IWRM and Groundwater: Plans, Pitfalls, and Prognostications

Michael E. Campana
Professor, Oregon State University
Technical Director, American Water Resources Association
aquadoc@oregonstate.edu

Groundwater is an important component of freshwater supply. It comprises approximately 95% of Earth's liquid freshwater – far more than surface water. Given its vast reserves, broad geographical distribution, generally good quality and frequent availability at or near the point-of-use, it has become the foundation of many water management systems for drinking water, irrigation, and M&I uses. In the USA, about 40% of the population regularly depends upon groundwater for drinking water and that same percentage is groundwater's portion of irrigation water. Rural areas are often 100% dependent on groundwater. Groundwater also supplies, on average, about 30% of all perennial streamflow.

Groundwater is largely undervalued and narrowly perceived. Even though the interrelationship between groundwater and surface water is well established by science, institutions at all levels struggle to effectively incorporate these concepts into laws, regulations, planning, and sustainable management.

When integrating groundwater and surface water management, planners and managers must be cognizant of the peculiarities of groundwater vis-à-vis surface water: 1) groundwatershed boundaries are often not identical to those of the overlying watershed and may be time-dependent; 2) groundwater response times are generally far greater than those of surface water; 3) pumping effects can be propagated many miles; 4) groundwater rights may be quite different from surface water rights; 5) the ratio of groundwater *stocks* to its *flows* are generally much greater than for surface water; and 6) polluted groundwater can take many decades to be 'cleansed'.

Integrated Water Resources Management (IWRM) is a process to manage water resources holistically. It promotes the coordinated development and management of water, land and related resources to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. The river basin is the fundamental spatial unit for IWRM and this can preclude the incorporation of aquifer systems, particularly deep systems that are not well-connected to surface water or underlie several river basins. Nonrenewable groundwater resources are particularly difficult to address through IWRM. Thus, in the case of groundwater, IWRM is essentially a two-dimensional approach to a three-dimensional system. I will discuss the apparent groundwater - IWRM conundrum and suggest a path forward.