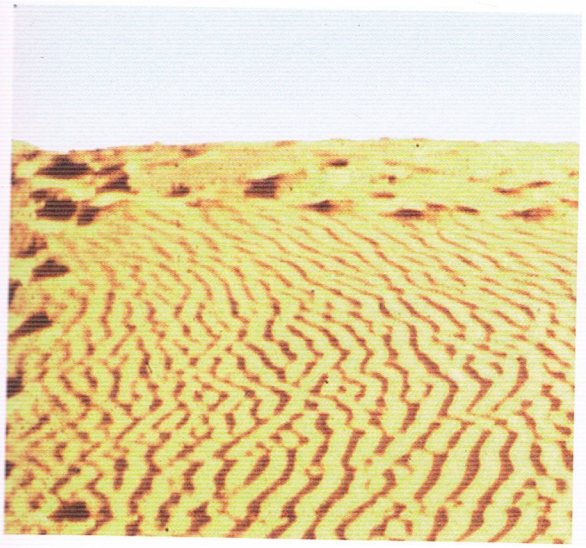
# The Radiant Raindrops of Rajasthan

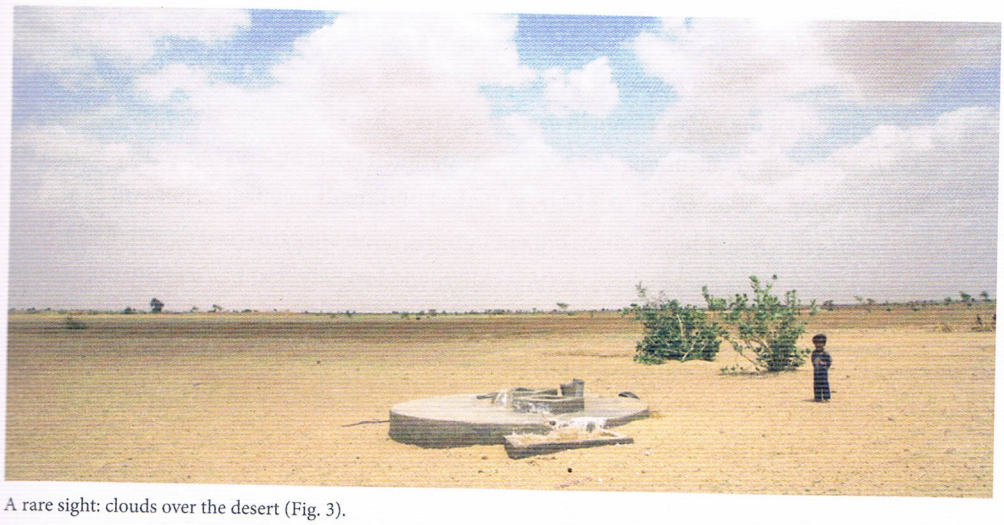
ANUPAM MISHRA

Social scientist and author Anupam Mishra has spent decades studying the culture of water practiced by the local desert communities of Rajasthan. His lecture reflects his fascination with the amazing water wisdom of traditional desert societies, and their social organization in the management of scarce water resources. At the same time, he describes a vast universe of experience, wisdom and adaptability. In order to better understand Anupam Mishra's contribution to this symposium, we would like to draw the reader's attention to Annie Montaut's afterword, in which she provides an in-depth look at the basic principles of Anupam Mishra's work.

Namaskar. During this session, please allow me to rename the theme of this symposium, *"Touched by water"* for this session only to: *"Touched by very little water."* I will take you



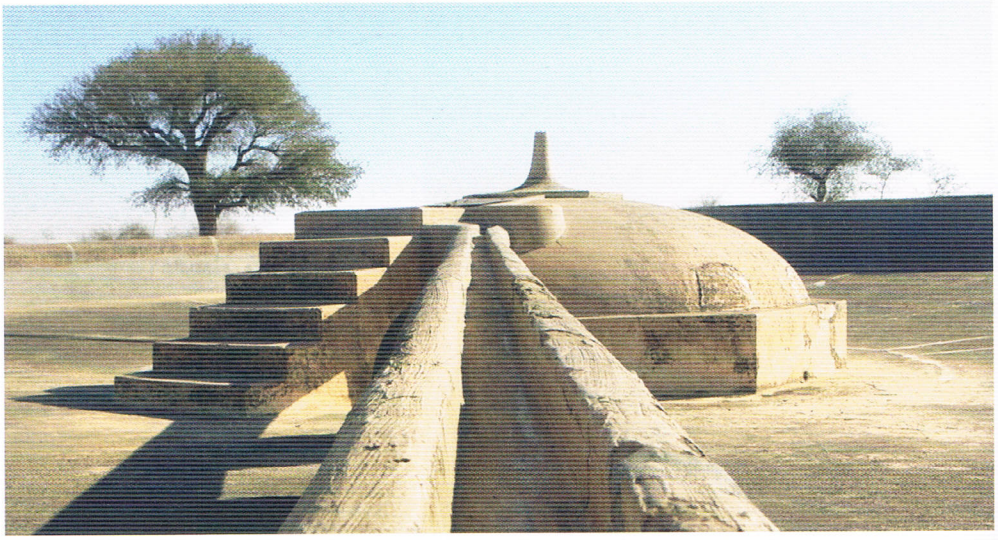
Fascinating landscapes and the most basic of living conditions: the Thar Desert in Rajasthan (Fig. 1 and 2).



A rare sight: clouds over the desert (Fig. 3).

to a desert, which will shower you with some new ideas. They may seem new but they are a thousand years old. Nature teaches us an important lesson that we tend to forget: nothing is that new, actually. What seems new to us is a continuation of what has been around for a long, long time. Nature's calendar runs into several millions of years.

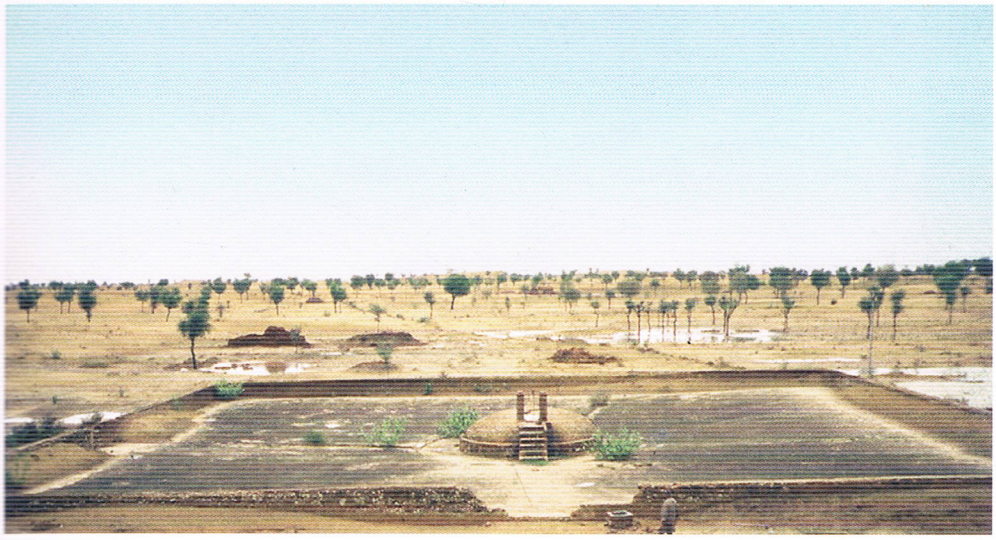
Welcome to the desert, the golden Indian desert, the Thar in Rajasthan (Figure 1).
It resembles other areas which are deemed underdeveloped. The roads are not like the roads



Kunds and tankas have been used to collect water through the centuries (Fig. 4).

you might find in Europe (Figure 2). Villages, hospitals and schools are few and far between. What is truly surprising, though, is the percentage of the population with safe drinking water: 99.7 percent of the villages here in the desert have drinking water. These arrangements are made by a very big government, but not by our national government, nor the World Bank. You can open schools in villages here, you can build roads in villages, but you cannot provide water if you are not big enough, big enough to understand this vast desert. The biggest government is the society here. A very enlightened society that has already done most of what is necessary to supply water without waiting for the government or for the World Bank. Not waiting for anybody. The society has solved its problems because it knows its desert, its secrets. They know their drops of water.

Clouds seldom visit this region (Figure 3). The average rainfall is 16 centimeters or 160 millimeters, which is nothing compared to other parts of India or even Germany. Groundwater is found 100 meters below the surface. If you do find it, you realize it is mostly saline. The technologies supported by multinational organizations like UNICEF will, at best, pump up water from great depths. But its salinity will ensure that it is not potable. Then somebody might suggest desalination plants, but they work on paper only, not in the desert. So people here decided to measure rainfall not in centimeters, inches or feet. They learned to measure the scarce rainfall in millions of raindrops. They look at the countless small, crystal-like drops and believe that nature has provided them enough water. They focus on catching these silver drops. No centimeters, no inches. Their dialect contains some 40 different terms

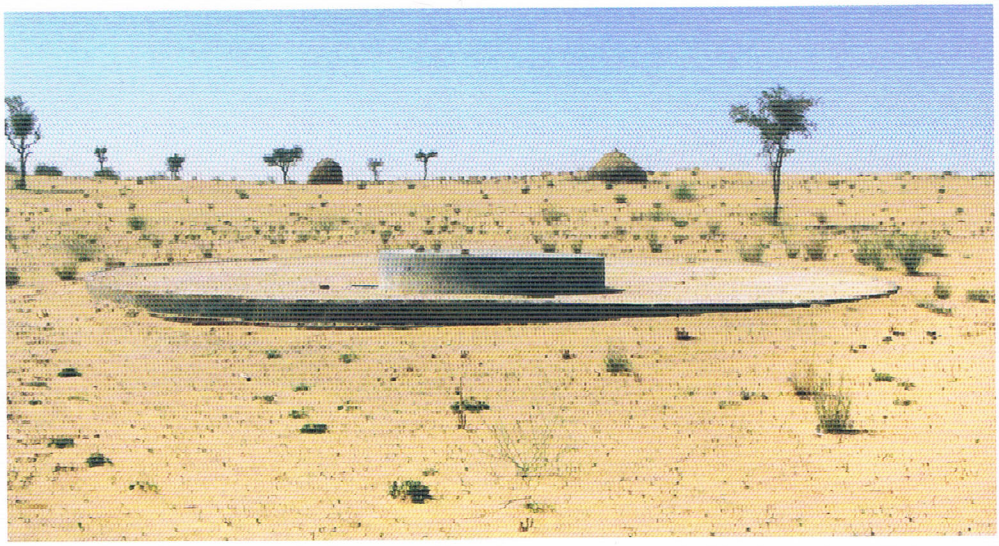


The rainwater tanks are kept meticulously clean; they are the only source of drinking water (Fig. 5).

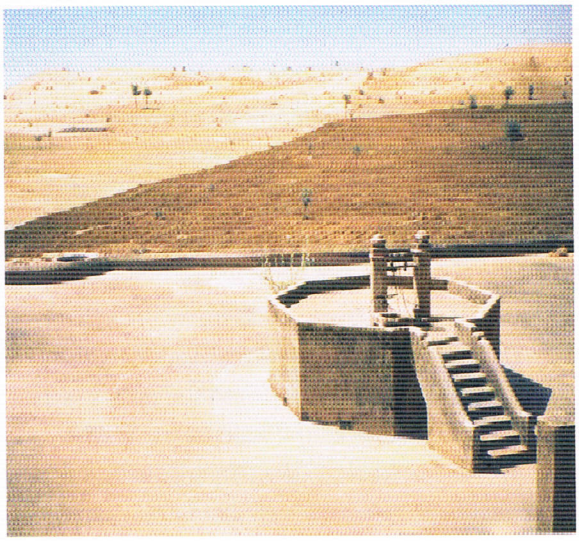
describing clouds. Some are poetic, some scientific, some even political: They say a particular cloud promises you water but will not deliver water to you. There are numerous ways of identifying clouds and of responding to their presence on the ground – all in the collective wisdom of the desert folk.

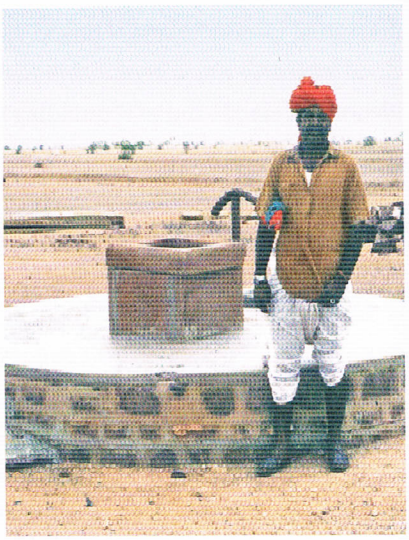
One system (Figure 4) is called the *Tanka* or *Kund.* You can see a false catchment surrounded by a wall. It slopes to a dome-shaped structure in the center. The dome in this particular image is about 300 years old. The well it covers is 12 meters deep. The lining of the well is of a quality, which does not allow a single drop to seep out. There is no seepage loss. Raindrops in the catchment are drawn to the center, where filters on the periphery clean the water before it enters the well. Whenever you need water, you climb these beautiful stairs, lower your bucket, and pull up the water. Because it has dropped in from the sky, it's pure distilled water. People make sure nothing contaminates the water before it is collected. But how much is collected? The average capacity of such a structure is about 100,000 liters per season. There is enough from one monsoon to last till the next year's rains. Over the past 10-15 years, the term *rainwater harvesting* has gained currency, even in Europe; the society which devised the *tanka* has harvested rainwater for thousands of years.

This structure (Figure 5) is operational, still in use, although it is 250 years old. Take a moment to consider the practicality of these structures. Their designer is the biggest government of all: society. Our elected governments plan for five years, ten years, perhaps



Simple, and yet efficient: during the monsoon season rainwater is channeled from the catchment area into the tank below (Fig. 6).





A living tradition: the structure on the left has existed for 300 years; the tank on the right was built only recently (Fig. 7 and 8).

20 years. But these structures were built to last hundreds of years. You may notice several filters here. The cleanliness of the structure and its catchment is maintained meticulously. The responsibility to clean the floor is distributed among the villagers and diligently followed – all this to ensure no dirt is washed into the water storage. Once you climb these stairs, you place your earthen pot on a platform where it sits safely secured. Not a single drop is wasted while pouring, and if any water spills, it is collected for the

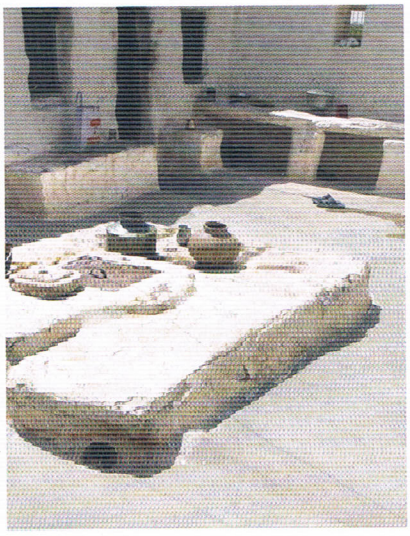
birds. A caring society remembers all its members – its birds, its cattle and every living being.

The structure in Figure 6 may remind the viewer of a flying saucer. It is only a water collection device, a much simpler one, though, without elaborate walls. It comprises only a raised platform which collects rainwater and funnels it to the center. One indication of the value of each drop is to remember the summer temperature in this desert: it reaches 50 degrees Celsius. Moisture is the difference between life and death here.

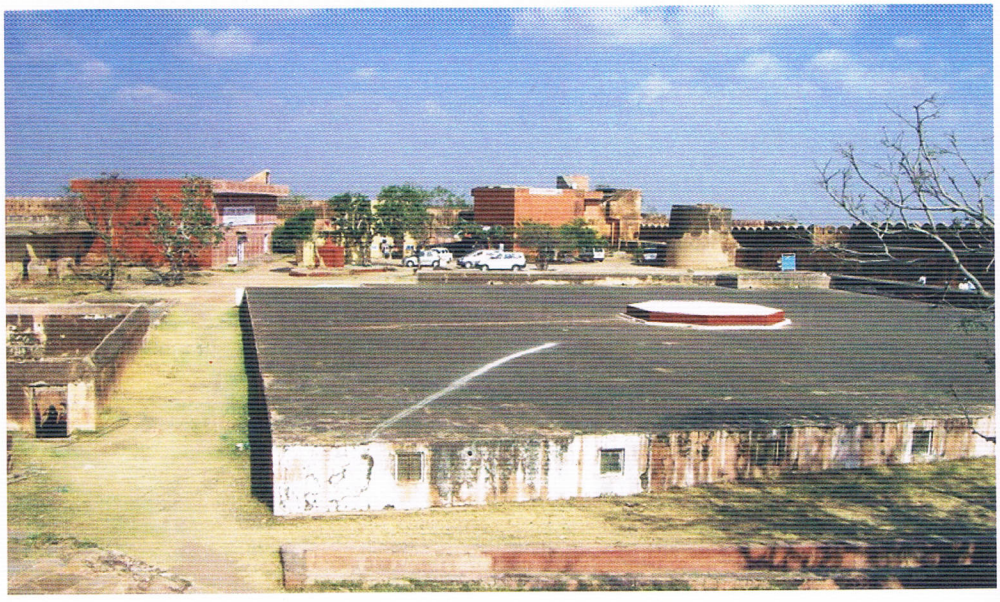
The structure in Figure 7 was built by a family some 300 years ago. In their will, they set aside funds for its maintenance from generation to generation. The money is given to another family, who cleans the structure regularly, especially its filters. There are often strict social regulations; for instance, I cannot enter the central area with my shoes on because pure drinking water is collected here. If I need water, I must ask the caretaking family. One of its members brings me water outside. Everybody knows who is in charge. Please also note the embellishments on the wall protecting the water collection area.

Water management in the desert centers on people. The man in Figure 8 has two colored flags under his arms. It tells you he is a gatekeeper at a level crossing of the railway department. He is among the lowest paid employees of Indian Railways, perhaps the largest railway company in the world. When he lowered the gates across the desert road, along the railway line, he noticed people waiting on their camel carts for the train to pass. He realized they might need water. So all by himself, he constructed this device. He designed it, engineered it, he is its architect and its fundraiser. If you happen to wait at this crossing in your car, he will enquire if you need water. After he has quenched your thirst, he will tell you that he built the structure by himself, and ask for a contribution. Some people contribute in cash, some in kind, some help carry stones, others provide building material. When cracks appeared in the structure, he was worried that they would gradually spread, creating many leaks. So he decided to install a T-pipe to allow an escape route for the air that expands in the tank due to the desert heat. His tank collects 70,000 liters of water from rainfall in an unpaved catchment. Nobody knows his name – of course we know, and we can tell you – but he is the best civil water engineer in that area.

The two village houses in Figure 9 also display water collection technology. In this region of the desert, population density is as low as the rainfall, with no more than five people per square kilometer. The next village is several kilometers away. No centralized system will ever



The monsoon rains are collected from the roof and the courtyard of the village houses of the desert, and stored in tanks below ground (Fig. 9 and 10).



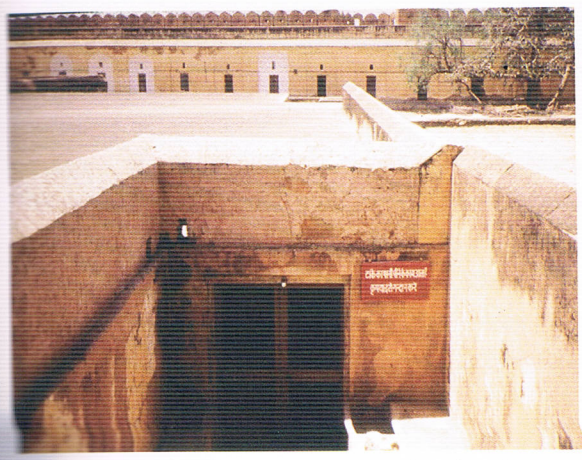
This 300-year-old tank near the fort in Jaipur holds up to 23,000 cubic meters of rainwater (Fig. 11).

be able to provide drinking water to a small number of people scattered over such a vast area. So the people here worked it out for themselves and constructed raised platforms beside their entrance doors. You rest here if you are weary from your travel, sleep here at night, or spread out vegetables for drying. When it rains, the 5-meter deep tanks collect water from both the roof and the courtyard. And each and every house has its own platform – two doors and two

Monsoon rainwater is collected from the surrounding hills and flows through canals down into the main tank in Jaipur (Fig. 12 and 13).

platforms are visible in the image, decorated with cow dung and the colors of sand. Each tank collects about 30,000 liters.

This Rajasthani house is exemplary (Figure 10). All shoes and footwear have to be left outside. This is to keep the courtyard clean, because it is a rainwater-harvesting surface. Before the rainy season, the entire area is swept clean to ensure the quality of the water going into the tank. Throughout the year, you can draw out water by merely opening the lid. This courtyard collects 20,000 liters each season.



Strict rules ensure that the drinking water drawn from the tanks is always clean (Fig. 14 and 15).

Houses in Jodhpur are traditionally painted blue as a reminder of the importance of collecting rainwater (Fig. 16).

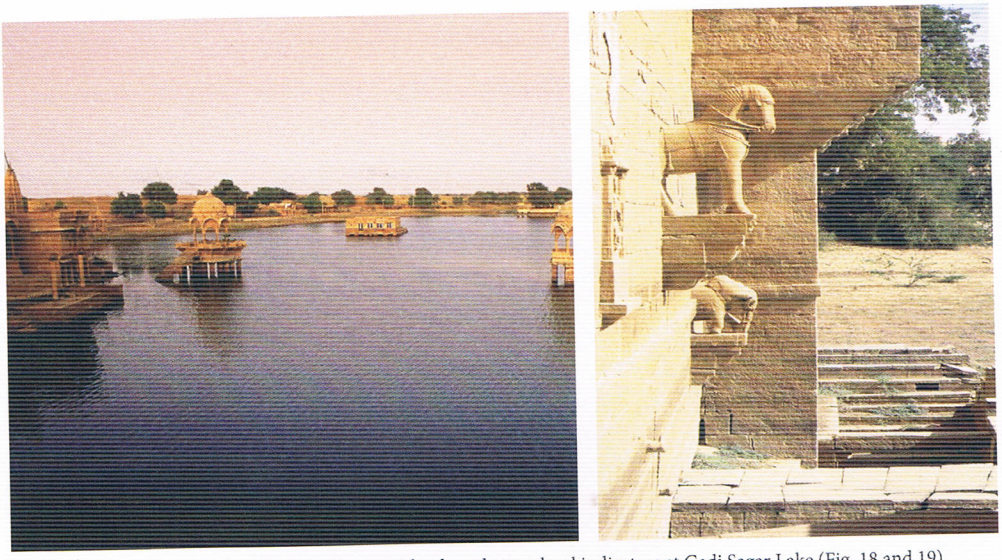
There are a large number of structures that harvest and store from 20,000 liters to 50,000 liters of rainwater in the Thar Desert. However, this one (Figure 11) has a capacity of some 23 million liters. It collects water from the surrounding hills. The storage is 12 meters deep, 47 meters long, and 43 meters wide, practically the entire area of this building. A 15-kilometer long canal (Figure 12) feeds this underground reservoir. It is wide enough for two cars. It was built 400 years ago and has functioned without any interruptions for repair or maintenance, making water available in this famous fort of Jaipur. Compare it to the small road adjacent to it, which had to be repaired several times in only 25 years (Figure 13).

The sign in Figure 14 is in Hindi, so let me translate: "Remove your shoes and enter carefully, because this is a site for collecting drinking water." A small lock secures the door. You can see somebody fetching water from a depth of 12 meters (Figure 15). Do not fail to notice that the water is colorless; the water level of the reservoir is also visible, attesting to the effectiveness of the canal that feeds it and its high maintenance standards. Sometimes people mistakenly think that the canister is empty. Let me assure you it is brimming with water just like distilled water. And since I've tasted it, I can tell you that it is very, very sweet.

Figure 16 is a landscape of rooftops in Jodhpur. The city was built 800 years ago in the driest part of the Thar Desert and was once a prestigious trade center on the silk route, similar to Dubai today. It rains precious little here and the groundwater is too saline to drink. People had no option but to devise various methods to manage water. For one, all houses in Jodhpur have been painted indigo for a long time, to remind everyone of an invisible river (Figure 16). This translates to collecting all the rainwater falling on the roofs. So you can imagine a river running along these structures. Then they designed 52 beautiful bodies of water, like these in the town of Jaisalmer (Figure 17). Again, the reservoirs are 800 years old – note the elaborate architecture, the quality of masonry. It was the biggest fresh water reservoir in that area. Everybody participated in building the waterworks, from the mighty king to the local carpenter.

The splendor of the architecture of the buildings on the manmade lake of Gadi Sagar in Jaisalmer highlights the importance of this fresh water reservoir (Fig. 17).

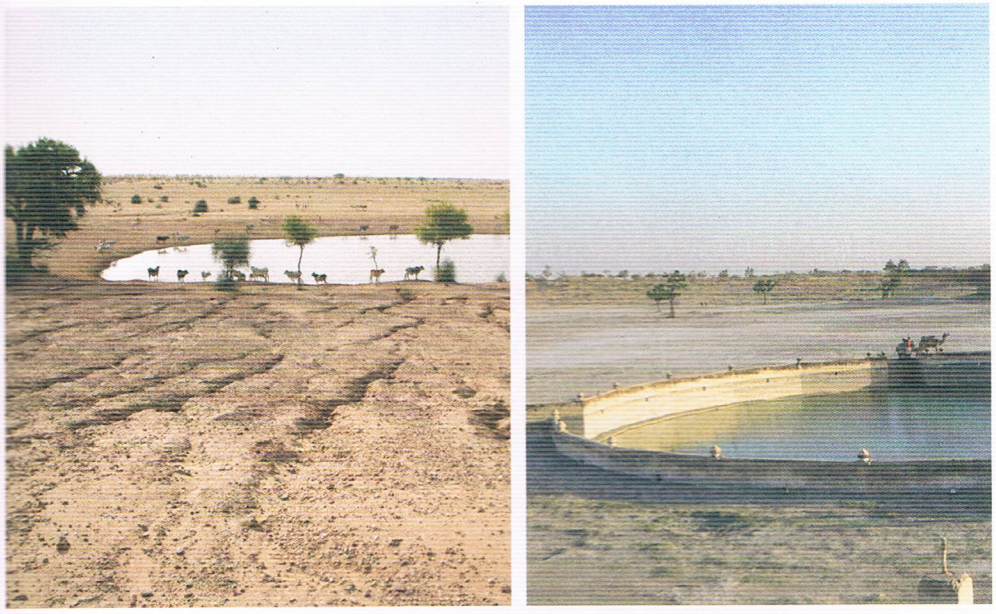
The reservoir in Figure 18 is called Gadi Sagar and located in Jaisalmer. Several intriguing stories are told about it. Its name is a metaphor. For example, a person indulging in a boast could be asked to go wash his face with the water of Gadi Sagar. There are a number of qualities attributed to it and it is beautiful in every season. Whether the water level is low or



Water reservoirs as cultural attractions: pleasure islands and water level indicators at Gadi Sagar Lake (Fig. 18 and 19).

high, there are pleasant meeting places there large enough to hold a symposium, but also smaller venues, surrounded by water and accessible only by boat. The catchment for this reservoir is about 125 square kilometers and, let me remind you, all this was built about 800 years ago.

Devising such a reservoir is not merely a matter of technology, but of culture too. For instance, the ordinary task of calculating the amount of water in the reservoir was turned into an aesthetic project with the help of stone statues on its banks (Figure 19). People know whether the water will suffice for four or six months by the level it reaches. If water touches the horse's feet – nine months, if the horse gets submerged, that is water for the entire year, right until the rains next year. There was no need to read the newspaper to know about the city's water reserves – a very transparent and beautiful way of offering people information. You might have heard the name of the pond in Figure 20, but perhaps you are seeing it here for the first time. This is in the region of Pokharan where India tested its nuclear devices and then faced sanctions from the world's nuclear powers. The Indian government was keen on nuclear power and this region was chosen because it is sparsely populated and considered deserted. But people do live here, and with little or no government help. As almost everywhere else in the Thar Desert, the groundwater here is saline. This pond is the only freshwater supply for Pokharan village. People look after it and maintain it because it is so precious. It is said these days that the Third World War will be fought over water, not land or energy



Varied solutions: a simple village pond and an ingenious rainwater reservoir (Fig. 20 and 21).

sources. The people of the Thar Desert know the real power, the power of life, lies in the sensible management of water.

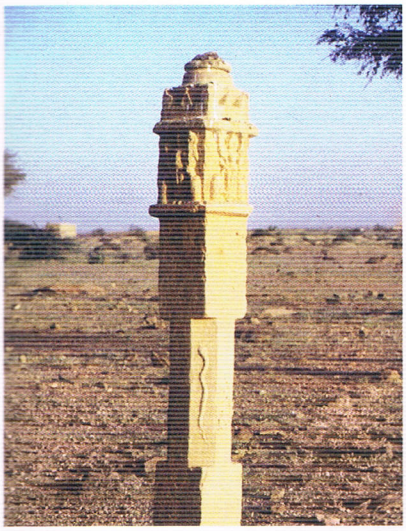
The structure in Figure 21 is no less than 400 years old. It is a large water reservoir. During the monsoon season, water fills this entire area and the circular structure is submerged. Then, after the rains cease, water gradually retreats from the outlying area due to usage and evaporation. Water supply is ensured even in the hottest months of April, May and June. The idea is to confine water inside a deep structure that minimizes evaporation. During summer, the heat inevitably evaporates all water unless it is confined in such a structure. Hundreds of camel carts take away water from here to supply nearby villages. But water is never sold here; it is not a commodity.

Blue and green are not colors usually associated with a desert (Figure 22). Yet the blue and green of this lake indicate the depth of its water. Deep waters lend a blue hue. This pond is 12 meters deep – and it is right in the heart of the desert. It is yet another example of a deep understanding of local natural conditions. The pond was made above a gypsum layer running at a depth of 12 meters. Gypsum is impermeable, which means there is no water loss due to seepage; it is like water in a glass container. The people of the desert knew the gypsum

Not a Fata Morgana: a 12-meter deep freshwater reservoir in the middle of the Thar Desert (Fig. 22).


Many towns in Rajasthan depend on rainwater from rural areas (Fig. 23 and 24).

layer would work as a bottom seal, and created a pond in the sand above it. The bank holds the water on one side, while the catchment on the other brings in rainwater. Note the lush green cover on the bank, which strengthens it. Remember, again, that this is in the heart of the Thar Desert. A small building is visible only by the reflection it casts in the water. It is a one-room inn, where anyone is welcome to stay.




Monuments of water wisdom: 800-year-old stone pillar marking a water collection area; the huge pulley of a deep well (Fig. 25 and 26).

Desert folk are immersed in the lore of water. In contrast, the towns and small cities of the desert have lost their water wisdom in recent years. That is why you can find an advertisement like this in towns today (Figure 23): medicine, local phone, water tanker. And where does the tanker get the water? From the villages (Figure 24); the city may have has lost its water management culture, but the village hasn't. The phone numbers are important, for they guarantee fresh water. The government supply and all other local water sources are saline as the groundwater they pump up is saline. The only fresh water in the area is collected in rainwater harvesting structures. So it is important to remember these numbers; who knows who may need them some day.

One of the Thar's secrets is its stone pillars (Figure 25). This one is 800 years old. You will find such pillars wherever you approach a body of water. It has been erected to announce to everyone that a water collection area is lying ahead. It signals: Do not litter, do not spit, do not do anything that may contaminate this catchment in any way. Treat and respect this area as your own – not the government's property, not a private property, but it is yours all the same. These pillars are respected and worshiped by society. They are about 2 meters high. The effort, time and money that must have gone into creating these works of art is obvious; the inspiration, though, can only be felt. It is an aesthetic and surefire way of ensuring the sanctity and collective ownership of a body of water, far more effective than a board that warns: "Do not enter here, by order of law."

Aboveground a building, belowground a well: 400-year-old architecture in Bikaner (Fig. 27).

Stone pillars indicate the vicinity of a water reservoir (Fig. 28).

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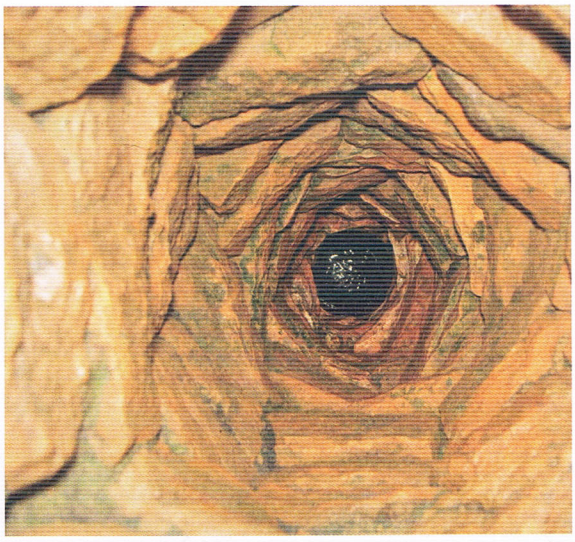
*Toda Rai Singh Baoli,* a water storage well in the Tonk district of Rajasthan was built in the 11th century (Fig. 29).

Most of the examples we have seen so far harvest surface water directly from raindrops. Let's now move on to groundwater, which is usually saline in the Thar Desert, but there are also pockets of fresh water. Hundreds of years ago, when there was no sign of modern technology, people discovered ways of finding these pockets of fresh water, and then created an entirely different set of waterworks for such areas. They built marvelous wells, some up to 100 meters deep. The pulley in Figure 26 is so large because it takes a lot of rope to reach the water in such a deep well. Figure 27 also shows a well in the city of Bikaner, only it looks like any ordinary building. There are 12 rooms and verandas inside this building, and a well. Built some 400 years ago, it not only supplies water but also provides office space for a new world, in this case for the state government. Government officials work virtually on top of the well.

Once again a pillar (Figure 28) announces you are close to a body of water. You remove your shoes and climb these stairs, for the view on the other side is nothing short of spectacular. Built in the eleventh century, this open stepwell is named *Toda Rai Singh's Baoli* in the district Tonk of Rajasthan (Figure 29). You enter right at the top and climb down at least eight flights of steps to reach the water. During the dry months, when the groundwater drops, more flights of steps appear; in the rainy season the water table rises and submerges them. When



Applied geology: *habur* stones are highly sought after for the construction of wells (Fig. 30 and 31).

the water recedes, it unveils beauty; when it rises, the water itself is an embodiment of beauty. The ambience is impressive due to the playful interaction of light, the steps and the water, giving you the feeling of entering an entirely new world. Three sides of the well have steps, the fourth is overlooked by a four-story building.

Figure 30 shows a special stone called *habur,* a kind of limestone. People here noticed its special qualities some 1,000 years ago. When British geologists surveyed India 200 years ago, they found this stone and they named it after the village where they found it: Habur.
This is also its traditional name in Rajasthan. *Habur* has special qualities with regard to water. It tolerates water well and does not erode or dissolve easily, which means it can be reliably used in waterworks. It also helps maintain water quality by softening hard water. Villages in the region are desirous of using this stone in their water structures. Figure 31 shows a well made using *habur* stone. People go as far as 200 kilometers on camels to get this material.

In contrast, let me make some remarks on the outcome of using modern water technology in the desert. I do not wish to deride our governments in the least. Their strategy is to drill deep tube wells, pump out the water and fill tanks (Figure 32). The tanks are supposed to supply water to cattle and sheep. However, this tank started to fall apart and became useless within five years. The animals have long gone back to the water places which sustained them for generations.

The people who have devised, designed and built the traditional water structures of the desert, the people who keep them running, are the best civil engineers I have met in our country. They are skilled enough to serve as visiting professors at universities and international organizations such as UNICEF. Provide them with a good interpreter and they will help you solve any water problem.

To close, let me return to one of the water awareness pillars worshipped in the heart of the desert (Figure 33). Here, in an area with no more than 8 centimeters or 80 millimeters of rainfall, you can see a crop of wheat. Agricultural experts will tell you it is impossible to grow wheat in the desert – absolutely impossible. What they do not know is that a layer of gypsum runs about three meters below the surface. It prevents rainwater from seeping away, retaining the moisture in the upper layers of soil. This moisture is all that the people here need to grow wheat (Figure 34). In an area condemned as desert, as deserted, they combine an understanding of geology, agriculture and collectivism; everybody gets a share of this precious field. About 40 families live around this field, and everybody will get a share. The collective farms of communist Russia and the Kibbutzim of Israel came much later, and their success is disputed. But here in the desert, there are no slogans and no claims to ideology. People have been farming collectively for centuries; raising wheat on equity.

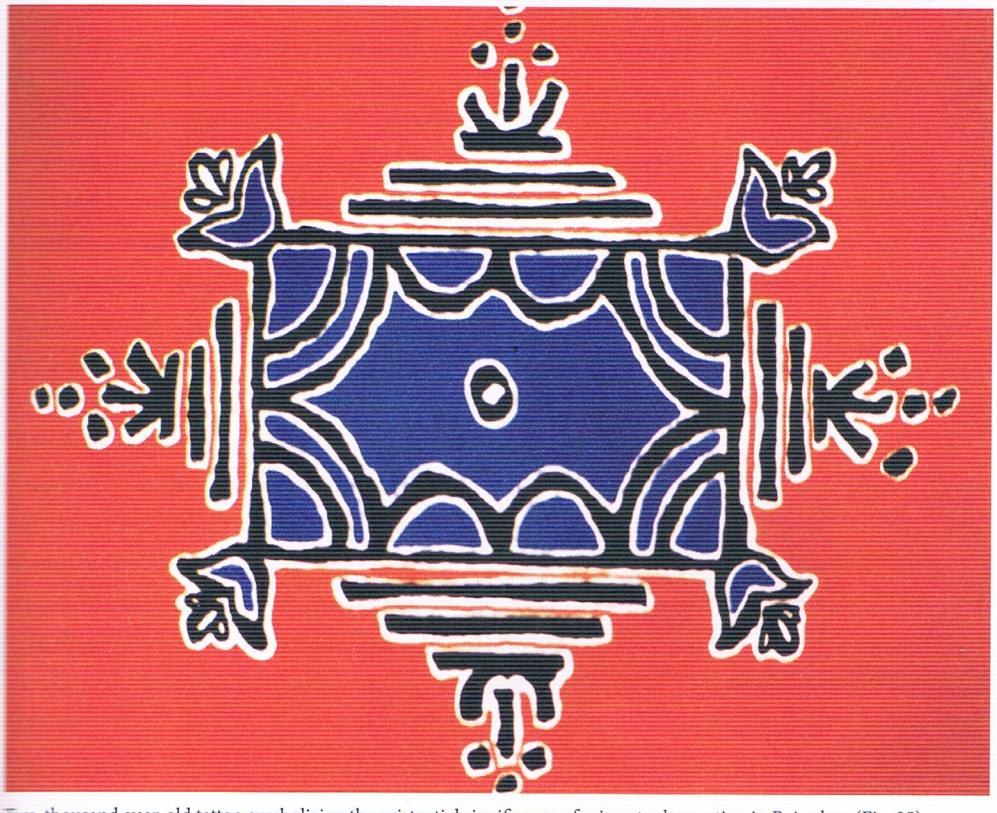
The water philosophy in the Thar Desert is well summarized in a two-thousand-year-old tattoo called the *Sita Baoli* (Figure 35). It symbolizes a body of water in the desert. In the middle is the center of life, surrounded by waves on the water's surface. Along the sides, there are the stairs of a stepwell like the one described earlier, crowned by trees protecting and

Even well-meaning government waterworks projects are doomed to fail without the water wisdom of the desert. (Fig. 32).

This stone pillar is not the only sign of water in this desert clime (Fig. 33).

shading the water. In the four corners, you will recognize the flowers which add fragrance to our life. Without water, there will be no fragrance. So we come back to the theme of this symposium: Touched by water, touched by very little water, touched by the fragrance of water. I thank you very much.

Almost a miracle: wheat grows despite the area's scarce annual rainfall of 80 millimeters (Fig. 34).



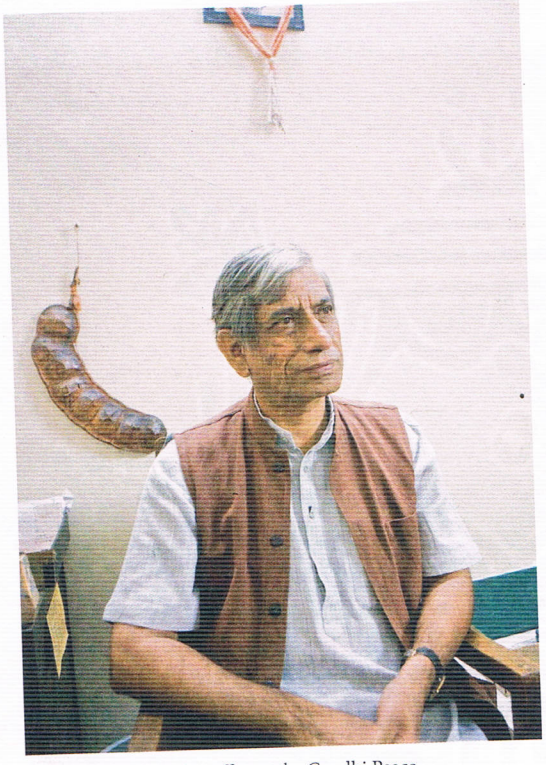
Two-thousand-year-old tattoo symbolizing the existential significance of rainwater harvesting in Rajasthan (Fig. 35).

# Anupam Mishra's Rajasthan

An introduction to his work about the desert and water culture of northwestern India, by Annie Montaut, based on her preface to Anupam Mishra's book, *"The Radiant Raindrops of Rajasthan"*.

Rajasthan is an Indian state in the northwest of the country, sharing a border with Pakistan and very often referred to as a desert: the Indian Desert, the Rajasthan Desert or the Thar. The whole of the Thar can be regarded as part of the Afro-Asian desert belt, stretching from the Sahara to the Gobi. Almost 58 percent of western Rajasthan is made up of sand dunes, low infertile hills and land high in mineral content.

The Thar is enclosed on the west by the Pakistani border, and on the east by the Aravali hills from where the river Luni (the salted one) flows down to the south.



Anupam Mishra in his office at the Gandhi Peace Foundation in Delhi.

Despite grim descriptions by early European travellers, no one visiting this region has the feeling of being in a desert. Even in Jaisalmer, the least populated district (four inhabitants to the square kilometer), one can see villages and fields everywhere, at least during the monsoons. This is a very different picture from the Sahara or Australian deserts, an image in total contrast to the stereotype of deserts being arid, sparsely populated and on the fringes of civilization.

Aridity cannot be defined by only one parameter such as annual rainfall. This would mean lands receiving an annual rainfall of less then 100 millimeters

would be desert, and those receiving 100 to 400 millimeters would be arid, in which case the Thar Desert in its totality would not be defined as a desert but be placed in the second category since even Jaisalmer, the district with the lowest rainfall, receives 160 millimeters of rain. One must keep in mind two other factors: first, the distribution of rain throughout the year, meaning that 90 percent of rainfall occurs during the monsoons from July to mid-September, and second, the torrential nature of rainfall, which does not allow optimal usage. Winds, a powerful agent of erosion and evaporation, also contribute to the desertification of an already arid region. If we add the temperature factor (in May the minimum temperature in Jaisalmer is around 27 degrees Celsius and the maximum around 43 degrees Celsius, and this range is barely lower in Jodhpur and Bikaner), we can accept using the term desert for Rajasthan, as Indian geography classification has always done.

If Rajasthan offers a very different impression of a desert, the explanation lies in the way the water it receives is so parsimoniously managed, one could say drop by drop. In his books and speeches, Anupam Mishra documents how the ingenuity and patience of people down the centuries have made it possible for life to be maintained in the desert, with inhabitants applying their technical knowledge to collect each and every drop. Drops become all the more precious given their scarcity, suggested by the very title of his talk on "*Rajasthan Ki Rajat Boonden, The Radiant Raindrops of Rajasthan*" (also the title of his groundbreaking book on the topic). *Rajat* in Hindi means silver but also ivory; it therefore connotes luminous whiteness, radiance and value. It is to each precious drop that local society has dedicated its effort, its love, its intelligence, in fact all possible human means to obtain optimal advantages. But local society does not view itself as the sole agent in this endeavor to make the desert suitable for human life. More specifically, it acknowledges a partnership from the offset; human intervention is always associated with supernatural forces and all the concomitant ethics deriving from this interaction. In fact the myth of the practice of water harvesting in Rajasthan is founded on human activity responding to a divine gift.

But as Anupam Mishra explains with so much sensitivity and discernment, the people of Rajasthan did not wait for manna to drop from heaven. Instead, they evolved a whole *riti* or *voj* (tradition) around their *shram* (labor) in water conservation. A *riti* is established on a deep partnership between nature (the environment), human action and its ethical as well as religious framework. The same spirit permeates Anupam Mishra's work as well as that of the Gandhi Peace Foundation, for which Anupam Mishra has worked the major part of his life. Anupam Mishra's work on traditional water harvesting and storage systems is an invitation to understand what these systems have to offer even in the present day. There are *kuins*, deep and narrow wells which access the capillary water trapped between the brackish water table

and the surface. Then there are ponds and water tanks, *kunds* and *tankas*. These range from the modest *tanka* which each family has on its roof, or the small *kundi,* which looks like a lid, to the enormous *tanka* of Jaigarh which contains several hundred million liters of water and the *kunds* which look like flying saucers. Other devices are retention pools of all sizes. In some cases, entire seasonal rivers are retained, their beds transformed after the monsoon into oases called *khadeens.* When the bed is dry, it is blocked on three sides by mounds of earth to retain water instead of letting it run off. This offers the possibility of having two harvests (*kharif* and *rabi*), the second one relying on moisture still in the soil. Anupam Mishra suggests that although this Indian model cannot be universalized, it does offer hope by providing a modern example of the efficiency at economic and social levels of self-managed traditional techniques.

Each technique has a particular function in the social and ethical fabric of local communities because such traditions cannot be separated from the philosophical and religious culture of the people who forged them; in fact this culture offers a way to manage natural and social resources and to integrate human beings with the natural environment.

## Technique and ecosystem – a way of life

And so, essentially through describing technical devices to manage and preserve water, invented and maintained over the centuries by the very special society of the desert, Anupam Mishra's objective is to illustrate the culture of a society bonding itself to the environment which keeps it alive, no different from elsewhere in India, but perhaps more pronounced here due to the hardship of natural conditions. In turn, society keeps the environment alive by transforming, respecting and cultivating it without exploitation. The same idea also permeates the most interesting facts. For example, Cherapunji in Bangladesh is a region with one of the highest rainfalls in the world, a minimum annual rainfall of 5 meters, yet it is listed as a district with severe water problems. On the other hand, Jaisalmer has always had drinking water – with just 160 mm of rainfall. In one case, the environment is conducive to symbiosis and a patient dialogue with the realities of nature, in the other it is not.

The insistence of Anupam Mishra on the special Rajasthani attitude *(tevar),* the virtues of frugality and modesty, in no way reflects a moralizing nostalgia for the past; on the contrary it underlines the awareness Rajasthani society has of the value of each drop of water. The drop is a fragment of the usable capital of water *(pani).* In fact, water is offered to the honored guest whereas others are offered milk; this capital of water, religiously maintained, is the fruit of a dialogue nurtured through the centuries by an entire culture and a mythopoesis between people, earth, heat and water.

When we say "a dialogue nurtured through the centuries," we must know that archaeological traces of sophisticated water structures have been found at the Harappan site of Dholavira in Kutch, dating from the beginning of the third millennium B.C., when the Harappan civilization flourished in the Indus valley and the Thar Desert. There are also indications that there would have been a technology transfer in Balochistan with its gabarband system reminiscent of the Iranian *qanat.* As early as the eighth or ninth century, the *Agni Purana,* an important medieval Vedic text, mentions tanks, lakes, reservoirs and step wells, describing the various rituals to be performed before consecration. Another more detailed treatise, the *Aparajita Pricha,* describes a complete typology of hydraulic works. From the beginning, we see that water techniques are also a ritual and a religious tradition and it is this tie that enables them to make the desert humane and fit for life.

Excessive heat and all too scarce water are not the only challenges people have to face to tame this difficult environment. The water table is salty in an extensive area of Rajasthan; in fact, the Jodhpur museum exhibits salt sculptures from Sambhar and marine fossils which confer historicity to the legend of Hakdo, the ocean which is supposed to have existed in the region before it turned into a desert. It is therefore a range of difficult conditions that society at large *(samaj),* meaning communities, has transmuted into a raison d'être, and which has generated social cohesiveness through work.

The name of this work is *shramdan,* the Gandhian concept meaning gift of labor or *seva,* service offered in a religious and respectful spirit. The gift of labor, in the interest of all, is the underlying spirit behind water harvesting and conservation work, from the smallest of *kundis* to the narrowest of wells and the vast step wells, from the family *tanka* to the big reservoirs of Jaigarh. That gift of love rests on a social cohesion which is itself linked to economic and cognitive structures. The notion of a good deed to serve all, the environment included, is considered *punya* (sacred and virtuous) because the relationship between society and nature which nurtures it is *punya;* on the other hand, paid work which is governed by individual profit does not belong to this way of thinking but to the structure which modern India has ultimately imposed based on an economic and technical modernization principle of democracy and secularism. In other words, the spirit of participation does not spring from a social void but from a global and holistic system.

The situation existing until the 19th century reflected this. Private property or collective property in the communist sense of the term was not prevalent. But the commons, the communal fields *(gochar),* the communal woods, and the wastelands accounted for 80 to 90 percent of people's resources (firewood, water and fodder for herds). Rivers, springs, and

their beds, which could be used once they were transformed into irrigated land, the *khadeens,* catchment areas of lakes and reservoirs, the lakes and wells themselves, as well as fallows, all belonged to the commons, and in many cases, so did personal habitats. Their collective usage and development, under the control of village assemblies, were efficient because in practice they concerned everybody, traditional rights being the legal mode of managing the few conflicts. Artisan knowledge also served the common good. Specialized communities such as the *Odhis,* who worked stones and earth, the *Agariyas,* who were blacksmiths, the *Gajdhars,* who were architects of well-making, the *Shilavat,* who were stone sculptors, and the *Ghumantu Samaj* of the Banjaras, nomads trading in grain and salt, were all recognized as *gunijanakhana* (literally meaning people with expertise); in other words, they were skilled workers and specialized engineers of their time. Today they are members of a social group which, since it does not belong to the educated class and no longer answers the new needs of modern technology, has been reduced to nothing, economically devalued and robbed of its sense of belonging to the general community.

## Modernization losses

What has brought about this metamorphosis within a century? Among the various causes responsible for this degradation, apart from population growth, one can list changes in the management of natural resources. Toward the middle of the 19th century, British colonization brought about privatization on one hand and state control on the other. In 1863, the Public Works Department (PWD) was created, thus withdrawing from the village community local control of its water resources, the *johars* and *talabs* (ponds and lakes). Similarly in 1865, British colonial government authorities took over the commons; the wealth and income earned from them were subjected to tax and taken from the people to be handed over to the British Crown. This mainly marks the end of the commons, and it translated into a considerable decrease in community resources. It also marked the end of the community's interest in upkeep and of its religious reverence for these resources, although local folklore still bears traces of these aspects. It heralded the beginning of the degradation of natural resources as well as the major harm done to soil due to erosion resulting from the degradation of forests and plant cover. The same process was witnessed in a more vigorous way in post-1950s modern India, which valued both privatization and state control as the sole means for modernization and progress, thereby further weakening the involvement of people with their natural environment. From the 19th century onwards, and even more so since independence in 1947, the government staked everything on the development of big basins. It encouraged projects linked to big dams and the large-scale development of river valleys to facilitate extensive irrigation through centralized control. One such project is the Indira Gandhi Canal, begun in Rajasthan in 1958 and yet to be fully operational.

All this has led to increasing bureaucratization, which involves bureaucrats alien to the culture of the region and ideologically removed from the uneducated masses. This in turn has perversely led to privileges for a select few, the creation of local mafias, and ultimately the plunder of natural resources, as portrayed in several Indian novels.
The next generation seems to have succumbed to a growing feeling of powerlessness, not to say defeatism. The great importance of the state, which on one hand encourages the privatization of agriculture while on the other wishes to play the role of the provider state through centralized control of water and forests, has led to the total disinvestment of society, now bereft of its control over resources and faith in their value. The abolition of pastures for the benefit of private agriculture, within the framework of changed access to property, with a subsequent change in the commons regime and its traditional rights to a partly private, partly state regime, has entirely dismantled a system which was once the foundation of the collective's participation in works of common interest. This explains the failure of welfare politics.

Too often the new impetus given to the *Panchayati Raj* (local or village administrations), which partly entrusts the management of local problems to the village councils, remains artificial. While the reactivation of the *Panchayati Raj* reflects a tacit acceptance of the failure of centralized policies, it brings about a resegmentation by cutting and splitting the structured networks of ancient communities and adopting a top-down approach. The central government's hope of getting back the people's trust and stimulating its participation is not realistic. Plans have a very low success rate because real self-management, the prime motor of participation, is lacking. What is also lacking is the psyche emanating from the notion of *dharma*.

This notion, much larger than that of religion, into whose vocabulary it is often translated, is central to the rapport humans have with their environment. This is all the more so in regions where the environment is fragile, whether in the Himalayan states of the north or in arid zones like Rajasthan. It is true that environmental problems are very often tackled from the angle of physical, if not economical, degradation, but this cannot be divorced from the sociological dimension in which the religious grounding, underpinning local popular culture, plays an important role. The idea that agrarian cults (fertility rites, worship of divinities associated with particular trees, and so forth) are at the core of an agrarian morale rests on a concept of human rapport with the universe which is not anthropocentric and in which humankind is not in a position of control vis-à-vis the universe. On the contrary, to worship humans and to substitute that for the worship of natural forces or the gods, leads to a will of might, control and exploitation of nature (which will sooner or later be devastating).

The decline of nature can be traced back to the error of seeing one part of the universe as if it were the whole.

It is not possible to understand the life of traditional agrarian societies if natural, social and spiritual resources are disassociated from each other. The individual is linked to his or her environment in the same way as to his or her social group, clan or village and this interdependence is seen in the framework of devotion to the local protecting divinities which impose on the whole community the sacred 'service' of environment in exchange for their protection. So much so that any degradation of the villager's perception in any of these three spheres (physical, social, supernatural) has an impact on the others. Thus, whoever wants to soundly address environmental problems in a traditional milieu needs to consider spiritual resources as well, whether they spring from imaginative originality, cultural and intellectual capital, or religious practices.

The loss of the vitality of popular belief and the degradation of the local cultural ethos in past decades cannot be disassociated from Rajasthan's growing environmental problems: drought, overgrazing, and wind erosion. The risks of resource degradation cause concern in the middle term. The weakening of the traditional mutual aid system, and the dissolution of social cohesiveness under the influence of privatization and market laws, have contributed significantly to the degradation of common resources, the reduction of biodiversity (diversity in crops and cattle was a traditional strategy to defend against the vagaries of climate), and the reduction of agricultural activities.

Today, the folklore linked to the traditional belief system, the specific expression of spiritual resources, has been discredited to a very large extent (precisely for being folkloric and thus retrograde and obscurantist) during the decades of 'enlightened progressivism.' It is thus difficult to rehabilitate its validity in the technological cultural-integration regime so prevalent now. This is all the more so because the Indian government is increasingly encouraging the construction of big and centralized water systems, supposedly beneficial to entire states. The Rajasthan Canal was followed by the Narmada Dam, which involved the displacement of numerous tribal communities, and then by the Tehri Dam, in spite of virulent local and international criticism.

Indian scholars have shown in their analyses of famines following droughts that the main problem of unequal access to resources can only be managed by a 'moral economy;' this is based on the notion of each person's entitlement to the management of food resources and therefore water resources.

In order to revive this empowerment, it is certainly not simply nostalgia to remember the holistic system of a society which built water systems that still function. It is in fact in direct line with the modern slogan of "think globally, act locally."

In his writing and talks, Anupam Mishra continuously illustrates this concept. He consistently explains technical terms with the help of discreet but recurring metaphors and references to classical culture as well as local legends. This is done to express, without being explicit or resorting to arguments, that the local technology of the region is an integral part of local ethics, the social fabric and the very foundation of Rajasthani culture. Anupam Mishra's work is an ode to local knowledge based on a deep knowledge of the ecology of a place.