allotment leads to contentious and competitive demands from various sectors. John Kurien and A.K. Sinha in their paper in Theme 4 mooted a minimum entitlement to all citizens for domestic consumption, an additional entitlement for traditional water users as per current usage, and the balance owned by the states, and auctioned, – the entitlements being tradable. Market trading of entitlements and private sector competition will ensure efficiency, the equity being taken care by entitlements, and sustainability by state/community and a regulator (institution).

With the myth of its abundance belied over the years, water is no further a free commodity. Rather rational water pricing may be an effective deterrent to groundwater overdraft. Kurien and Sinha advocated a market driven pricing policy. A.K. Rastogi suggested a slab system pricing structure, with the economically weaker section charged at subsidized rate. V.V. Damle was of the view that groundwater pricing should reflect service costs as well as social opportunity costs. K. Rajarajan and K. Md. Najeeb attempted groundwater pricing in overexploited water shed in Hassan district, Karnataka, based on the amount of water artificially recharged and extracted by users.

As the wells are mostly owned and operated by private users, community participation is a major step forward in groundwater governance. Srinivas Mudrakartha in his lead paper in Theme 5 cited the experience in Gujarat, where, in a complex domain of groundwater, Multi Stake Holders Participation (MSP) Forums trigger participation at various levels and provide linkages with concerned institutions. A shining example of community participation is the story of construction of 5600 johads and water management in Alwar district of Rajasthan (Rajinder Singh).

The seminar concluded with a set of recommendations highlighting demand-side and supply-side management, as also equity and sustainability of the resource.

Briefly the seminar was a wake-up call for the scientists, engineers, planners, social activists to the reality of the time. Every citizen has a role to play in groundwater governance, or in more popular parlance, groundwater management. Dr. S. Romani, ex-Chairman, CGWB and Dr. K.D. Sharma, Director, NIH, as Joint Organizers of the seminar, deserve full credits for spearheading this national debate on groundwater governance with a futuristic vision.

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INTERLINKING OF RIVERS MAY CAUSE GEOMORPHIC CHANGES

Technologists contemplating interlinking of rivers apparently compare rivers to artificial channels whose dimensions can be controlled at will. However, channel-width, meander wavelength, amplitude and radius of curvature of a river channel are interdependent (Knighton, 1972). A river modifies its dimensions and readjusts itself to the changed circumstances when its water discharge changes. In this respect, a river behaves almost like a living entity.

The dependence of the morphological components of a river on the amount of water flowing through its channel (the discharge) can be demonstrated by arranging the following well-known equations in the following sequence.

$H = 0.086\, d^{1.19}$	(Allen 1968, p.171)	(1)
$W = 42\, d^{1.11}$	(Allen 1968, p.175)	(2)
$L_m = 10.9\, W^{1.01*}$	(Leopold et al. 1964, p.296)	(3)
$L_M = 106.1\, \bar{Q}^{0.46*}$	(Carlston 1965, p.875)	(4)
$V = Q_{ma}/A$	(Schumm, 1972, p.103)	(5)

*These equations (where the units are in f.p.s) are intermediate steps for estimating the mean annual water discharge.

Where H is the mean dune height in meters, d is the bank full depth in meters, W = channel width in meters, L_m = meander wavelength in feet, V = flow velocity meters/second. $\bar{Q}$ = mean annual flood in cubic feet per second, Q_{ma} is the mean annual flood in cubic meters/second. A=channel cross-sectional area in square meters. For practical purposes mean annual flood (Q_{ma}) may be taken to be approximately same as bank full discharge (Schumm, 1972, p.103).

Working backwards through this set of equations it is easy to see that any change in the water discharge of a river channel, which is the ultimate aim of the 'interlinking project' is bound to cause morphological changes. Particularly, the meander wavelength, channel width, and even the dimensions of the sand dunes within the channel would change. Consequently, the human habitations adjacent to the river channel will have to readjust themselves to the changed circumstances.

Several forums (*see* for example, Acharrya 2003), have already discussed the likely adverse effects of interlinking of rivers on ecology, human and wildlife habitat, river dynamics, and hydrological balance. One wonders how disastrous the net effect of 'interlinking' would be, if the geomorphic changes outlined above add to these problems.

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THE CRETACEOUS SYSTEM IN THE MAKAROV AREA, SOUTHERN SAKHALIN, RUSSIAN FAR EAST. Edited by Yasunari Shigeta and Haruyoshi Maeda, National Science Museum, Monograph, no.31, 136p.

A monograph on the Cretaceous system in the Makaraov area, southern Sakhalin, Russian Far East brought out by National Science Museum, Tokyo, Japan has been received in the Geological Society of India's library.

The continuous sections in the Makarov area, which include numerous well preserved fossils ranging in age from the Santonian to Maastrichtian, may provide an important key for the establishment of a precise biostratigraphic framework for the Cretaceous in the western Pacific region, including Japan and Far Eastern Russia. The monograph includes three research papers starting with detailed historical review of research conducted on the Yezo Group in Sakhalin with over 200 references, may help readers in understanding the rationale for the design of the various aspects of future research of Yezo Group. The second paper gives the stratigraphy and fossil assemblages of Upper Cretaceous System (Yezo Group) in the Makarov area, southern Sakhalin. The last paper consists of Maastrichtian ammonoid fauna from the Pugachev area, southern Sakhalin.

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