



Figure 1. Balkhash environs. River Ili (Saraswati) has been numbered one and the rest of Saptha-sindhu accordingly.

Brahmins. Sharada was thus the goddess of knowledge who gave the tools for trade.

*Sapta-sindhu.* Vedas speak of seven such rivers, including the Saraswati. We have only one. How do we explain this? According to me, all of them are present outside India (see Figure 1).

The *Mahabharat* lists all the sacred places on Saraswati. There is one named Oceanus which corresponds to Greek Oceanus. Balkhash is the Greek Oceanus.

Then there is a famous dhyana shloka of Saraswati. It is supposed to bring before the mind's eye, a picture of the river. In that couplet it describes the river as *shubhra vastrankita*. According to me, *shubhra vastra* – a saree – is but a paper thin crust of ice which formed on the river surface. This can happen only outside India. This dhyana shloka is recited throughout India by the devout, without worrying about the exact meaning.

I put these points as a poser to those who believe in an 'Indian Saraswati'. Can they find satisfactory answers?

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gives shar. So the river is also Sharada. This shar grass is the raw material for

arrows used by kshatriya and reed for pen used by the mercantile community and

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## India's imminent water scarcity is a concern for people and environment

Nirupa Sen's article on the land- and water-care movement in India (*Curr. Sci.*, 2001, 81, 236) is timely, since water shortages are now becoming a major global concern. Falling water tables from over-pumping of groundwater are now ubiquitous in several parts of India and also in China, Mexico, Thailand, the United States, Northern Africa and the Middle East. Rising water tables of polluted and over-salinized water are also destroying crops in coastal areas of India by water logging and adding a deadly level of salt to the soil. Experts believe that the water scarcity will also be a security threat of the future<sup>1</sup>.

Historically, Egypt has threatened to go to war to protect its water supplies and just two years ago, the Libyan leader Muammar Qaddafi warned that the next Middle East war would be over dwind-

ling water supplies! The long-standing tensions between Israel and the Arab world are perhaps the most famous of these water tussles. Other areas where friends may be forced to become foes include the Danube in Europe, the Zambezi and Nile in Africa, and the Mekong, Ganges and Indus in Asia<sup>1</sup>.

Based on per capita of renewable water availability, India has water barely to meet its people's needs. Despite an estimated 2464 cubic metres per person per year, many of its nearly 1 billion people do suffer occasional water shortages, as a result of uneven availability. According to the International Water Management Institute, India is one among the 17 countries that will face absolute water scarcity in the future. India has showed miraculous achievement in agriculture, solving food shortages through the green

revolution in the past. But, will it handle the imminent water shortages in future?

Even those who live in areas of high rainfall in India often face the threat of droughts because of deforestation. Since the soil is compacted, rain water runs off before it can be absorbed. Even the legendary Cheerapunji that receives the highest level of mean rainfall, suffers from excessive flooding for 3–4 months and frequent droughts during the rest of the year<sup>2</sup>.

Asia and the Pacific have 23% of the world's land area, but 58% of its people<sup>3</sup>. Patterns of unsustainable resources use and conflicting policies are already causing continued loss of biodiversity in Asia, including the biological hotspots of India<sup>4</sup>. With a rapidly growing human population pressure, water shortages and desertification in India are likely to

worsen. However, they can be averted by fundamental change in direction that involves mobilizing popular support for water saving, integrating water resources management through sustainable development, allocating water to highest-value uses, conserving water reservoirs to maintain groundwater tables, preventing pollution to groundwater, and focusing national support for water initiatives in priority areas.

The land and water-care movement in India may be burgeoning, but it has the

daunting task of tackling future water crisis by working with rural and urban public, politicians and bureaucrats.

1. Postel, S., *Last Oasis: Facing Water Scarcity*, W.W. Norton, New York, 1992.
2. Rao, R., *Ambio*, 1989, **18**, 5.
3. Brown, L. R., Brown, M. and Halweil, B., *Vital Signs: The Environmental Trends that are Shaping our Future*, Norton, New York, 1999.
4. Mittermeier, R. A., Myers, N. and Mittermeier, C. G., *Hotspots: Earth's Biologically Richest and Most Endangered*

*Terrestrial Ecoregions*, University of Chicago Press, Chicago, 2000.

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## Major resource management problems in the arid zone of Rajasthan

Rajasthan was thought to be once a land of luxuriant forests, pure water and air. However now it is facing power cuts, scarcity of drinking water, pollution of land, water and air, senseless devastation of forest, exploitation of minerals and criminal wastage of water for irrigation. Scientists of various research laboratories in Rajasthan remain mere spectators watching the deterioration helplessly.

The constantly increasing human and livestock population is putting tremendous pressure on the available natural resources of the arid zone of Rajasthan. The main problems are (1) scarcity of water, (2) low rainfall with frequent droughts, (3) insufficient groundwater resources, (4) saline or brackish water at many places found at great depths with low discharge, (5) water-logging problem in Indira Gandhi Nahar project areas, (6) poor productivity of soil, (7) wind erosion, (8) deteriorating pasture lands, and (9) advancement of desert.

There is acute shortage of potable water and village women have to fetch water from places far away to meet their domestic requirements. Nearly sixty per cent of the arid zone has saline water, with the total dissolved salts content ranging from 2000 to 20,000 ppm.

Drought in western Rajasthan is a regular phenomenon. Mild and moderate agricultural drought occurs in the entire region, while Jaisalmer region experiences severe drought conditions. Sand flux rate of up to 150 kg/sq m is common during drought. Vegetation cover is reduced to a minimum. Acute water shortage makes normal life miserable.

The state also suffers from destabilization of dune systems due to high wind

erosion, excessive grazing by livestock and cattle, along with other activities like road building, canal excavation, ploughing and deforestation. Nearly one-third of the cultivated land in the arid zone is severely affected by the problem of sand drift. The soil loss is estimated to be 2837 tonnes/ha (ref. 1). The spread of desert towards north-east has endangered the productivity and fertility of soil cover. A study has shown that the desert is spreading through twelve gaps in the central northern Aravalli hill ranges. It has been observed that an area of about 160 km<sup>2</sup> every year is engulfed by the advancing desert. Some measures to check the desert have been suggested by Dhabariya<sup>2</sup>.

In the canal command area of Indira Gandhi Nahar Pariyojana, mean rise in water table of more than one metre per year has been recorded. This is leading to the problem of land degradation, as productive land is getting converted into water-logged areas. Such water-logged areas have increased due to excess irrigation and poor drainage.

The region receives mean annual rainfall of 200 mm. Due to loss of water, the land is incapable of supporting agriculture on its own. It can sustain animals on its natural vegetation comprising shrubs and grasses. Animal husbandry replaces agriculture in this region, which is crucial to the economy of the region. Therefore, the natural grasslands are one of the most precious natural resources. Amongst other grasses, Sewan (*Lasiurus sindicus*) is the dominant perennial grass. There are nearly six million ha of Sewan-dominated, open pasture lands. These grasslands are being degraded either due to

impoverishment of useful species or indiscriminate grazing. Nearly 24% and 44% of the pasture lands are in desertified and highly degraded states, respectively.

Barmer and Jaisalmer districts have rich deposits of limestone, which is used in making cement, clays for ceramics, gypsum phosphorite, and lignite. It is estimated that 2500 million tonnes of limestone deposits occur in this area. Oil and natural gas deposits have also been identified in some regions of the arid zone, but proper mining technology has to be provided in this area. An efficient programme for recycling of the mining waste has to be designed without further delay.

Advancement in technology has provided us a modern technique – remote sensing – for the management of major resources. Satellite remote sensing provides reliable and comprehensive data on various resources for their exploration, monitoring and effective management. The role of remote sensing in resource management has been discussed by George Joseph<sup>3,4</sup>.

1. Dhir, R. P. *et al.*, *Thar Desert in Rajasthan: Land, Man and Environment*, Geological Society of India, Bangalore, 1992, p. 191.
2. Dhabariya, S. S., *Environmentalist*, 1988, 54.
3. Joseph, George, *Remote Sensing Rev.*, 1996, **13**, 257–342.
4. Joseph, George, *Curr. Sci.*, 1997, **72**, 47–54.

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