

“There is nothing like a 'groundwater surplus' scenario... groundwater management in India must be enabled at highly decentralised scales of operation”

The divide between groundwater abstraction and aquifer management is growing, with a narrow focus on drilling and little regard for the effects of a rapidly expanding groundwater footprint on both groundwater reserves and quality in our aquifers. **Dr. Himanshu Kulkarni**, Executive Director and Honorary Secretary of Advanced Center for Water Resources Development and Management (ACWADAM), in conversation with **Venkatesh Dutta**...



[Dr. Himanshu Kulkarni has been a CSIR research fellow, UNESCO scholar, and a Fulbright Fellow. He leads ACWADAM, a non-profit knowledge institution and think tank that has been working on groundwater issues since 1998. Under Dr. Kulkarni's leadership, ACWADAM has worked to bring communities closer to their aquifers and to manage groundwater as a common pool resource through the 'Aquifer-based Participatory Groundwater Management' approach. Dr. Kulkarni is a hydrogeologist by training, having earned his Ph.D. from Pune University in 1987, and has worked on aquifers and groundwater for more than 35 years across India's diverse groundwater regimes. He has been a member of the drafting committee of National Water Policy, Ministry of Jal Shakti (Water Resources), Government of India during 2019-20 and also served as member of the advisory committee of Water Strategy Development, Government of MP. He has also contributed to the drafting the Water Policy for the state of Karnataka, as member of the committee through the Karnataka *JnanaAayoga* and chaired the sub-committee on 'Groundwater and its interaction with surface water' during 2017-18. Dr. Kulkarni was the Chairman of the working group on 'Sustainable Groundwater Management', for the 12th Five Year Plan: 2010-11, Planning Commission, Government of India. He has also contributed on reforming and restructuring CWC and CGWB, the two apex institutions dealing with surface water and groundwater under Ministry of Water Resources, Government of India during 2015-16 as member of the High Level Committee. He also works as adjunct professor and course adviser for the post-graduate course on 'Water Science and Policy' at Shiv Nadar University. He is also a visiting faculty and a member of the Board of Studies at TISS, Mumbai.]

VD: Have we failed to manage groundwater as a common pool resource?

HK: Success and failure are relative terms. We have seldom considered groundwater as a common pool resource despite some good experiments that tested the concept even as far back as the 1970s. The pursuit for many decades was on the sourcing of groundwater to meet

various needs, especially to achieve food and water security for a growing nation. The understanding of groundwater as a resource rare came into focus in our programmes and policies. The divide between sourcing of groundwater and the management of aquifers grew further because of a narrow focus on drilling and extraction without much attention to the impacts of a haphazardly growing groundwater footprint on the stocks and quality

of groundwater resources in our aquifers. However, there is hope as we begin to look more closely at our aquifers through a variety of disciplines that provide insight to the close relationship between aquifer behaviour and human behaviour, in an effort to manage groundwater as a CPR.

VD: Why have we not adopted hydrogeology based 'springshed' management in our planning?

HK: The assumption that there is little groundwater in mountainous regions dominated our water praxis and policy. It was only when the crisis of spring depletion emerged in areas that depended upon spring-water did we wake up to the fact that there are complex mountain aquifers that discharge groundwater naturally in the form of springs. While watershed management prevailed in many of India's mountainous region, it lacked any integration with the system of aquifers below. Infusion of hydrogeology has led to the development of the concept of springshed management that is able to understand the relationship between watersheds and the underlying aquifers. There are now many examples on hydrogeology based springshed management, especially in regions across the Himalaya, Western Ghats and Eastern Ghats. However, there is a long way to go for the concept to be scaled out effectively.

VD: Most of the people think that groundwater is a renewable resource, especially in the Ganga Basin, and we are water surplus. What is the true picture?

HK: Water surplus and deficit in nature are often oversimplified through a play of numbers. While groundwater is a renewable resource, there is nothing like a 'groundwater surplus'. An aquifer, however large, has a defined capacity to store and transmit groundwater through its storativity and transmissivity. An aquifer goes into various stages of depletion when there is a mismatch between groundwater extraction, groundwater recharge and the available stocks in the aquifer. Exploitative extraction of

groundwater leads to depleting groundwater stocks. There is a change in the relationship between the aquifer and the surface water system – streams, rivers, lakes, wetlands – leading to a depletion in base flows. The Western Part of the Ganga basin is under severe stages of groundwater exploitation while this pattern seems to be progressing eastwards. The true picture can only be revealed if we are able to piece together the micro-pictures of water balances and aggregate them together for the Ganga basin. The Ganga basin has three distinct aquifer settings – the Himalayan aquifers, the alluvial plains aquifer system and the southern catchments encompassing a heterogeneous mix of sedimentary and hard-rock aquifers. Each is unique and it becomes necessary to map our rivers basins for aquifer diversity before we oversimplify the surplus and deficit scenarios for such a basin.

VD: We are heavily dependent upon groundwater resources for our drinking and irrigation needs, but it is the surface water department that gets the attention. Do you think that we need to strengthen our groundwater departments?

HK: The unitary nature of water that includes the complex interplay between surface water and groundwater cannot be ignored. The recharge to and discharge from an aquifer are perhaps a clear connotation of the importance of groundwater as part of the larger hydrological cycle. The easy visibility of surface water naturally accords it the greater attention it receives in society, academia and governance. Integrated management of surface water resources and groundwater necessitates a closer association of departments dealing with these two facets of the water system. Strengthening water planning and management on the concept of water as a common pool resource, the hydrological and socio-ecological dimensions of river basins including aquifers and the importance of participatory water governance can break the silos in which the surface water and groundwater functions operate today.

VD: Many States have framed Groundwater Management Bill and Acts, but they have not been able to tackle groundwater depletion. What are your thoughts?

HK: Regulation of any kind requires a mature society that is aware of why it is important to accept such regulation. Legislating groundwater cannot function in a top-down, command-and-control manner unless the large base of groundwater users is taken into confidence. Protection of aquifers and prioritising basic needs to be met from groundwater must become the foundation for community-based participatory groundwater management. Therefore, legislation must be formulated to protect the conservation benefits achieved through collective decision and cooperative action from free riding by individuals. Seeding such concepts in the groundwater model bills through a trusteeship role by the state seems the first step forward. Legislation, first and foremost, must break the shackles of the colonial legacy that links land and water rights! The concept of aquifers as CPRs can catalyse a reformist legislation on groundwater.

VD: Many States are subsidising solar powered irrigation pumps (SPIP), do you foresee any negative impacts in the future?

HK: Solar powered irrigation pumps for groundwater extraction hold much promise from the point of view of improved pumping efficiencies and indirect regulation of groundwater extraction. However, the technology of pumps often leaps ahead of time and distances itself from the basic premise of aquifer behaviour, creating a risk of sorts when extraction rates exceed the capacity of an aquifer to sustain them. Solar power also has the potential to catalyse cooperation by organising people through groundwater collectives. It seems like a double-edged sword though, and careful co-management of groundwater and energy, whether it is grid power or solar power becomes necessary to offset potential negative impacts that may ensue in the future.

VD: A few meters decline in groundwater means several cubic kilometers of mass loss.

Are we able to correctly map the decline and its consequences?

HK: Most estimation efforts focus on mass balances of large (alluvial) aquifers. It is not difficult today, to track mass balances, in such aquifers, what with technological advances that we have observed during the last couple of decades. India's aquifer diversity makes it challenging to apply a single technology that is applicable to track changes in a range of aquifer systems with a wide spectrum of aquifer properties, various degrees of development of groundwater and the range of agro-climatic fluxes that act upon these aquifers. Groundwater management in India must be enabled at highly decentralised scales of operation. Hence, tracking groundwater balances for decentralised water budgeting becomes important. This is not difficult and can be easily achieved through the concept of socio-hydrogeology. The advantage of this method is to go beyond tracking the decline to catalysing change that will operationalised decentralised groundwater management and governance. Conservation, protection, management and governance of groundwater through a close collaboration between the users and government is the only way out to redeem the situation and look beyond stating the obvious!

