example of the ever-expanding notion of a chemical bond, and the high spin metal clusters are expected to play a fundamental role in cold atom chemistry and spintronics. It is refreshing to see the valence bond approach to such novel high-spin clusters. Kronik and Neaton show the power of many-body perturbation theory and density function theory in calculating properties of molecular solids. Such approaches, although computationally demanding, are required for an understanding of the optical properties of organic molecular crystals held together by weak forces. The accurate description of several phenomena that is required to have predictive power is clear from the discussion in the review. Makes one wonder as to how lucky a 'mix and wait' approach needs to be to hit upon the right material.

Thus, in summary *ARPC67* brings out the role of physical chemistry in a wide range of phenomena that span all the way from small clusters to live cells. This is a rather long review of a collection of reviews in physical chemistry. However, for a volume that has 30 articles that span about 700 pages, one cannot hope to do justice in a page or so. I am glad to have glanced through this volume, for several of the articles have been educative and, more importantly, have once again made it clear that challenges abound when it comes to understanding the structure and dynamics of all systems, large and small. I wonder if these diverse sets of topics can be communicated to the students in some fashion so that they get a perspective of this sheer breadth and amazing versatility of the field of physical chemistry.

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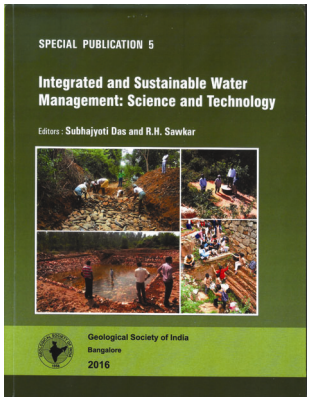

Integrated and Sustainable Water Management: Science and Technology. Subhajyoti Das and R. H. Sawkar (eds). Geological Society of India, No. 63, 12th Cross, Basappa Layout, Bengaluru 560 019, 2016. xviii + 196 pages. Price: Rs 1500.

Water is a key factor in sustainable development of a nation. Hence, the status of water resources and their sustainability, particularly in the arid and semi-arid areas of the country, are of prime concern. Rainfall, the source of all water on earth, has a huge spatial and temporal variation in the Indian subcontinent; it is mainly confined to four months during the monsoon season in a year. India has nearly 33% of its geographical area in the semi-arid and arid category. A substantial part of the arid and semi-arid areas is drought-prone.

Although agriculture is the backbone of our economy, 65% of the net arable area of the country is rainfed and contributes to about 45% of the total foodgrains production in the country. No development is possible without food and drinking water security. Uncertainties in rainfall and uneven water resource availability in space and time are the major constraints in socio-economic development of the region.

Groundwater is the all-important source for drinking water and agriculture in the peninsular region of the country. However, a major part of this terrain is underlain by consolidated formations like granites, gneisses, trappean basalts, metamorphics and cemented sedimentary rocks that hold a moderate to limited reserve of groundwater in the weathered residuum and fractured-rock aquifers, susceptible to overexploitation leading to chronic water scarcity.

This book encompasses 23 peer-reviewed research papers organized in two sections, namely 'Integrated water management and people's participation'; and 'Science and technology in water conservation'.

In the first section, vital issues regarding water management such as the integrated water resources management, water sustainability, water equity, planning and water reforms, water use efficiency, urban water management, inter-basin water transfer, public participation and involvement of citizens, etc. have been discussed.

Aquifer mapping is an important step in aquifer management for sustainable groundwater management. A robust community-based approach for this common pool resource is necessary and to that end, the policy of 'know your aquifer, manage your aquifer' has been advocated. The significance and scope of large-scale rainwater harvesting and artificial recharge in the drought-prone areas of the country have been explained to find a solution to the falling groundwater level and as supply-side management. Importance of soil moisture and water conservation, crop-water planning, irrigation efficiency and rainfed agriculture on demand-side management has been discussed at length.

The importance and effectiveness of people's participation in the management of groundwater resource have been illustrated through interesting case studies and analyses in the book. A few case histories of successful water harvesting and conservation efforts with community participation in the Aravari basin in Rajasthan and Ichalahalla, Kumudvathy and Vedavathy watersheds in Karnataka have been discussed in detail. This has brought out the importance of integrated watershed management based on indigenous knowledge systems with modern inputs for all-inclusive rural growth.

Farm pond for *ex situ* rain water harvesting.

The second part of the book is dedicated to research and water conservation. This section contains many good articles; the readers are introduced to modern techniques such as 3D subsurface mapping using Heliborne transient electromagnetics, or heliborne multi-moment geophysical surveys. With these techniques, tracing weathered zones, water-filled fracture networks, better understanding of aquifer characteristics such as exploitation, conjunctive use and artificial recharge, aquifer mapping, identification of successful borewell sites in fractured rock aquifers, etc. can be accomplished precisely as well as quickly. Such advanced techniques and applications can be useful in the national aquifer-mapping programme in India.

Being the largest consumer, water reforms in the agriculture sector are the need of the hour. The water and food demands are increasing due to rapid population growth and agriculture expansion. The water conservation and management strategies discussed in this section mainly focus on the conjunctive use of surface water and groundwater; advocacy of adoption of drip irrigation and alternative irrigation techniques, and the use of treated wastewater from the sewage treatment plants.

Surface and groundwater management in the Lakshadweep islands in the Arabian Sea and Andaman and Nicobar Islands in the Bay of Bengal has been discussed at length in two papers. As the oceanic islands around the world are threatened by increased incidences of cyclones, storm surges, tsunamis, and submergence by sea-level rise, discussions on water management models for islands will help in combatting the impacts of global warming. Water-related disasters like droughts, floods, storm surges, tsunamis, cloudbursts, etc. have also been discussed in the section. The possible solutions and comprehensive disaster monitoring system for effective mitigations are included.

Many major spheres of water management such as agricultural, water-use efficiency, conjunctive use, urban water, wastewater treatment, oceanic island, disaster, surface water, groundwater, floods and droughts, canal commands, etc. have been covered in the book. This publication highlights many important issues in integrated water resources management. The book rightly suggests a fusion between traditional knowledge and scientific inputs and people's participation to make water resources management sustainable and eco-friendly. The various articles do provide much food for thought for hydrologists, hydrogeologists and water managers in the country.

The editors of this book are renowned experts with a lot of experience working in the Geological Society of India. They have done justice to the subject and have reviewed the papers carefully. Finally, the closing paper by one of the editors contains many useful ideas and strategies for sustainable water resources management in the country.

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