

Water Accounting: International Approaches to Policy and Decision-making. Jayne M. Godfrey and Keryn Chalmers (eds). Edward Elgar Publishing Limited, The Lypiatts, 15 Lansdown Road, Cheltenham, Glos GL50 2JA, UK. 2012. xx + 318 pp. Price not mentioned.

Water is already a scarce resource in most of India and the severity of scarcity is increasing every year. Simultaneously, there is an increased awareness about the economic importance of water, and the tussle for access to and use of available water is also getting more intense. In addition to inter-state and international disputes, now there are disputes between various user groups, viz. farmers versus urban users, farmers versus industry, all human users versus environment, etc.

A standard principle of resolution of such disputes is that existing use should be protected and balance water available can be negotiated. However, determining the existing use or balance water available is far more complicated than what it seems, which is why disputes like those of the Cauvery water linger on for decades despite a Tribunal, a Regulatory Authority at the highest level, and intervention by the Apex Court.

With increasing scarcity it is clear that the use of water will have to be made more efficient in every sector. The concept of 'water footprint' of various products has been introduced, though not yet in use; a few industries have started internal water audits and attempts are being made to introduce benchmarking of irrigation systems.

All these initiatives require establishing water accounting protocols. 'Water accounting' refers to not only measurement and estimation of water availabi-

lity, which is in the domain of hydrology and relatively easier, but also to determining how much water is being used by who, where, for what purpose, and with what productivity. This is in the domain of policy and more difficult. A soft drink manufacturing facility uses water as raw material for the soft drink; as a process material for the washing and cleaning operations, as a coolant for plant air conditioning, and also in the washrooms in the factory premises. Which of these uses is to be considered as 'water use' for the manufacture of a unit quantity of soft drink, is not a question of hydraulic measurement, but a question of accounting policy. This makes it a complex issue, and there are no unique answers. Unfortunately, devising and building a consensus on water accounting procedures is a neglected area in India.

The book under review is a collection of 15 essays on various aspects of water accounting and case studies. These are contributed by 36 authors, all senior professionals in the fields of water, law, economics and environment. Interestingly, neither of the editors is a water-sector professional. Both are professors of financial accounting. But they have squarely addressed this question in the Introduction, as to what qualifies them to edit a book on water accounting.

The collection is organized in three parts. Part I comprising four essays addresses water accounting systems. Management of Murray Darling Basin (MDB) of Australia, starting from construction of a large storage capacity, management of irrigation supplies and out-of-the-box ideas like purchase of water from farmers to be released in the river as environmental flows has provided rich study material to river basin management professionals. The first essay in Part I, 'Beyond the hydrographers' legacy: water accounting in Australia', traces the evolution of water accounting in Australia, with MDB as the backdrop.

The water footprint concept takes water accounting beyond the traditional water withdrawal statistics. In public discourses in water conservation, it is now fashionable to quote 'producing one kg of beef takes five times as much water as producing one kg of rice'. The third essay in Part I, 'Water footprint accounting' by Arjen Y. Hoekstra explains in detail how water footprints are computed. The other two essays in Part I

explain two frameworks for the accounting of water; the SEEAW framework by the UN Statistics Division, and the IWMI-WA, by the Colombo-based International Water Management Institute.

Part II, 'Application and evaluation of water accounting systems' comprises five essays. The first essay is about water accounting in mining and minerals processing. As aforesaid, there is still no rigorous water accounting in India. Estimation of water-use efficiency is limited to water use for agriculture, because agriculture is the largest user of water and to urban domestic water supply, because it is fashionable and politically correct to scold urbanites for their supposedly wasteful practices, even if urban water withdrawals are about 8% of the total water withdrawals and of this consumptive use is about 20%. The essay by Claire M. Cote, an environmental specialist, and others, starts by recognizing that water is a key business asset in mining, and deals with not only quantitative use of water but also with impacts of mining operations on water quality. However, there is a third and equally important aspect which has not been covered, the impact of mining on watershed and hydrology of the area.

The next three essays in Part II are country studies in South Africa, Spain, and China, and the last essay is a comparison of Australian and UN approaches to water accounting.

Part III 'Contemporary issues addressed by water accounting' comprises six essays. The first essay by Gordon L. Clark and Claire Woods is a good 'food for thought' analysis of the difficult subject of long-term versus short-term benefits and inter-generational equity, more commonly known as 'sustainable development'. Other essays in this part include one on water accounting in the context of corporate practices, two essays on the use of water accounting for conflict resolution, a case study of California and of Western United States.

Overall, the book examines the topic in sufficient detail, in a scholarly manner, is easy to read and understand, and all chapters have a long list of references which would provide further reading material for those interested. However, the reader of a review would want to know whether he should obtain a copy of the book. The answer to that question is not easy. Science is transposable across the continents. Policy is not. Books that

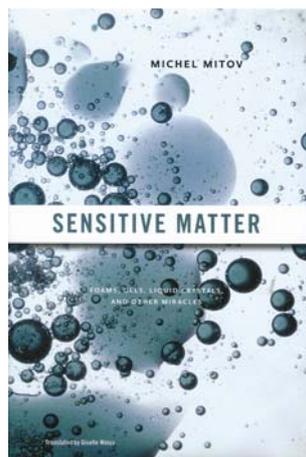
address topics which are entirely in the policy domain, are interesting to read. But one has to keep in mind that the practices enumerated therein have worked in a particular social, economic, policy and legal context. It is doubtful if any of these can be transposed and used in a different context in India.

This is all the more so, because rigorous water accounting at a level this book describes, is yet to be introduced in India. It is pertinent to note that there is no contribution from India. Not only is there no case study, but not even a theoretical contribution. The water sector in India can be seen as divided into three clear groups. One, the technocrats and bureaucrats in the Government, who are essentially practitioners, and plan and implement water management projects. Two, academicians in hydrology or water resources departments of various institutions, who confine themselves mostly to technology, and that too purely theoretical aspects of technology. And three, a small number of civil society actors whose perception of water management rarely goes beyond rainwater harvesting and 'ancient wisdom'.

Neither of these three groups will have much use for a scholarly book on water accounting. The main users for this book will be those who develop policy. As of now India does not have any organized think-tank of water-sector professionals for generating thinking on policy issues. If and when such a think-tank is established, the thinkers would find this book an excellent starting point to develop water accounting practices for India.

CHETAN PANDIT

(Retd.) Member
(Water Planning and Projects),
Central Water Commission,
House 119, 'Sayantara' Society,
DSK Vishwa,
Pune 411 024, India
e-mail: cmpandit@yahoo.com



Sensitive Matter: Foams, Gels, Liquid Crystals and other Miracles. Michel Mitov (translated by Giselle Weiss). Harvard University Press, Cambridge, Massachusetts, USA. 2012. xvi + 184 pp. Price not mentioned.

Physicists, well known to be a breed apart, often fall prey to a Peter Pan syndrome that drives them to look for new toys to play with, new interlocking pieces of that complex jigsaw puzzle we call reality. So these children who never grew up have come up with a new discipline they call 'soft matter physics' and are stubbornly persuaded that the same basic ideas may help us understand how all these things work, from Titian's colors to the organization of life – a life that, according to Shakespeare, is made of the same 'stuff that dreams are made of'? And what could be softer than a dream?

–Roberto Piazza in 'Soft Matter: The Stuff that Dreams are Made of' (Springer Science + Business Media, 2011).

Michel Mitov's delightful book tells us why this dream is not so wild after all. Indeed, French physicist Pierre-Gilles de Gennes received the Nobel Prize in Physics in 1991 for his discovery that the methods developed for studying order phenomena in simple systems can be generalized to more complex forms of matter such as liquid crystals and polymers. The term 'soft matter' was coined by Madeleine Veyssié almost 40 years ago to describe colloidal suspensions, liquid crystals and polymers. The flow of these materials, constituted by mesoscopic aggregates held together by weak forces, is strongly correlated to their easily deformable structures.

In his Nobel lecture, de Gennes listed 'complexity' and 'flexibility' as the two distinguishing features of soft materials. The complexity arises from the organization of the supramolecular structures constituting soft matter. Mitov's book addresses the issue of flexibility – the amazing ability of soft materials to adapt to their environment (in cellular membranes, for example), their ability to create conciliation between two immiscible materials (in getting oil and water to 'mix' while making an emulsion) and their ability to completely change the properties of a material even when added in minute quantities (as in the discovery of rubber).

How do we get oil and water to mix? It is easy if we have surfactant molecules at our disposal – those schizophrenic molecules with a 'hydrophilic' (water-loving) head and a 'hydrophobic' (water-hating) tail. Surfactants orient themselves at the oil–water interfaces with their hydrophobic heads facing the oil and their hydrophilic tails facing the water. This reduces the surface energy of the emulsion droplets and stabilizes the emulsion. This principle is utilized every time we whip up some tasty mayonnaise (essentially a mixture of olive oil and egg yolk, the latter comprising about 50% water and a surfactant called lecithin). Indeed, the human liver would not function properly if the subtle balancing act of bile salts, lecithin (again!) and cholesterol is somehow disturbed.

There is another way of getting molecular 'enemies' to come together – by making chemical links between two warring molecules. In this context, we are introduced to liquid crystals, constituted by elongated molecules that align when subjected to the smallest of voltages, a property that makes them essential ingredients of our computer monitors and television screens.

The discussion now turns to the role of soft materials in facilitating certain desirable changes in the properties of materials. Mitov tells us about the discovery of rubber by the Amerindians of the Amazon basin. The chemistry of rubber formation is simple – atmospheric oxygen reacts with the liquid-like latex extracted from Hevea trees to form bridges between specific points of the latex chains. The result is a solid material – rubber. We are then introduced to Charles Goodyear, the intrepid inventor, who, by sheer serendipity, ended up discovering a more