University of Nebraska - Lincoln
DigitalCommons@University of Nebraska - Lincoln

Drought Network News (1994-2001) | Drought -- National Drought Mitigation Center

10-1-2001

Poor Water Resources and Drought in the Gujarat/Saurashtra Regions of India

K. K. Nathan
Water Technology Centre, IARI, New Delhi–110012, India

Follow this and additional works at: http://digitalcommons.unl.edu/droughtnetnews

Part of the Climate Commons

Nathan, K. K., "Poor Water Resources and Drought in the Gujarat/Saurashtra Regions of India" (2001). *Drought Network News (1994-2001)*. Paper 58.
http://digitalcommons.unl.edu/droughtnetnews/58

This Article is brought to you for free and open access by the Drought -- National Drought Mitigation Center at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Drought Network News (1994-2001) by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

Poor Water Resources and Drought in the Gujarat/Saurashtra Regions of India

Inadequate water resources pose a big threat to the economy, human activities, and livelihood in the Gujarat/Saurashtra regions of India. Scanty rainfall with wide aberrations in its distribution has made the situation worse, leading to chronic drought in the state in 2001. With the exception of the Narmada and Tapi rivers, there are hardly any water resources to sustain agricultural production in the region. The gradual disappearance of forest cover in the state has further aggravated the drought situation. This has led to large-scale erosion of the topsoil, particularly near the riverside. There is apprehension that the region will soon become an "environmental refugee" zone.

In addition, groundwater resources are overexploited in the state, with the water table going down nearly 4 m per year, particularly in the premonsoon season. The state was once a lush green carpet of groundnut and cotton crops, but mismanagement of water resources at all levels has led to the current drought problem in the Gujarat, Saurashtra, and Kutch regions. Figure 1 depicts the current drought-affected regions of the state.

India has a record of 12 successive good monsoons, with the 13th in the offing this year. But the drought in the Gujarat and Saurashtra regions may be due to the poor monsoon and winter rainfall last year. The crisis was aggravated by overexploitation and reckless use of groundwater. Out of 100 million people affected by drought in India, 25 million are from this region, spread over 17 districts of the state, and 7 million cattle are also affected. There is a 30% deficit of food grains in this region.

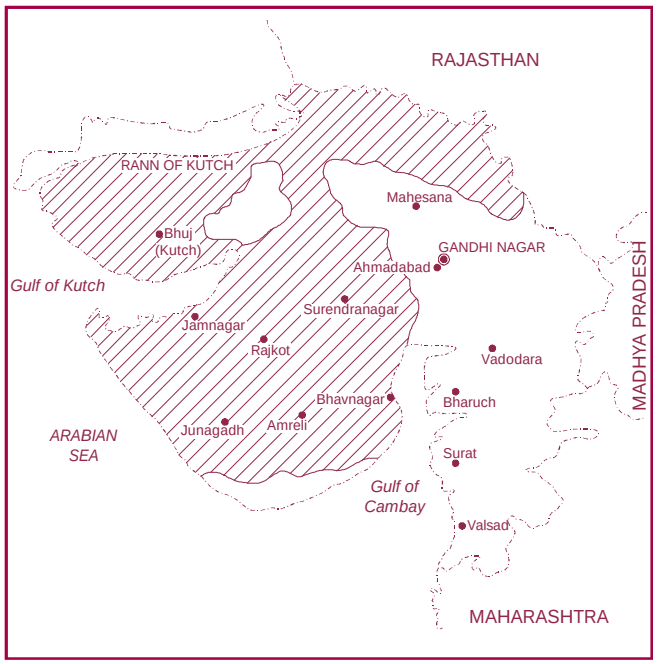

Figure 1. Drought-affected regions of Gujarat state of India.

Current Scenario

The Kutch region, once covered with 6-foot tall green grasses, has now been reduced to dusty plains. Most of the cattle grazers are battling the drought for their livelihood. Fodder supplied by the government hardly meets their needs, and milk yields from buffaloes are therefore poor. As one alternative source of income, some producers have been able to sell the glue produced by scrub trees such as *Prosopis juliflora*.

Habitation is very much affected by water quality problems due to high levels of fluoride and salinity in the drought-affected region. In Gujarat, 12.4% of the total area is affected by salinity, with EC>4,000 micro-mhos. Gujarat has replenishable groundwater resources of about 20.4 billion cubic meters (BCM). Groundwater resources in alluvium/unconsolidated rocks amount to about 92 BCM; groundwater resources in hard rocks, about 12 BCM. Overdraft of groundwater has led to the problem of seawater ingress, particularly along the Saurashtra coast. Water logging affects 172,590 km^2 and salinity affects 911,000 km^2 in Gujarat; soil alkalinity is not a problem in the region.

Table 1 shows the status of the monsoon in the region. The significant drought years are 1982, 1985, 1986, 1987, and 1988; 1982 was a moderate drought year in the Saurashtra and Kutch regions, with more

Year	Gujarat	Saurashtra/Kutch
1991	N	D
1992	N	N
1993	N	D
1994	E	E
1995	D	D
1996	D	N
1997	E	E
1998	D	N
1999	E	D

D = Deficit (-20% to -59%)
N = Normal (+91% to -19%)
E = Excess (+20% or more)
Note: 1984, 1985, 1986, and 1987 are successive rainfall deficit years

Table 1. Status of monsoon in Gujarat, Saurashtra, and Kutch regions.

than 3,000 villages facing acute drinking water shortages. From 1984 to 1987, the Gujarat and Saurashtra regions faced continuous rainfall deficiency, with 1987 being the worst drought year (rainfall deficits of -42% for Gujarat and -74% for Saurashtra/Kutch).

In 1985, a dry spell of 12–14 weeks affected more than 75% of the crops. During 1986 and 1987, India as a whole suffered from drought, but it was a chronic drought for Gujarat and the Saurashtra/Kutch regions. Against a target of 2 million tons, rabi production fell by 9 lakh[1] tons, a loss of Rs. 976 crores. There was complete absence of surface water, with 40 dams completely dried up and 20 dams partially dried up. In Saurashtra alone, 5,000 cattle died.

Climatic Resources

Gujarat and the Saurashtra/Kutch regions have arid climates. The mean annual rainfall varies from 300 m to 600 mm with 40–60% coefficient of variation (CV). The southwest monsoon sets in during mid-June and withdraws by mid-September from these states. Monsoon rain is also scanty during June–September, with 300–500 mm of rain, having a CV of 50–60%. The number of rainy days during this period is 10–30. Winter rains are also poor, with about 20 mm of rain from October to December. Nearly 90% of the annual rainfall occurs during June–September. During April–June, more than 10 hours of bright sunshine, with nearly 500–600 cals./day of solar energy, prevails in the region. This increases the evaporation rate to an average of 12–14 mm per day for April–June. Annual mean evaporation is 3,500 mm in Gujarat and Saurashtra states. Thus we have a large deficit of moisture with atmospheric subsidence in the region.

Table 2 shows the rainfall and evapotranspiration of these states. The moist weeks for the region during the monsoon are meteorological weeks 26–39. However, the moisture deficit week occurs either before the monsoon or during the winter months (week 40 onward). The water availability period for crop planning for Gujarat is shown in Table 3. The annual deficit varies between 750 mm in Surat to 1,650 mm in Bhuj region. Therefore, the poor water resources and moisture deficit together with unfavorable climate conditions have made the region drought prone.

Participatory Approach for a Better Future

In response to the current drought conditions in this region, the people of the villages (including tribal) have developed strategies to combat drought. In this process, some of the old check dams were repaired through financial support from nongovernmental organizations (NGOs). A few farmers contributed money for plastic lining for farm ponds to conserve water. Other farmers participated in land shaping work. Strict orders were issued to prevent people from pumping water out of the check dams. People from tribal regions of Gujarat built 15 check dams on 200 ha of land. These check

Stations	PET (mm)	Rain (mm)	Moist weeks	Water deficit weeks
Gujarat:				
Ahmadabad	680	758	26–37	23–25
Baroda	642	934	26–39	23–25
Broach	674	971	26–37	40–43
Saurashtra and Kutch:				
Veraval	644	572	26–31	33–43

Table 2. Seasonal rainfall and PET.

[1] 1 lakh = 100,000

Stations	Water availability duration (days)	Annual deficit (mm)	Mean annual rain (mm)
Bhuj	80	1,650	350
Jamnagar	110	1,220	490
Rajkot	120	1,470	670
Bhavnagar	115	1,210	600
Veraval	135	990	700
Ahmadabad	125	970	820
Baroda	140	880	930
Surat	150	750	1,200
Broach	155	810	1,000

Table 3. Water availability period for Gujarat and Saurashtra regions.

dams provided water for irrigation and also for groundwater recharge.

During the current drought, about 10,000 check dams were constructed in the chronic drought regions of Saurashtra and Kutch. Here the farming community contributed 40% of the cost; NGOs also provided support. Water harvesting and a participatory approach in watershed management by the village community, along with the empowerment of women, could bring about a substantial increase in efficiency in the water cycle in Gujarat, Saurashtra, and Kutch states. However, water is no longer a plentiful resource. It needs to be used judiciously.

Social Mobilization for Drought Proofing

Gujarat, Saurashtra, and Kutch are not the only states affected by drought. Other regions of India will also be affected if we do not care enough to take the necessary steps to conserve and regenerate water resources. It has been suggested that future wars will be fought over water. Water is now not only a state or national subject but also an international topic.

Exploitation of groundwater through tube wells has led to an alarming fall in the water table, resulting in poor, brackish water. India receives major rainfall in about 100+ hours out of 8,760 hours in a year. If proper rainwater harvesting were to be done in the cities of India, there might not be any water problem in the next few years. Just 1% of our rainfall, if harvested properly, would be enough to serve the country's needs. About 100 mm of rain received in a hectare plot may yield 1 million liters of water. The solution lies in harvesting rainwater through capturing it, storing and recharging it, and then later using it effectively during prolonged drought periods or dry spells. This must be implemented on a large scale through social mobilization by NGOs, if not by government bodies.

Some of the practical methods of rainfall harvesting, such as rooftop harvesting and conservation of small check dams, require the people's participation. In the future, the quest for water will involve community-based rainwater harvesting in both urban and rural areas of India, which may help us achieve food sustainability and security.

K.K. Nathan
Water Technology Centre
IARI, New Delhi–110012
India