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The Manufacture of Popular Perceptions of Scarcity: Dams and Water-Related Narratives in Gujarat, India

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Summary. — This paper critically examines some narratives of water scarcity in Kutch, western India. It argues that images of dwindling rainfall and increasing drought largely serve to legitimize the controversial Sardar Sarovar dam and manufacture dominant perceptions concerning scarcity. This manufacture has naturalized scarcity in the region and largely benefits powerful actors such as politicians, industrialists and large farmers. But the needs of the poor in water-limited areas are neglected. By exploring the various connotations of scarcity, the paper argues that scarcity is both a biophysical phenomenon as well as a powerful discursive construct. By distinguishing between the "real" and "manufactured" aspects of water scarcity, the paper attempts to enhance understandings of environmental change at the local level. © 2001 Elsevier Science Ltd. All rights reserved.

Key words — Asia, India, water scarcity, dams, narratives of scarcity

1. INTRODUCTION

Water scarcity is one of the most pressing problems confronting the well-being of humankind in the 21st century (Ohlsson, 1995; Postel, 1994; The World Bank, 1993). Scarcity of water and drought are complex phenomena that can be analyzed differently from social, political, meteorological, hydrological and agricultural perspectives. But technical and popular understandings of water scarcity have tended to be simplistic (Falkenmark & Chapman, 1989). There has been the tendency to direct attention to the lack of supply of water due to natural forces rather than look at human-induced land and water use practices and at socio-political considerations. Real causes of scarcity can be obscured leading to inappropriate solutions. This paper explicitly addresses the complexities surrounding water scarcity by taking the case of Kutch, a semi-arid to arid region in western India. According to Government of Gujarat documents, Kutch is designated to benefit from the controversial Sardar Sarovar Project (SSP), a controversial dam under construction in western India (Government of Gujarat, 1991; Raj, 1991).

There are several polarized views regarding how the water needs for present and future generations of a country and region can be met (cf. Mehta, 1997). Until a few decades ago, the large dam [1] was universally considered to be the panacea for water scarcity. The proponents of large dams tend to downplay the social and environmental costs of large dams against the benefits of hydropower and irrigation (Biswas & El-Habr, 1993; British Dam Society, 1999). These views are increasingly contested by a worldwide constituency comprising academics, scientists and members of voluntary agencies who have highlighted the problems of invol-

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untary resettlement and environmental damage due to large dams (e.g., Goldsmith & Hildyard, 1992; McCully, 1996). The World Commission on Dams has recently completed its mandate to investigate the myriad aspects of dams concerning economic growth, equity, environmental conservation and participation. It concluded that while dams have made a considerable contribution to human development, in too many cases unacceptable costs have been borne in social and environmental terms. The Commission also argues that often water and energy needs can be met through alternative solutions that would fare better than dams on equity grounds (WCD, 2000).

These views are not shared, however, by a large number of agencies and governments, especially in the South. Judging from the severe reservations expressed by the Indian government, the International Commission on Large Dams and the International Commission on Irrigation and Drainage to the Commission's Report (Bhogale, 2001; Government of India, 2001), it is clear that there are still very polarized views on dams and the role that they play in mitigating water scarcity. Is this because large dams are urgently required to solve the problems in water-needy areas or is it because of questions concerning a wider political economy? Is there a need to investigate the relationship between discourses of water scarcity and the vested interests in large-scale development projects? The paper demonstrates that that the pro and anti-dam dichotomy is largely counterproductive for regions such as Kutch, which are often affected by severe conditions of aridity. Instead the paper suggests that concerted efforts toward creating sustainable land and water use practices might be the more desirable alternative to waiting for a little water from a controversial and distant dam. The paper draws on a year's fieldwork in Kutch and Gujarat in 1995–96. The research employed a combination of methods such as participant observation at the village level, semi-structured interviews with a host of rural and urban actors, the analysis of rainfall data, discourse analysis and historical and archival research. Several months were spent in a village I call Merka, in eastern Kutch where diverse water and land-use practices were studied (see Mehta, 1997).

The paper follows a growing number of authors who argue for the need to see water resources as having symbolic as well as material characteristics. Such an approach calls for the need to link water resources management with social organization and questions concerning power (cf. Bruns & Meizen-Dick, 2000; Mosse, 1997; Potanski & Adams, 1998). By building on precedents set in work on environmental narratives by authors such as Leach and Mearns (1996) and Roe (1991), the paper focuses on narratives connected with dwindling rainfall and increasing droughts which are widespread in the district and the state. The critical examination of these narratives leads to the conclusion that while water scarcity is a "real" enough problem with biophysical manifestations, it can also be "manufactured" in such a way to serve the interests of powerful actors such as politicians, bureaucrats and irrigation farmers. Popular perceptions of scarcity, as represented in the mass media and by politicians and advocates of the water question, have naturalized scarcity in Kutch. They have also succeeded in manufacturing the dominant perception of water in the region, namely that there is no alternative to the Sardar Sarovar Project (SSP). Due to this "manufacture" which largely benefits powerful actors such as politicians and large irrigators, controversial schemes such as the SSP are legitimized. The paper also distinguishes between the physical phenomena of scarcity and their social explanations and manifestations. The distinction between the "real" and "manufactured" aspects of water scarcity, I argue, is a useful way to understand environmental change both at the level of discourse as well as at the biophysical realm.

Sections 2 and 3 present an overview of Kutch and its relationship with the SSP. Section 4 examines the water-related narratives concerning dwindling rainfall and climatic change. The paper then goes on to argue that these popular perceptions feed into the perception of the SSP as a panacea and the only solution for Kutch. In the conclusion, the paper argues it is not merely enough to discredit popular narratives of environmental change by creating new counternarratives. Instead, the analysis of environmental change must capture both discursive as well as material realities. The paper attempts to achieve this by examining both the "manufactured" and "real" aspects of scarcity and the nature of their relationship.

2. KUTCH AND ITS WATER RESOURCES

Kutch district is located in a crescent-shaped peninsula in the Gujarat State of Western

India. It is the largest district in Gujarat and has an area of 45,612 sq. km constituting 23% of the state. Kutch is like an island bound by the sea in the South and West and by the Ranns (salt marshlands) in the East and North. Kutch was a princely state ruled by the Maharao of Kutch and was integrated into the state of Gujarat only in 1960.

Kutch has a population of 1.2 million. It is far more sparsely populated than the rest of India and has witnessed a very marginal increase in the population in the first few decades of the last century. Rapid population increase has, however, occurred in the decades since its integration into the Indian union (about 122%) (see Mehta, 1998 for details on population dynamics and environmental change). It has nine *talukas* or administrative subdistricts: Bhuj and Nakhatrana in the North; Lakhpat and Abrasa in the West; Mandvi, Mundra and Anjar in the South and Bachau and Rapar in the East. Apart from its very heterogeneous social and ethnic composition, the region has nine ecological zones (Gujarat Ecology Commission, 1994). All of Kutch's 97 rivers are nonperennial and have a high run-off rate. Rainfall is erratic and variable. The average rainfall is about 380 mm (mm) ranging from 440 in southern Kutch to 338 mm in western Kutch (Raju, 1995, p. 10). It only rains a few days per year, (15 days on average). Kutch has a semi-arid type of climate and accounts for 60% of the semi-arid tract in Gujarat. Temperature ranges from 45 degrees centigrade in the summer to two degrees in winter. Kutch is considered to be a drought-prone district as droughts take place every two to three years. [2] Fifteen percent of the area of Kutch is cultivable. Rainfed agriculture and animal husbandry are the chief occupations in Kutch.

Water management began during the princely era that saw the creation of several medium-sized earthen dams, irrigation and drinking water tanks and wells. Seventy percent of the present large schemes were built by the Kutch State. [3] Eleven percent of the net cultivated area is irrigated. Privately owned shallow and tubewells account for just over 80% of all irrigation (Mehta, 1998). No major dam is possible in Kutch due to its topography. In 1996, the surface water schemes comprised 20 medium and 162 minor irrigation schemes. [4] Medium-sized schemes fall under the jurisdiction of the state of Gujarat and minor schemes are bureaucratically and institutionally managed by the district level government. Many existing schemes work under their potential capacity due to a high rate of siltation (between 15% and 70%). [5] As the de-silting process is very costly, it is cheaper, but less efficient to construct new dams downstream. The reservoirs of Kutch also have a lower overflow rate than in other parts of Gujarat (Gujarat Institute of Area Planning, 1989, p. 15). Due to the variable rainfall, there is often not enough water for release in the canal networks, and therefore, the irrigation schemes of Kutch utilize only 28% of their entire potential.

The intensity of well irrigation is higher than that of canal irrigation because it is less dependent on the vagaries of the rains. But, the recharge rate of the total precipitation is only 8% in Kutch as opposed to the usual 20% (Gujarat Ecology Commission, 1994, p. 34). These natural constraints are intensified by the uncontrolled extraction and overexploitation of aquifers, not least due to the skewed pricing of electricity that uses a flat charge rate irrespective of the water extraction. Instead of pricing for the actual electricity consumed, the cost is estimated on the capacity of the motor. There is therefore no incentive for farmers to reduce water consumption. These trends have led to the overexploitation of aquifers. This, combined with seawater ingression, has led to salinity in the water and soils and to a falling ground-water table (Gujarat Ecology Commission, 1994).

Groundwater resources are also tapped by the district's drinking water and industrial schemes. Government tubewells providing water to the regional water supply scheme run dry regularly due to a falling water table in the surrounding area. The average life span of a tubewell in Kutch is about 50% less than in other parts of India. [6] Thus the drinking water schemes have a limited life span and water is prone to much wastage. Drinking water schemes also compete with the needs of industry. For example, within the Gandhidham–Kandla complex in southern Kutch there are several industries such as the Kandla port, fertilizer plants and the Free Trade Zone. The rapid development of this area has led to tremendous pressure on the water resources in the villages that supply water to it. For example, the water levels in the 42 tubewells supplying water to this area have declined from 12 to 60 m in the recent past, and their salinity content is increasing (Mehta, 1998). The drinking water wells of local farmers in the area have also been negatively affected.

The implementation of government-sponsored watershed projects and micro-level water schemes has only recently become a priority. Watershed development falls under the jurisdiction of the Gujarat State Land Development Corporation (GSLDC) and state agencies working on rural development. They have identified 177 potential watershed sites in Kutch, but due to limited resources only 40 have been developed. Largely, micro-level solutions in Kutch had not been prioritized adequately due to the focus on large-scale irrigation and the extra-basin transfer of water.

3. KUTCH AND THE SARDAR SAROVAR PROJECT (SSP)

There is a widespread belief in Kutch that due to the harsh climate, erratic water supply, declining groundwater sources and frequent droughts, the only solution is to get water from the rivers of mainland India (Kutch Development Forum, 1993). All hopes are being pinned on the Sardar Sarovar Project (SSP) a controversial multipurpose irrigation and hydroelectric project under construction on the Narmada River in Gujarat. If completed, the planned 163-m dam is intended to bring drinking water to 30 million people and irrigate 1.8 million hectares of land (Raj, 1991, p. 11). It will also submerge 37,000 ha of forest and agricultural land as well as the homes of at least 250,000 people. [7]

Even though the project was conceived almost a century ago, actual work has been stalled due to interstate conflicts regarding the height of the dam, the extent of submergence and the sharing of benefits. Different committees and commissions were set up to resolve all these interstate conflicts. Some of the early commissions, such as the 1972 Irrigation Commission Narmada Waters, stressed the importance of providing Narmada water to the scarcity areas of Gujarat:

> Irrespective of what share of the Narmada waters might come to Gujarat, the first priority in the use of this water must be given to these areas where the rainfall is scanty and irregular, rather than to Broach and Baroda districts which have 762 mm of assured rainfall. The benefits from the use of this water in the areas of North Gujarat, Saurashtra and Kutch, will be far greater than what would accrue in the two districts mentioned above. There will also be indirect benefits from the replenishment of sub-soil water, which will help the farmers to raise more than one crop a year. As a long term prospect, we can envisage a beneficial change in the ecology of this area (cited in Kutch Development Forum, 1993, p. B2).

As will be outlined later, this did not happen. The command area of the SSP is largely located in the central corridor of Gujarat, which not only has better water endowments than Kutch, but has the state's strongest industrial lobby. The following account highlights how the needs of Kutch and other drought-prone areas were by-passed in the planning processes of the SSP. In 1965, the Government of India appointed the Khosla Committee to draw up a master plan for the allocation of water. The report of the Khosla Committee awarded a high share of water to Kutch. Out of the 44.56 million acres of irrigated land designated for Gujarat, 0.75 million acres were allotted to Kutch. This worked out to 16.45% of the total land to be irrigated (Kutch Development Forum, 1993).

The scheme also included a plan for three subcanals for Kutch: the first in the Ranns and Banni; the second through central Kutch and the third along the coast. The Khosla Committee proposed a 500-feet dam to fulfill its plans. This height was unacceptable to the states of Madhya Pradesh and Maharashtra, which refused to bear the brunt of such massive submergence for the benefit of Gujarat. Hence the Narmada Water Disputes Tribunal (NWDT) was appointed by the Central government in 1969. Deliberations went on for about a decade. The Tribunal declared its verdict on the project in 1978 and the SSP, as it is known today, was conceived. The dam's height was fixed at 460 feet (163 m) against the demands of Gujarat, which pressed for 540 feet and Madhya Pradesh, and Maharastra which were content with only 210 feet. Kutchis maintain that the state of Gujarat did not represent their interests adequately before the Tribunal. As a result, during the course of several rounds of negotiations, Kutch successively lost out. As opposed to the three canals that would have brought Narmada water to Kutch, only half of one of the canals along the coast was sanctioned. Instead of allowing for the irrigation of 945,000 acres of land in Kutch, only 95,000 acres of land were to get irrigation (Kutch Development Forum, 1993). This makes up a only 2% of the total area of Kutch. SSP advocates in Kutch maintain that the Government of Gujarat did not contest the Tribunal's allotment to the state and consider its implications for Kutch (Kutch Development

Forum, 1993). The intrastate allocation plan for irrigation did not emerge through a consultative process. According to the Kutch Development Forum (1993) no bureaucrats or engineers from the state irrigation departments or water resources ministry were consulted. Several Kutchis also believe that the decision was based on something as trivial as petty political rivalries between several decision-makers. [8] According to a review committee set up by the Indian government to investigate the project and its controversies, the allocation of water to Kutch was very meager and there has been a marked mismatch in official rhetoric concerning the claims by project authorities about the benefits of SSP to Kutch and the actual irrigation benefits going to the region accorded to the region.

Kutch has had a very marginal presence in mainstream Gujarati politics, and thus this low allocation of SSP is not very surprising. Usually important decisions concerning its future are made in distant Gandhinagar where the bureaucrats concerned are likely to be out of touch with location-specific realities. Kutch, however, continues to be used to legitimize the scheme. The Government of Gujarat is known to have taken World Bank missions and other international dignitaries to remote areas in Kutch to highlight the urgency of the need for the project. Work on the dam has recently been resumed after a break of several years following a judgement by the Supreme Court of India. Still, it is unlikely that the water of the Narmada will ever reach Kutch, and certainly not in the near future as I demonstrate in Section 5. Nonetheless, drought-prone Kutch is largely used to legitimize the dam's construction and the popular narratives to which I now turn support this view.

4. POPULAR NARRATIVES OF SCARCITY

There is unambiguous consensus in Kutch and elsewhere that climatic change, independent of human intervention, exacerbates the problems of water scarcity. This is exemplified by the widespread perception at the district and village level that, "It is raining less and droughts are increasing ...".

This is not just restricted to the perceptual level. Clearly, there are several symptoms and much empirical evidence of environmental change in Kutch. Some of these symptoms are: increasing salinity of the soils and sea water ingression (especially in southern Kutch and coastal areas); dwindling water aquifers (all around the groundwater belt in Kutch, including Merka); and species loss due to the planting of the exotic salt-resistant species *Prosopis juliflora* (popularly known as *ganda bawal,* literally wild or mad Acacia). [9] In real terms, cultivators experience difficulties in getting safe and plentiful yields and pastoralists face a growing paucity of fodder and forage. The causes of these phenomena are manifold and I shall turn to them shortly. Nonetheless, the scapegoat is made out to be the lack of rainfall and increasing droughts. Scapegoating climate change for increasing water scarcity is not restricted just to Kutch. A study by Dahlberg and Blaikie (1999) also notes that dwindling rainfall is a common focus around which explanations of environmental change turn. Falkenmark, Lundqvist, and Widstrand (1990, p. 30) argue that the climate change often referred to when explaining water shortages globally may be a myth. Indeed, a scrutiny of the rainfall data of the past 60 years in Kutch indicates that while there have been erratic variations in the quantity of rainfall, there is no evidence to suggest that precipitation rates have changed. [10] A *t*-test, comparing the rainfall in Kutch over the last 30 years (1968–97) with the previous 30-year period (1938–67), revealed no significant difference ($t_{\text{obt.}} = -0.28, p > 0.05_{\text{2-tail}}$, see Sinclair, 1998). Rainfall data were available for the *talukas* of Abrasa, Bhuj and Rapar for a longer period (120 years). Hence, it was possible to conduct inference tests in order to examine whether differences existed between four 30-year periods (1878–1907, 1908–37, 1938–67 and 1968–97). A repeated measures analysis of variance revealed no significant differences over these periods (Sinclair, 1998). Table 1 gives the mean rainfall over these periods with their standard deviations.

Why then does the perception of dwindling rainfall persist and what does it obscure? Roe (1991) argues that the "development narrative" simplifies ambiguity. Uncertainty at the micro and macro levels is overcome by being subsumed into the broad explanatory narrative (Roe, 1991, p. 288). In the same way, the perception of dwindling rainfall and increasing droughts obscures uncertainty and regional variations. The study by Dahlberg and Blaikie (1999) comes to similar conclusions. In their study in northeast Botswana, interviewees also perceived a dramatic drop in the rainfall, even

Table 1. *Mean rainfall in Kutch (mm)*

	Mean rainfall in mms (S.D.)				
	1878–1907	1908–37	1938–67	1968–97	1878–97
Abrasa	329 (240)	314 (267)	384 (330)	354 (294)	345 (282)
Bhuj	354 (171)	363 (239)	364 (256)	340 (246)	355 (228)
Rapar	396 (212)	370 (177)	371 (203)	385 (294)	380 (223)
Kutch	N/a	N/a	358 (204)	375 (259)	367 (221)[a]

Source: Institute of Desert Ecology, Bhuj.
[a] Based on data available for all *talukas* from 1932–97.

though scientists discredited these views. With respect to Kutch, this narrative obfuscates several features intrinsic to rainfall and drought patterns in Kutch and shies away from acknowledging human-induced forms of scarcity. Let us explore these issues in greater depth.

(a) *High variability*

While the results of Table 1 indicate that rainfall in Kutch (and the *talukas* of Abrasa, Bhuj and Rapar) is neither increasing nor decreasing, rainfall is characterised by high annual variability (see Figure 1 for Kutch and Figure 2 for Abrasa *taluka*).

Local categories deal with this variation in different ways. The traditional classification of years was as follows: good or *sookal* (good rainfall); moderate or *kurwara* in which one fall of rain failed; and lean or *dookal* (drought) (Burnes, 1831). This classification, though officially no longer in use, is still prevalent at the practical level. Life in Kutch comprises both *sookal and dookal.* All years are never uniformly bad or *dookal.* It is common to use several years (at least three, five or even a decade) as a unit of analysis. For example: "On an average out of 10 years, approximately 3–4 years are famine years, 4–5 years are lean years and 2–3 years are better years..." (Government of Kutch, n.d., p. 14).

This statement from an undated document of the Kutch State in the 1950s is not very different from today's village-level sentiment that a decade comprises three good years, three bad and four years, which are moderate. Hence, there is a tendency to take several years as the

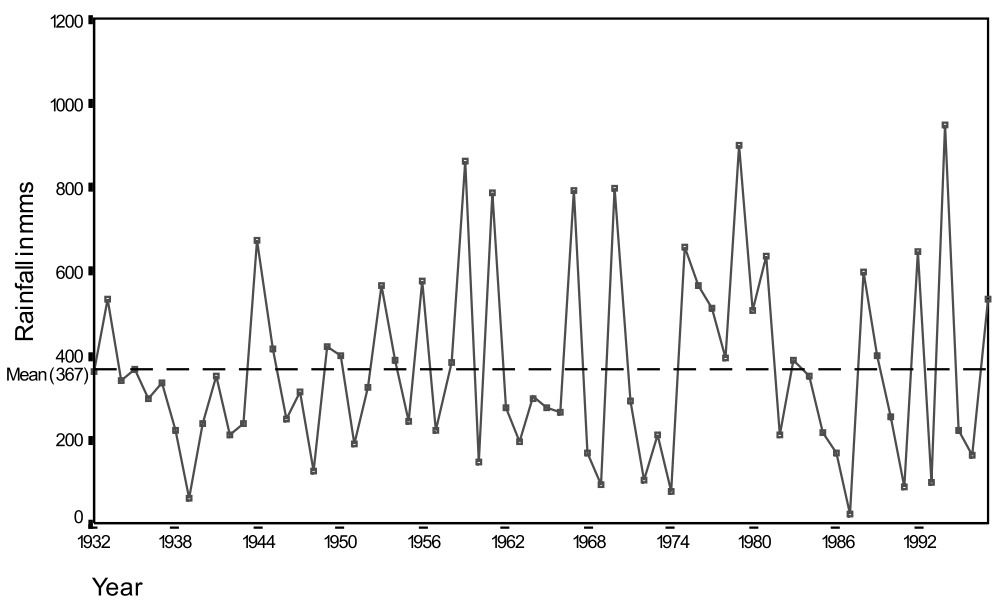

Figure 1. *Average annual rainfall in Kutch.*

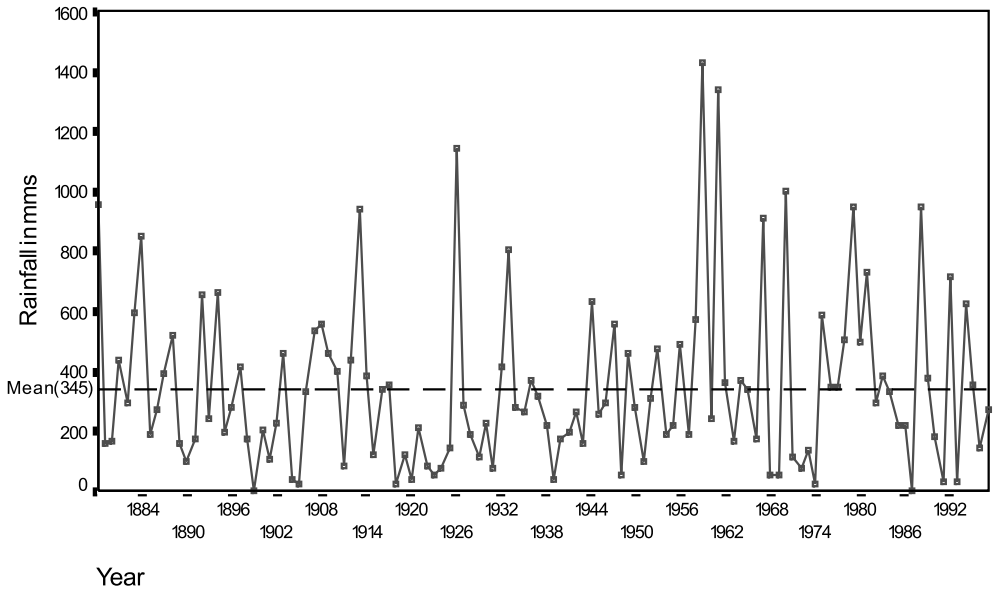

Figure 2. *Annual rainfall in Abrasa.*

unit of analysis. Rainfall is seen to be "*regularly irregular.*" I have argued elsewhere that a way of life has evolved in Kutch to deal with this uncertainty through the creation of coping strategies rooted in knowledge systems and practices (Mehta, 1998). Some of them include migration, risk minimization strategies in dryland agriculture and pastoralism, which is both highly adaptive and suitable to the semi-arid to arid climate of Kutch. [11] The irregularity of rainfall is demonstrated in the results of the rainfall data analyzed. Even when a decade is used as the unit of analysis, there is considerable variability from one decade to the next as well as across regions (see data for the Abrasa area 1878–1997, Figure 2).

Using the Indian Meteorological Department's definition of drought, [12] an effort was made to identify a pattern of good, bad and moderate years for the whole region based on rainfall data for the past 60 years. It emerged that in each decade there is a mixture of good, bad and moderate years, but there is no predictable pattern (Sinclair, 1998).

In addition to the variability from year to year, there is tremendous variation from place to place. In 1996, for example, residents in eastern Kutch experienced a "moderate" year with 382 mm rain in Rapar; by contrast, in western Kutch, rainfall was 149 mm. The high variation and sudden swings in rainfall distribution contribute to the perception that rainfall patterns may be changing, even though the rainfall data suggest that there is a clear lack of patterns and high variability over years and over regions. I am of course aware that the change in distribution of rainfall during the wet season can be as disastrous to farmers as the lack of rainfall. For example, in Merka dryland agriculture needs three or four well-timed showers. Late starts, early finishes or long gaps in the growing season constitute tremendous risks for farmers. Perhaps this is why farmers (both large and marginal) in Merka resort to the narrative of declining rainfall instead of providing more nuanced explanations for crop failure.

As hydrologists inform us, droughts are recurrent phenomena in semi-arid and arid areas (Falkenmark & Chapman, 1989). When viewed longitudinally, it becomes clear that there have been prolonged periods of drought followed by periods where drought was absent (see Figure 3). The rainfall data analyzed do not substantiate the notion that the intensity of drought periods and rainfall has changed, or that there have been an increase in two or three years of droughts over the past two decades

Still, many villagers maintain that the intensity of rain and drought periods has changed. Why this mismatch? Clearly memories of the previous drought cycle of 1987–88 and experi-

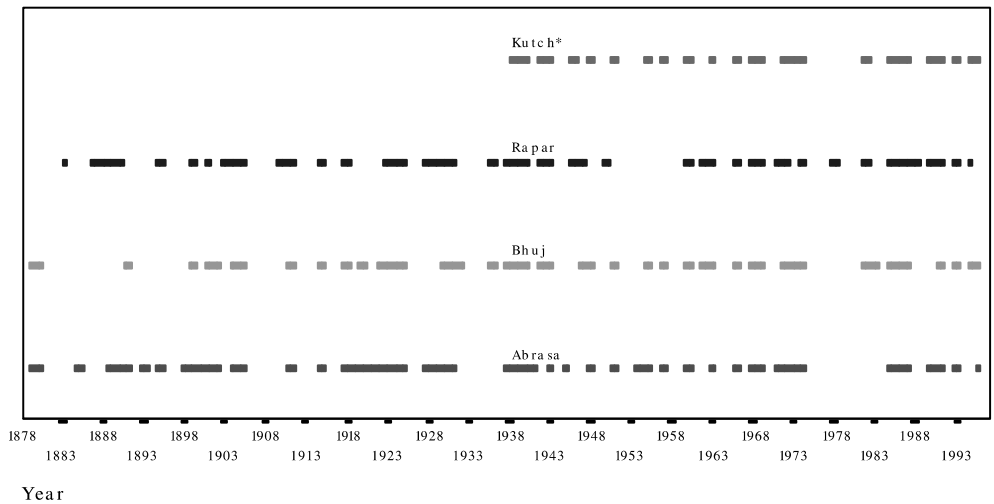

Figure 3. *Periods of moderate/severe drought.*

ences of the current drought cycle must shape these views. During 1987, the century's lowest level of rainfall was recorded. In the 1987–88 drought, people were unable to sustain their livestock and eyewitnesses talk of abandoned dying livestock and mountains of animal carcasses. [13] Such memories and images have certainly moulded recent views and perceptions of drought in Kutch. [14] The current drought cycle, compounded by the havoc unleashed by the recent earthquake that struck Kutch in January 2001, has also caused tremendous hardship to local people. The anthropogenic dimensions of scarcity also need to be investigated. It is to these that I turn.

(b) *Human-induced scarcity*

While the actual volume of water bestowed by the Rain God might not have changed, the severity of drought or scarcity is felt more acutely today than in the past. [15] Scientists and local people maintain that the intensity of drought has increased (cf. Murishwar & Fernandes, 1988). There are several factors at play. The first factor is increasing *devegetation* which has certainly taken place due to an increase in commercial logging activities in the last five decades. Prior to Kutch's integration into the Indian union, the Maharaos had instituted a policy of afforestation. Areas known as *Rakhals* were set aside, where tree cutting and grazing were prohibited. The *Rakhals* were used as game sanctuaries, grass farms and for experiments at reforestation. Despite their elitist nature, the *Rakhals* were successful in experiments concerning the types of trees suitable for Kutch's unique requirements and considerable forest cover was created (Rushbrook Williams, 1958, p. 29). After 1948, these institutional restrictions ceased to exist and there was a boom in unchecked logging. Trees were cut down and smuggled out of Kutch into Gujarat for coal. This has had serious repercussions on the vegetational cover of Kutch. [16] As discussed, the wild growth of *prosopis juliflora* has also led to loss of grass cover and the undermining of indigenous tree species. Moreover, it is believed that *prosopis juliflora* neither attracts rain nor gives moisture to the soil even though it might conserve water within its own system. [17] Bad water management practices have also played a role in vegetational reduction. The world famous grasslands in northern Kutch, for example, have suffered considerably due to the damming of Kutch's northern rivers. The damming stopped the annual inundation and natural fertilization by the silt traditionally brought by the rivers. The grasslands are now dependent only on rainfall for their rejuvenation (Ferroukhi, 1994, p. 41).

All these are indicators of increasing devegetation. It is unlikely that devegetation leads to changes in precipitation rates (cf. Falkenmark *et al.*, 1990; Gornitz, 1987; Water Management Forum, 1987). Nonetheless, devegetation can render rains less efficacious due to reductions in

soil moisture due to the high run-off rate (Falkenmark *et al*., 1990, p. 30). Devegetation and denudation also lead to greater run-off and lower the recharge of underground aquifers. This is a plausible explanation for why farmers and pastoralists complain of difficulties in getting plentiful yields and a reduction in grass cover. Though the volume of rainfall might not have changed—especially when viewed longitudinally—devegetation and changes in soil moisture have led to real and tangible problems for people in rural Kutch. The term ''dwindling rainfall'' is a handy way to express several phenomena that, at face value, seem unrelated. It also helps to blur the anthropogenic nature of scarcity.

Another dimension to anthropogenic scarcity is the *overexploitation of groundwater aquifers*. Access to and control over groundwater in Kutch is marked by tremendous inequality. In Merka, ''higher castes'' such as the Rajputs and Jadejas comprise less than 30% of the population but they control about 65% of the land. They also own most of the wells in the village. Well ownership goes hand in hand with land ownership. Those who have access to land, control the water below them. The rich irrigators in rural areas (popularly known as ''water lords'') are often responsible for depleting vast amounts of groundwater resources. They tend, however, to attribute declines in the groundwater table to climatic change which again obfuscates the real problem: namely, rapidly increasing groundwater use leading to a declining water table (cf. Olsen, 1987). This can only dry out local wells and ponds and has far-reaching effects on biomass regeneration and the water recharging capacity of soils. The Gujarat Ecology Commission describes the groundwater situation in Kutch:

> Out of nine *talukas* of the district, two fall under the Over-exploitation category (...) this is because of the over depletion of the groundwater. In Bhuj, Nakhatrana and part of Mundra and Mandvi, groundwater depletion between 1980 and 1982 was 10–15 mts [18]. Near Bhuj and Nakhatrana, the rate of depletion in groundwater table is about 1.2 m per annum (...). Such excessive groundwater utilization in Kachchh has reversed the groundwater gradient resulting in massive saline water ingression in coastal areas. Consequently about 45% of the wells serving the area are having saline water (i.e., TDS > 2000 ppm) (Gujarat Ecology Commission, 1994, p. 14).

There is no evidence to indicate that these are misreadings of groundwater patterns in Kutch. Clearly, water extraction outweighs water recharging. Consequently, the water table is declining by about 1 m every year in Kutch. Groundwater is Kutch's most precious, yet, most abused resource. Its control lies in the hands of powerful landed owners and irrigators and is their most important forms of material capital making them powerful water lords in their local communities (cf. VIKSAT, n.d.; Shah, 1993). These water lords overcome groundwater constraints by their willingness and financial ability to invest in yearly or even monthly well digging, broadening and deepening operations. They are also successful at circumventing legislature and making the best of institutional loopholes. [19] Bhatia (1992) uses the analogy of parched throats amidst lush green fields: while drinking water wells run dry, the pump-sets on irrigation wells are busy at work. The groundwater crisis, hence, is not just one of dwindling water levels, but instead a crisis of access and control over scarce resources. Irrigators in the region often tend to think short-sightedly. This manifests itself in their willingness to tap scarce water resources during droughts to grow water-hungry crops. For example, the water lords of Merka have used communal reservoirs to pump water illegally for commercial crops at the expense of the needs of the pastoralists who are left without water for their livestock. During drought periods access to water is very socially differentiated. By virtue of control over wells, the richer castes that own irrigation facilities barely feel the difficulties of water scarcity. By contrast, the poorer social groups such as dryland farmers and pastoralists in the village need to resort to strategies such as migration and nonfarm employment to cope with lean periods.

The above discussion should make it clear that the growing water crisis in Kutch is largely human-induced. But, in popular discourse the anthropogenic dimension of water scarcity is obscured. The culpability of large farmers, bad water management practices and state policies is denied. The story of ''dwindling rainfall'' obscures the fact that water has been misused and legislation is constantly circumvented. The power of the water lords remains unquestioned and their greed is exonerated. The water problem is seen as ''natural,'' something beyond human agency, even though rainfall and drought patterns are characterized by high uncertainty and variability. Projects such as the SSP are evoked as the only solution to set right

what nature has ostensibly disturbed. Let me now explore how the aforementioned perceptions play a significant role in moulding water management practices in the region.

5. TINA AND THE SSP

... the last three droughts have convinced that there is no alternative ... except speedy implementation of Narmada Project (Mehta, 1991, p. 23).

The perceptions of dwindling rainfall and increasing droughts have tended to serve as beacons for some state and nongovernmental organization (NGO) action by legitimizing the SSP project. This is exemplified by the following quote from a SSP Project document:

> The surface and ground water resources of Gujarat State, particularly in the regions of Saurashtra and Kachchh are very meagre. The rainfall is very erratic. Droughts in these areas are frequent (...) Inter-state Sardar Sarovar Project Multi-purpose Project envisages provision of irrigation and drinking water facilities to these areas, and will be immensely beneficial to the chronically drought-affected and water deprived regions of Saurashtra and Kachchh (Narmada Control Authority, 1992, Foreword).

As we have already seen, however, the actual allocation of water to Kutch is very meager. Thus it is questionable whether the project will significantly eliminate the drought conditions in the region. In the past few decades, the phenomenon of TINA (There Is No Alternative) to the Narmada Project and the SSP gained momentum in Gujarat. Despite all the criticism from national and international review teams (e.g., **JAYANT**, Morse & Berger, 1992), the notion of TINA gained currency in Gujarat, not least due to the powerful imagery of depopulation, perennial droughts and underdevelopment in Kutch. Let me now examine the Kutch/SSP axis by focusing on the logistical, technical and socio-political aspects of TINA.

(a) *Logistical, technical and economic considerations*

I have already discussed the political and historical processes that have led to Kutch standing to benefit very marginally from canal irrigation (a mere 2% of the total area). Apart from this historical legacy, several logistical issues need to be tackled before making canal irrigation from the SSP a reality for Kutch.

Water can only enter Kutch after the Narmada main canal is constructed. The construction is still in Phase I, which covers around 144 km (Mehta, 1998). Once diverted into the main canal, the water will traverse 500 km before it touches Kutch (Phase II). Along the way, the canal will have to cross major rivers such as the Mahi, the Sabarmati and the Banas and their valleys, which is not likely to be easy. Before entering Kutch, it will also have to cross the Little Rann. Here high evaporation is to be expected. The quantum of water entering into Kutch is around 50 cusecs, making it into a small river. [20] As the Little Rann lies in a depression, in a conventional canal system, this would be the terminating point of the waterway. In this case, however, this is where the proposed Kutch Branch Canal will bring SSP water into Kutch. The water will have to be lifted at two points before it can flow into the proposed Kutch Branch Canal (KBC). In 1996, no work had started on the proposed canal because the alignment line had not been determined. Negotiations were still taking place on the area of the potential command area in Kutch. The present plan envisages a canal of 200 km in Kutch, which would extend from the village of Adesar in Rapar to the historical port of Madvi. The canal will pass through a tiny coastal strip in eastern and southern Kutch. In this way five *talukas* stand to benefit. They are: Rapar, Bachau, Anjar, Mundra and Mandvi. Only two of these *talukas*, namely Rapar and Bachau, are considered to be drought-prone. The other three are richer in groundwater endowments. The industrial belt of Kutch situated in the Kandla-Gandhidham area, which includes a free-trade zone, is also located in the command area. Hence, the needs of industrial residents and rich farmers, rather than those in drought-prone areas, are more likely to be met. The SSP, if realized, may also intensify the existing social and economic divide in the district.

Apart from irrigation, the project is supposed to provide drinking water to all the villages of Kutch (Raj, 1991). It is the drinking water promise that makes the project so popular in Gujarat. To date, however, plans for the supply of drinking water are not very comprehensive. Officials from the Narmada Planning Group in Gandhinagar, the experts responsible for the planning and design of the project, could not give me any details of drinking water supply which they say is the responsibility of the Gujarat Water Supply and Sewage Board.

According to the master plan, SSP water should have reached Kutch by the mid-1990s. At the time of fieldwork, even government officials estimated 2025 as the likely date for the water to arrive, given of course that the financial crunch and the tremendous controversies did not jeopardize the future of the SSP totally.

As Kutch is located at the tail end of the canal network, its access to water from the Narmada River is weakened. Most of the water in the command area of the project will be disproportionately appropriated by the politically strong Gujarat districts of Bharuch, Kheda and Baroda, situated in the initial reaches of the SSP command area. Critics of the project assume that once canal irrigation is available here, farmers will switch to growing water-guzzling sugarcane as was the case with the Ukai dam in southern Gujarat (D'Souza, Mukhopadhyay, & Kothari, 1998). In fact, seven large sugarcane factories were granted licenses in the early 1990s, despite the fact that almost no sugarcane was being grown at that time. The Gujarat government has promoted industries coming up along the "Golden Corridor," largely situated in the project's command area. It has attracted investments worth Rs. 750 million for this purpose (Desai, 1995).

The above discussion points clearly to several issues. One, Kutch is not going to benefit significantly from the project. In fact, Narmada water may never reach Kutch. Two, Kutch has been a victim of political propaganda and expediency and that business and political interests in Gujarat's rich agro-industrial belt are being prioritized over those of the poor in drought-prone areas. Even in Kutch, save for Rapar and Bhachau, the water will serve the interests of the business community and rich farmers rather than the water-needy (e.g., pastoralists or residents of Lakhpat and Abrasa).

(b) *The manufacture of TINA*

Despite all this evidence, why is there so much belief in the ostensible bounty of the SSP? I suggest that the State and its supporters have succeeded in *manufacturing* perceptions or myths concerning the SSP. Here, I borrow Herman and Chomsky (1994) concept of "manufacturing consent." In a book titled by the same name, the authors highlight the role of the media and public institutions in the United States in "manufacturing" consent on national issues and describe how support is mobilized for special interests that dominate the state and private activity. In a similar vein, in Gujarat, the State has *manufactured* the dominant perception of water, namely, the Narmada project as the single solution. This manufacture also contributes to making scarcity an all-pervasive phenomenon in Kutch.

Different actors play different roles in this manufacture. For politicians promises concerning water are great vote-grabbers, as are attacks on ruling parties for failed promises. In Gujarat, politicians have convinced generations of Kutchis/Gujaratis that the SSP is their "lifeline." Details of the project are part of various school curricula in Gujarat. This makes the project a matter of regional pride. Political careers have also been enhanced as a result of the Narmada project. One notable example is that of the late Chaimanbhai Patel who served as Chief Minister of Gujarat until the mid-1990s whose tenure was closely linked to highlighting the gains for Gujarat emerging out of the project. He had, however, objected to the project when he was in the opposition.

The role of the mass media in supporting this manufacture cannot be underestimated. The Gujarati language press has provided unequivocal support to the project and condemned the resistance movement. Several leading Gujarati newspapers rarely or never carried a critical article on the SSP. The project has also enlisted the support of various Gujarati NGOs such as Centre for Rural Care and Arch Vahini who help the state in the resettlement and rehabilitation of the displaced populations and have propped up this manufacture. The political climate in Gujarat has not encouraged a democratic debate on the issue of the dam and its alternatives. For example, the Government of Gujarat refused to co-operate with an investigation team of the World Commission of Dams in 1999. Members of the Save the Narmada Movement, have often had to face police violence and human rights violations during protest activities. Other members of civil society having reservations of the project are often tied to government funding and cannot be so vocal or confrontational. They feel that it is a taboo to criticize the project or even to suggest that the SSP is not the panacea that it is made out to be. Academic institutions in Gujarat such as the Centre for Social Studies, similarly tied to government funding, have often written reports that have offered legitimacy to dominant state discourses concerning the project. [21]

(c) *Consequences of TINA*

The focus on the SSP entails serious consequences for water resources development in Kutch and the rest of Gujarat. Usually, the paradigmatic underpinnings of large-scale, state-directed, capital-intensive irrigation schemes are coincident with the interests of business, engineering, bureaucratic, "development" and political elites. As discussed, business interests are being served in central Gujarat to the detriment of the water-needy of Kutch. Furthermore, there is a lopsided prioritization, in budgetary and financial terms in Gujarat. Almost a third of the finances of Gujarat State of the previous Five-Year Plan during 1992–97 were to be invested in the SSP project. This is evident from the Eighth Five Year Plan of the state, which says:

> The highest priority in investment is given to the Sardar Sarovar (Narmada) Project (...). An outlay of Rs. 2900 crores [22] which amounts to 25.22% of the total size of the Eight Plan has been proposed for this single project which is the lifeline of Gujarat (...) Thus an outlay of Rs. 3756 crores for the Eight Five Year Plan has been provided for irrigation (...) which includes outlay for SSP (...) This constitutes 32.66% of the total Plan outlay for the Eight Plan (Government of Gujarat, 1992, pp. 26–27).

Apart from consuming a significant proportion of the state's budget, the SSP has also led to jeopardizing the future of several minor and medium-sized schemes all over Gujarat. Take the case of Kutch: the head of a water resources department in Kutch stated that detailed project proposals for over 20 minor schemes have been submitted since 1984 to the relevant authorities in Gandhinagar. Since 1984, however, only five schemes have been sanctioned. [23] Kutchi officials attribute this to the lack of political interest in Kutch by the then Congress government; critics of the SSP attribute this to the lopsided diversion of state funds to the SSP. Whatever the reason, one fact remains clear: the large centrally-managed water intervention gets preference over local ones.

(d) *Alternatives to the SSP*

Given that water scarcity in arid areas arises due to the complex interplay of rain, soil, vegetation, human interventions and socio-political processes, holistic and long-term measures are required to tackle the problems of scarcity. Some of them include: the reduction of the run-off of rainwater into the sea through the creation of impediments along slopes so as to help the water to percolate into the soil and subsoil strata; soil and water conservation within rather than on the surface of the land; restoration of vegetative cover; checking soil erosion; waste-land development; replenishment of groundwater resources; and upstream catchment area treatment so as to check reservoir siltation. The "dryland blindness" of planners (cf. Mehta, 2000) has led to investments in surface water schemes and groundwater developments that do not perform well in Kutch due to its extreme climate and erratic and variable rainfall. The focus on externally supplied water has prevented water-harvesting schemes from gaining wide-spread acceptance in Gujarat. Officials of the Gujarat State Land Development Corporation (GSLDC) feel that their work is marginalized in water resources departments in Kutch and in Gandhinagar. Their efforts are stymied due to the state-wide obsession with the Narmada project. An official of the GSLDC in Bhuj said:

> If all the 177 watersheds in Kutch would be developed, there would be no need for Narmada water. But our work is not taken seriously. Everybody is obsessed about the Narmada project, but what should the people do until the water comes? We lack human power, our offices are understaffed and during scarcity years, all our work comes to a standstill because our schemes are converted to relief sites. In areas where we have worked, wells have been recharged and water conservation has increased. The need for relief has gone down. But this is a long and protracted process, which cannot take place overnight.

Villagers in Merka also echo these sentiments. Every year they watch helplessly as water flows unchecked into the Rann due to Kutch's topography. Due to the sharp gradient, all the 97 rivers and streams of Kutch are nonperennial and have a high runoff rate. Whatever little rain that falls is washed away and flows off in several streams and rivulets into the sea or into the Ranns. Thus is necessary that water is sufficiently tapped through rainwater harvesting and catchment area treatment. Institutional reform is also required which includes greater interagency co-operation and the introduction of demand driven approaches that do not tax the poor but curb wasteful consumption of water by industry and rich irrigators. Vigilance is also required to ensure that politicians and ministers do not

sanction and implement schemes that are technically inviolable, economically unfeasible and largely serve vested interests. I acknowledge the deprivations of aridity and realize that it is very difficult to find sufficient water resources to meet domestic, industrial and agricultural needs in areas such as Kutch. The extrabasin transfer of water into Kutch could help recharge tanks and aquifers. As it stands Narmada water allocated to Kutch is too meager to make a significant contribution to ameliorate the district's water problems. If Narmada water ever reaches Kutch, rather than providing irrigation to a small area, it should be used to augment locally available water and energy resources generated from rainwater harvesting techniques, watershed and biomass development and provide respite during drought years.

6. DISCUSSION AND CONCLUSION

The extrabasin transfer of water from large dams is often considered the only way to mitigate the problem of water scarcity in semi-arid and arid areas. Indeed, the extensive canal networks of large dams in Rajasthan and Arizona have made the desert bloom, even though a growing literature points to their high environmental and social costs (e.g., McCully, 1996). Rather than investigating the consequences of dams and their accompanying canals, I was interested in understanding why dams are often evoked as the only solution for areas such as Kutch, even though many of the claims and benefits are exaggerated. To do so it was necessary to investigate the popular perceptions concerning water scarcity. The paper demonstrates that, despite the counterevidence discrediting them, the perceptions of dwindling rainfall and increasing droughts have gained much currency at the local and state levels. They have molded local, regional and national images of water scarcity in Kutch and serve to legitimize the controversial SSP project.

What is the usefulness of investigating these water-related perceptions or narratives of scarcity? Precedents for critically examining such perceptions or "narratives" have been set by authors such as Leach and Mearns (1996) and Roe (1991). Whether labeled as myths, "received wisdom" (Leach & Mearns, 1996) or "narratives" (Roe, 1991), such narratives tend to serve certain socio-political agendas and/or reflect the world-views of their advocates instead of being rooted in local realities. They also tend to obscure plural readings of landscape use practices (cf. Fairhead & Leach, 1996). Following these precedents, this paper has tried to throw the issue of scarcity into sharp relief. It has done so by highlighting whose interests the popular perceptions serve (e.g., politicians, business constituencies and irrigators) and what they end up achieving and obscuring (i.e., essentializing scarcity in Kutch and making it seem as "natural," ignoring its anthropogenic nature). The notion of the bounty of the SSP and its contribution to Kutch's and Gujarat's development is a classic "development narrative" which has a programmatic character and has the objective of getting its listeners to believe or do something (Roe, 1991, p. 288).

What do these narratives tell us about environmental change and about the problem of water scarcity? While work on environmental narratives has proven very useful in allowing for the emergence of plural perspectives of environmental change and challenging dominant state or scientific perspectives, they have not been without problems. For one, they can lead to the creation of counternarratives, which can actually deny the problems of water scarcity. Furthermore, they risk creating a dichotomy between different narratives (e.g., between state and local actors or scientists and lay people). This can lead to both a hopeless relativism or to the relegation of environmental problems to mere text and to the level of discourse. Recent work by Dahlberg and Blaikie (1999) has attempted at a "closure" of local and scientific perspectives and for bringing together understandings of ecological dynamics and people's interactions with the environment. The findings from my study point to both a divergence of perspectives and to closure. With respect to rainfall, meteorological data suggest no significant change, whereas local people asserted that rainfall was decreasing. But, most people (scientists and local people) seemed to believe that Kutch was undergoing a host of ecological changes which, as argued above, were often simplistically attributed to dwindling rainfall and increasing droughts. With respect to the large dam, there appeared to be unambiguous consent all over Gujarat that the SSP was the only way to mitigate the problem of water scarcity. This consent was, however, largely "manufactured" due to the socio-political processes discussed. Thus, there emerged the need to analyze water scarcity at two levels:

One, at the discursive level and two, at the material level as a biophysical problem.

While narratives such as dwindling rainfall and increasingly droughts certainly need to be discredited, it would be foolish to merely produce new counternarratives of scarcity in Kutch or to deny the problem all together. Devegetation, dwindling groundwater aquifers, soil salinity and the general undermining of local strategies to cope with scarcity result in the rural poor feeling the impact of drought more severely. These are "real" manifestations of the biophysical problem of water scarcity and they are different from narratives of scarcity which have a "manufactured" nature. Hence, it might be useful to distinguish between "real" and "manufactured" scarcity (see Table 2). "Real" scarcity is a biophysical phenomenon with ecological and social dimensions (e.g., dwindling aquifers, the depletion of water resources in a communal tank or a longer trudge for rural women). It is, however, usually cyclical given that periods of abundance are interspersed by periods of dearth. It is highly dependent on resource availability and exogenous factors such as rainfall and climate, which are variable and erratic. Real scarcity is relative to several hydrological, meteorological and agricultural factors. This complexity is obscured by "manufactured" scarcity, which is a discursive construct. Scarcity is essentialized and universalized (e.g., Kutch is made out to be a "museum of environmental hardship). Seen as permanent, the cyclical dimensions of scarcity are ignored. Scarcity is made out to be "natural," thus ignoring the anthropogenic areas of culpability. The "manufactured" nature of scarcity allows controversial schemes such as the SSP to continue to be legitimized. Largely, powerful actors benefit from this "manufacture" though, as in Kutch, there might be widespread cultural consensus allowing the manufacture of scarcity and its supporting narratives to sustain.

Why is this distinction useful? The study has demonstrated that environmental problems such as water scarcity are created and reproduced at both the discursive as well as at the biophysical levels. What is the nature of their interaction? The "manufacture" of scarcity at the discursive level obscures several important aspects of "real" scarcity. One, inequalities often shapes access to and control over water. Two, water scarcity is not natural, but instead largely due to anthropogenic interventions, resulting out of bad water management and land use practices. The naturalization of scarcity at the discursive level does not help mitigate the symptoms and causes of "real" scarcity. In some cases, "real" scarcity might be exacerbated due to the popular narratives (e.g., water tables might continue to decline if dwindling groundwater resources are attributed to climate change rather than on their uncontrolled extraction). Furthermore, the "manufacture" of scarcity might not result in the creation of solutions appropriate to local needs and conditions. The result can only be that the real water requirements of the water-needy are marginalized and the limited water resources in water-scarce areas continue to be misused or even abused.

7. POSTSCRIPT

In January 2001, a massive earthquake struck Kutch. This paper was written before the earthquake and does not attempt to analyze the post-earthquake situation with respect to water resources. Given the present drought cycle affecting the region, and the discussions around the need to have safe and reliable water during relief and rehabilitation, the material presented here is still relevant and will hopefully provide insights during the rebuilding process.

Table 2. *"Real" and "manufactured" scarcity*

Real scarcity	Manufactured scarcity
Biophysical phenomenon with ecological and social consequences, e.g., dwindling aquifers	"Constructed" problem
—Declining grass cover	—Scarcity is universalised
—Fodder *problems*	—Scarcity as natural
—Longer trudge for women (marginalised groups particularly disadvantaged)	—Anthropogenic dimensions are whitewashed
—Cyclical (periods of abundance and dearth)	—Relief and drought industry
—Relative to agricultural, meteorological and hydrological factors	—Powerful stakeholders benefit from "scarcity"
	Scarcity as permanent

NOTES

1. According to the World Commission on Dams, there are currently over 800,000 dams in the world of which 45,000 are large. A large dam has a wall height of more than 15 m.

2. For a discussion of changing and fluctuating notions of drought and scarcity, see Mehta (1998).

3. Mr Vauru, Circle Irrigation Office, Bhuj, personal communication.

4. A medium irrigation scheme has the potential to irrigate more than 500 ha of land. A minor scheme irrigates less than 500 ha. As there are no perennial rivers in Kutch, there exists no site in Kutch for a major irrigation scheme or a large dam (Mr Vauru, Circle Irrigation Office, Bhuj, personal communication).

5. Dr K Raju, Former Director, Central Ground Water Board and Vivekanand Research Training Institute, Mandvi, personal communication.

6. Mr Ahuja, Gujarat Water Supply and Sewage Board, personal communication.

7. A discussion of the cost/benefit analysis of the project and a summary of all the controversies surrounding it, though interesting, are not possible in this paper.

8. Kunderlal Dholakia, Former Member of the Legislative Assembly Gujarat and Speaker, Bhuj, personal communication.

9. Even though *prosopis juliflora* is a coppicing and hardy plant that has a high tolerance for salinity and, thus, checks salinity ingression, especially in the coastal areas, it has spread in an uncontrolled fashion all over Kutch. This is due to the fact that its seeds are germinated in animal faeces (Bharara, 1993, p. 3). The spread of *prosopis juliflora* has both undermined Kutch's biodiversity and has caused a host of problems for pastoralists rearing small ruminants and cattle. Save buffaloes, livestock cannot ruminate its pods, resulting in loss of appetite, paralysis or even death.

10. Rainfall data were obtained from the Institute of Desert Ecology, Bhuj, and analyzed in Brighton (see Sinclair, 1998).

11. Kutch's climate and shallow soils enhance a vegetation with a pre-dominance of short annual grasses suitable for the foraging of ruminants (Gujarat Ecology Commission, 1994, p. 20). In fact, varied grass growth is possible only with about 112 mm of rain. Agriculture, by contrast requires at least 250 mm of rain (Dr Bhatt, Animal Husbandry Expert, Banni Development Office, Bhuj, personal communication).

12. The Indian Meteorological Department defines drought as a situation where the annual rainfall is less than 75% of the normal rainfall. Moderate drought is stated to prevail when the rainfall deficit is between to prevail when the rainfall deficit is between 25% and 50% and severe drought prevails when the deficiency is more than 50% (Sarma, 1987, p. 71).

13. David Hadrill, Veterinary consultant in Kutch in 1987, personal communication.

14. The problem could also be one of definition. Authors writing about increasing drought do not define what they consider constitutes "drought." As several authors argue, drought can be perceived either in hydrological, agricultural or meteorological terms (e.g., Falkenmark *et al*., 1990). Hence the notion that drought events have increased in the last 50 years.

15. Interviews with villagers of Khari village and senior members of Merka, Sushma Iyenger, Kutch Mahila Vikas Sangathan, Bhuj and Sandeep Virmani, Jan Vikas Ecology Cell, Bhuj.

16. Interviews with Himatsinhji Jadeja, Ecologist, Bhuj, Jayshankar Antani, Retired Civil Servant, Bhuj and Jushab Sama, Journalist, Bhuj.

17. Interview with Merka villagers and Himatsinghji Jadeja.

18. Mts = metres.

19. Gujarat was the first state to pass a groundwater law in 1976, which dealt with the regulation, and licensing of tubewell construction and control of groundwater use. Its implementation, however, has been difficult given the strong political opposition and because rights to use groundwater go hand in hand with land ownership (VIKSAT, n.d., p. 11). The skewed pricing of electricity contributes to uncontrolled rates of water extraction.

20. P.V. Rao, Executive Engineer, Kutch Branch Canal, Anjar. personal communication.

21. See criticisms of the reports of the Centre for Social Studies by Whitehead (1999).

22. One crore = 10 million.

23. Interview with unnamed water resources official in Bhuj's water resources division.

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