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GUEST EDITORIAL

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Sustainability and groundwater management

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In Texas, the old adage goes—whiskey is for drinking and water is for fighting. The battle for the control over blue gold is heating up in many fast-growing arid and semi-arid regions like Southwestern US, India, Middle East and Africa. The surface water in most regions of the world is managed using the doctrine of prior appropriation or the first in time, first in right approach. The water in many rivers is already spoken for and warring nations have in some instances constructed dams on many international rivers to wage economic warfare on their downstream neighbors. In many fast growing areas, the downstream users have to depend upon effluent releases from their upstream neighbors to have access to any water. Even in the US, the discharge of treated wastewater has been allowed by several southwestern states since the 1970s to meet downstream and in-stream ecological needs. The good news about this move was that there was more water available for downstream users. The bad news however was that there was still not enough to go around.

Unlike surface water resources, groundwater is privately owned in many parts of the world and governments have given little thought towards the management of groundwater resources. In Texas, the century old Supreme Court ruling allows landowners to pump as much water underneath their land for beneficial uses as practical, with little regard to the needs of the adjacent landowners. The legislature has since somewhat remedied the situation and groundwater conservation districts can be petitioned for, and enabled by the Texas legislature. These districts have democratically elected board members who develop rules and regulate the aquifer resources within their jurisdiction. In most instances, groundwater conservation districts have been set up along administrative (county) boundaries and they tap into the same aquifer, leading to water related confrontations and tensions.

The rural electrification and subsidizing of electricity by the Indian government during 1960s and 1970s allowed farmers cheap access to groundwater resources. This move has been hailed as the silent revolution that led India from being a net food importer to an exporter. In elections held in India early last year, groundwater issues played a major role in determining who came into power. In the state of Andhra Pradesh, an illustrious chief minister, who heralded the Internet era was voted out of power for apparently not providing sufficient electricity subsidies to poor farmers facing drought conditions. While plans to link major rivers are now being contemplated in India, groundwater is minimally regulated and the law of the largest pump has created some powerful water lords who have the financial infrastructure to install deep wells and heavy duty pumps.

Just like rivers and streams, many aquifers are shared by different nations. The lack of visibility of groundwater probably has something to do with its limited public awareness. Over exploitation of aquifer resources in one country not only reduce water in an adjoining down-dip nation, but also affect its water quality. Saltwater intrusion into the aquifer due to population growth and economic development plague Israel, Palestine and other nations in arid Middle East with heavy reliance on groundwater that share the same aquifer. The recharge areas for the aquifers in the Kingdom of Qatar are all in the adjoining Saudi Arabia. Seemingly benign actions of economic development, such as building shopping malls and associated parking lots in Saudi Arabia, if carried out with little regard to aquifer, can seriously affect the already depleting groundwater resources of Qatar.

With increased public awareness of the importance of groundwater, the elusive concept of sustainability is slowly emerging to the forefront of groundwater management. The Texas legislation challenges groundwater districts to consider the competing objectives of current economic development as well as the need to conserve

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this resource for future generations. Trans-boundary aquifer issues are being highlighted and the United Nations has recognized groundwater as a nations' valuable resource. Sustainable management of groundwater resources is being called for by both political entities and scientific organizations alike. Interestingly, all stakeholders, including those planning to move significant amounts of groundwater over large distances for what seems like short-term gains claim to work within the rubric of sustainability. Unfortunately, the consensus over sustainable groundwater management seems to end there.

Consensus-based management is vital to foster sustainable groundwater policies and practices. A first-step towards reaching consensus is to understand what "sustainability" means to different stakeholders. Groundwater capital within a management area is comprised of—natural capital (i.e., the water in the aquifer) and physical capital (i.e., benefits derived from using the water). Those interested in marketing water or using it for short-term economic gains often ascribe to the notion of weak sustainability and assume that the physical and the natural capital are perfectly substitutable. The benefits derived from using the water in the present are assumed to generate enough revenues to identify and seek alternative sources in the future. Cities like Los Angles, CA, San Antonio, TX and Chennai, India are classic examples of weakly sustainable systems whose prosperity and growth has created a tax base that helps them identify alternative water supplies in nearby areas. Conservation-oriented folks on the other hand strive for strong sustainability, and emphasize that physical and natural capitals of groundwater cannot be interchanged. The ecological services provided by groundwater, in the form of springs and wetlands and freshwater inflows to rivers and estuaries, foster a unique quality of life that people in many rural areas cherish and want to preserve for future generations. Thus, the word sustainability has different meanings in rural and urban settings! Understanding these differences is vital to promote meaningful dialogue that will eventually lead to sustainable solutions.

Intra-generational equity is also an important aspect of sustainability theory. In the context of groundwater, Mother Nature has played favorites and allocated easily extractable groundwater to those in the recharge areas. It makes perfect geologic and economic sense to seek water supplies in areas where the aquifer is prolific. Does this mean, those living in down-dip areas have a smaller stake on this resource? Technological and economic instruments can be used to address the issue of intra-generational equity. Setting up water markets and tradable permits wherein the available groundwater is equitably divided up amongst all landowners, while allowing down-dip users to sell (lease) their share to up-dip land-owners can at least address the economic aspect of intra-generational equity. However, fostering intra-generational equity would require actions that may be economically inefficient and require additional work on the part of regulators and decision makers. In a trans-boundary context, intra-generational equity calls for unpopular political decisions which may be perceived as unpatriotic as well!

The recent regulatory changes in Texas mandates joint planning amongst groundwater districts and if carried out properly it can address both intra- and inter-generational sustainability issues. International organizations dealing with trans-boundary aquifers have been established in some instances and may be required in other areas to bring different stakeholders to discuss groundwater needs. However, to be successful, it is imperative to create an environment where the competing viewpoints of sustainability can be openly discussed with healthy respect and skepticism amongst different parties. To paraphrase Mahatma Gandhi, true progress can only be achieved when people can honestly talk about their differences. Creating such an environment will be our gift to the future generations.

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