modeled upon the Helsinki Rules in 1970. This document, known as The Convention on the Law of Non-Navigational Uses of International Watercourses, was adopted by the United Nations in 1997. Unfortunately, the document has not yet been ratified by enough member countries to be accepted and enforced. This is partly due to Article 7 of the document, which would require that water resource users refrain from doing harm to other users in a watershed, and provide legal
redress in any case where harm was actually done. A new set of draft articles pertaining to transboundary groundwater management was submitted to the United Nations General Assembly in 2008. This set of documents contains language intended to address concerns raised about section of the previous document noted above.

In addition to the numerous draft documents related to the governance of internationally shared groundwater, a large body of information has been assembled on the nature and extent of transboundary aquifers. In 2000, the International Hydrological Programme of UNESCO created the Internationally Shared Aquifer Resources Management (ISARM) initiative to provide expertise on the topic of transboundary groundwater.

**United States Groundwater Management**

The United States shares no fewer than seventeen aquifers with Canada and Mexico. Many of these aquifers are of regional significance for both of the countries they underlie. Management of groundwater resources varies significantly throughout North America. Groundwater is treated as federal property in Mexico. It is regulated by individual states in the United States, and provincially in Canada.

Canada-United States transboundary aquifer management is under the authority of the International Joint Commission (IJC), which was established under the Boundary Waters Treaty of 1909. The IJC is generally a surface-water focused organization, but can potentially involve itself in groundwater issues. This has not yet been necessary, as neither country has significantly impacted the other’s groundwater resource use. While water quantity has not been a significant issue at the Canada-United States border, water quality is of some concern in several transboundary aquifers. The Abbotsford-Sumas aquifer in particular is seriously contaminated with nitrates from agricultural pollution. In the case of this aquifer, state and provincial environmental authorities have cooperated extensively to address contamination issues.

United States-Mexico transboundary aquifer management is carried out through the International Boundary and Water Commission, which was established in 1889. Treaties regarding the allocation of surface-water resources were signed in 1906 and 1944. Groundwater was not explicitly dealt with until 1973, when the International Boundary and Water Commission’s Minute 242 was signed. This document cites the need to develop a comprehensive plan to manage United States-Mexico shared groundwater resources, but does not mandate any specific policy. To date, it does not appear that any binding treaty exists to regulate the withdrawal and protection of groundwater resources along the United States-Mexico border. Unfortunately, cities along the border are developing rapidly. As a result, over-pumping and contamination are occurring in many of the important aquifers. Without proper management, the situation can only worsen.
Climate Change

The impact that climate change will have on North American groundwater resources is difficult to precisely predict for a number of reasons. The linkage between climate and groundwater is certainly not as direct as the linkage between climate and surface water. Moreover, the climate of North America varies greatly across its extent, so expected changes may be significantly different from one region to another. The general consensus appears to involve a warming of a few degrees across the continent, with a slight increase in precipitation possible in the north. Decreases in precipitation are predicted for the south, though the potential for greater precipitation concentrated into fewer events has been suggested.

The impact of these changes on North American groundwater resource may not be as pronounced as the impact on surface water resources, but it is likely to be significant. Higher temperatures will lead to greater evapotranspiration and decreased snowpack. Both of those effects will decrease recharge to aquifers and reduce available quantities of surface water. In areas where precipitation is predicted to decrease, the recharge issue will only be compounded. In areas where the precipitation is predicted to increase, it may be of little help; runoff from snowmelt can be much more important for aquifer recharge than direct precipitation in mountainous areas. In general, groundwater availability can be expected to decrease as result of the simultaneous decrease in recharge and increase in withdrawal due to decreases in surface water availability. When considered alongside the importance of some North American transboundary aquifers, this underscores the need for carefully considered and properly implemented management strategies.

References

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