

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.

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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 km² every year is engulfed by the advancing desert. Some measures to check the desert have been suggested by Dhabariya².

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^{3,4}.

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