

Feature

Environment

# Need to Protect Ground Water

by Md Harunur Rashid

**E**NVIRONMENTAL protection is part of doing business today. Protection is the law of land. Farmers should be, therefore, trained actively seek out ways to protect and improve the environment as aggressively as they search for better ways to live.

Protection of ground and surface water is the major reason for preventing losses of fertilizer nutrients and pesticides from the farmer's site. Because some aquifers contain water that is decades or centuries old, any degradation of water quality today portends problems for future generations.

Water is a precious resource to everyone — farmers, urban dwellers, manufacturers alike. The nation has become increasingly concerned in recent years about the quality of water and other factors of environ-

mental degradation. Today, even small amounts of some chemicals in water are considered undesirable.

Three things happen to precipitation. Some evaporation and returns to the atmosphere. Some becomes runoff ending up in streams and lakes. And much soaks into the ground. Water only several feet beneath the soil is used by crops. Some precipitation, however, goes deeper into the earth, filtering down through layers of soil and through crevices in rock formations.

Water moving down and filling the spaces around particles of sand, gravel and rock in underground formations is called groundwater. It is a major underground resource. Where available in sufficient quantity, this water becomes a 'stream' known as an aquifer that supplies fresh water to wells and springs. Aquifers de-

velop at different levels (depths) beneath the soil's surface. Thus, more than one aquifer often can be found beneath a given surface site.

Aquifers flow from higher to lower elevations, from less porous to more porous materials and toward discharge points, such as streams or wells where the water is withdrawn. Compared to a mountain stream or a river, aquifers flow very slowly. Water may stay in a shallow aquifer only weeks or months before resurfacing as springs and streams. On the other hand, the residence time for water in a deep aquifer can be hundreds of years.

Farmers tap aquifers for drinking water and for irrigation. Many cities also get water for domestic and industrial uses from these underground streams. Groundwater supplies drinking water for more than half of the Bangladesh population.

Groundwater is never 100 per cent pure in nature. It picks up mineral as it moves downward into the earth. This natural 'contamination' sometimes limits the usefulness of ground water. Excessive 'hardness' caused by high content of dissolved minerals or calcium, magnesium or sodium, is an example. Other actions of nature — the weathering of soils and rocks, decay of plants and trees, reactions of lightning in thunder storms, etc. are continually releasing nutrients to the environment. Thus any soil will contain certain level of nutrients even if the land has never been farmed. Surface water and ground water, even in pristine settings, may contain significant 'background' levels of nutrients.

Contamination also can develop when other materials get into the water. Potential sources of groundwater contamination include livestock wastes, septic tanks, industrial and municipal discharges, decaying vegetation, erosion runoff and fertilizers and agricultural chemicals.

Because of the nature of the aquifers, contamination at a aquifer site can show up locally, in an adjoining country

# W A T E R

## Special Feature

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### WORLD DAY FOR WATER

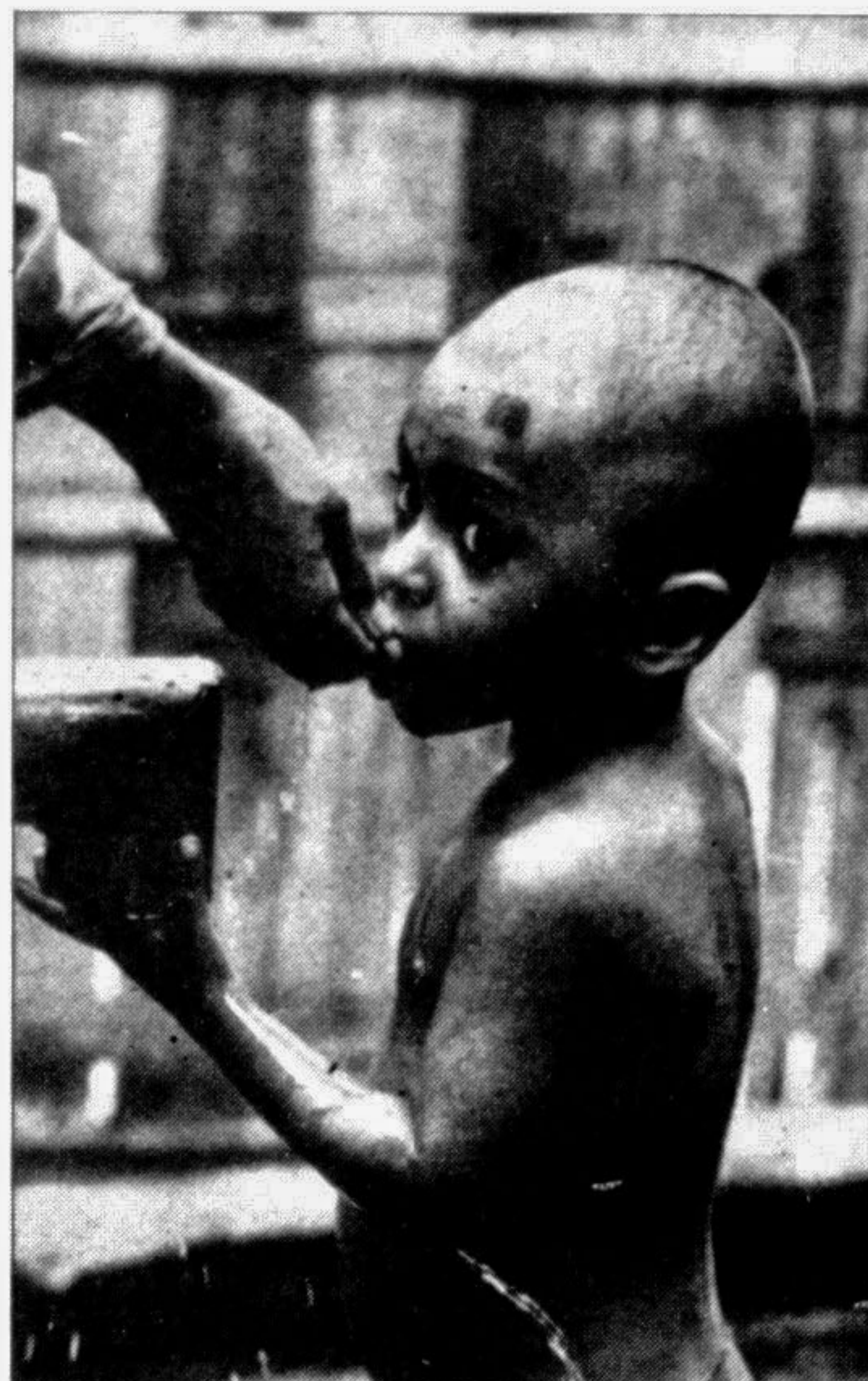
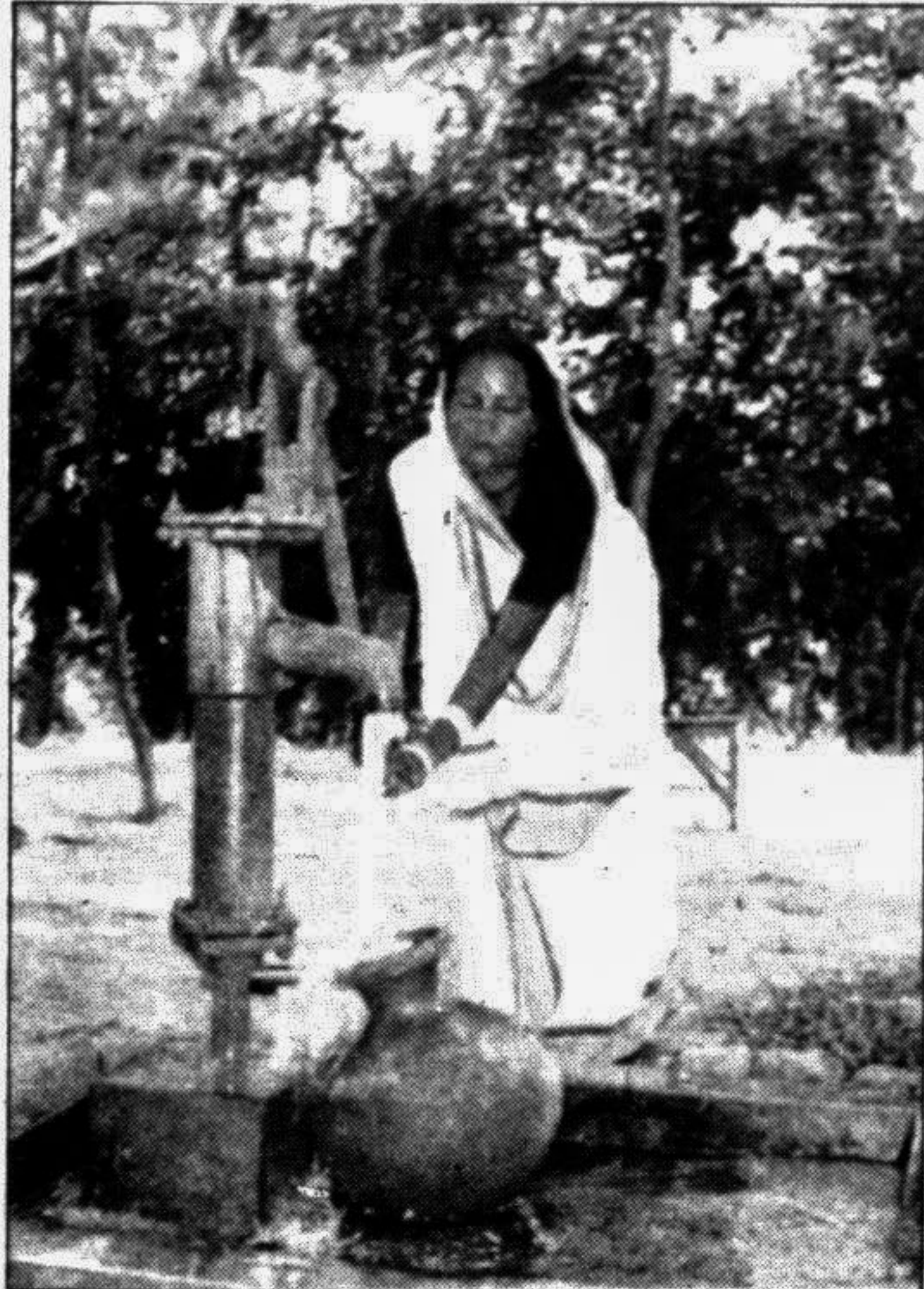


Photo: Shezad Noorani

or in the next state. Also, once groundwater is contaminated, its effects may last for decades or longer.

Not all pollution can be eliminated. Nor is it always necessary to do so. Contamination becomes a major concern when it approaches or exceeds levels thought to pose health problems. Even a small amount of some agricultural chemicals are of

concern because of their extreme resistance to break down into harmless forms. Contamination by our generation can make a devastating impact on our future generation. Dangers are less with materials for which the body has higher tolerance, but those that leave a permanent wound to our body and the environment deserves our attention.



**T**HOUGH the realisation is just dawning on Indian planners that "water will be critical resource to mankind" by the turn of century, conflicts over water are not new to the region. Way back in the 5th century BC Gautam Buddha had intervened to resolve a dispute over water while still a prince of the state of Kapilavastu in Nepal.

While Buddha might have done his arbitration on the strength of his autocratic powers, mediation these days must depend on prescribed laws and regulations. Needless to say, sometimes political muscle can be wielded to divert water from one area to another. Consequently, one must situate New Delhi's increase in water supply at the cost of the neighbouring states within this political climate.

Like previous summers, when the water shortage in New Delhi became acute once again this summer, the situation necessitated Prime Minister P V Narasimha Rao to call a meeting of senior ministers in this cabinet to discuss the problem. Urban Development Minister Sheila Kaul, Water Resource Minister Vidya Charan Shukla and the Lt Governor P K Dave got together with the Prime Minister to sort the problems of this centrally-administered area termed Union Territory.

The issues discussed were methods expedite the sharing of the Yamuna river water between the states of Himachal Pradesh, Uttar Pradesh, Haryana, Rajasthan and the Union territory of New Delhi. They also reportedly addressed the interim arrangements for the supply of raw water to the capital from Haryana and Uttar Pradesh — the two neighbouring states — till the completion of the proposed Tehri, Kishan and Renuka dams which will further supplement the water supply.

But with an agreement on apportioning Yamuna waters hanging fire for over one and a half decades, even the Prime Minister's intercession did not produce the desired results. All that remained to be done for the politically powerful capital was to somehow persuade Haryana to release more water through the West Yamuna Canal (WYC) which supplies water up to Delhi. This did not prove to be too difficult as Haryana is also ruled by the same Congress party which is in power at the Centre.

The Upper Ganga Canal (UGC), the third source of supply after the Yamuna river and the WYC, is already stretched to the limit as far as supplies for New Delhi are

# Whose Right is It Anyway?

by Damandeep Singh from India

concerned.

Going beyond political loyalties and exigencies of power, the complications to a deal on the Yamuna waters arise from feeling of discrimination that some states like Rajasthan, for instance, feel. The Central government makes New Delhi's position in this water dispute distinct and different. It cannot be part of any agreement between states, according to Dr Chhatrapati Singh, Director of the Centre for Environmental Law at the World Wide Fund for Nature — India, who is presently coordinating a research project in rights and law about water.

Obviously a great deal of confusion prevails about the status of water rights in the country. Political will apart, the question depends on the definition of resource, the implication of riparian rights and the methodology of distribution. This geopolitical configuration of resource, rights and distribution must be understood separately in terms of surface and ground water. Water is a natural resource, constitutes national wealth as well as a local asset. The contradiction of meaning inherent in the definition of resource is further complicated when one examines the discrepancy in the way the surface water disputes are dealt in theory and in practice, that is, by the legislation and the courts.

Even though the Indian Easement Act of 1882 recognised the customary and the prescriptive rights of the people, laws laid down subsequent

to the Indian independence from colonial rule in 1947 effectively prescribe that the Indian state has absolute right over all water in the lakes, rivers, tanks, ponds and the like.

The courts, on the other hand, have been upholding people's riparian rights over the resource and since the 1980s have also admitted litigation under Article 21 of the Constitution which guarantees "Right to Life". Dr Singh pointed out. Employing nothing more than a common sense approach, the courts have been upholding people's natural claim to water as necessary for them and the environment.

In what came to be known as the Doon Valley Case, the Rural Litigation and Entitlement Kendra took the Uttar Pradesh state government to the Supreme Court demanding that the government take actions to restore the ecology of the valley. Here too the judges reinterpreted Article 21 of the Constitution as not only a right to life but implied in it a right to clean environment and, hence, to clean water.

The situation with respect to groundwater is even bizarre. According to Dr Singh groundwater is a "slave" to private property. This implies that anyone can dig a well on his property and draw as much water. Due to insufficient and unreliable supply through the WYC and UGC to farmlands in the command area, farmers rely on tube wells for their ir-

rigation. The proliferation of tube wells in the states of Haryana and Uttar Pradesh result in ground water depletion as well as huge electricity bills.

How this unregulated withdrawal of groundwater might impinge on the neighbours' rights to draw water from the same aquifer is not even considered. And "what about the landless population of the country which comprises over 70 per cent of the total population?" asks Dr Singh.

With different federal state enacting varied laws, the need was felt for a national approach to the vexed issues of water rights, its availability, sharing and transportation. Till the late eighties there had been no prioritisation of water requirements in the country which hampered any comprehensive development of legislation.

In 1987 the ministry of water resources outlined a National Water Policy with full federal representation to address these lacunae and to prepare guidelines for planning. This stated that "water is one of the most crucial elements in developmental planning. As the country prepares to enter the 21st Century, efforts to develop, conserve, utilise and manage this important resource have to be guided by national perspectives. The need for a National Water Policy is thus abundantly clear; water is a scarce and precious national resource to be planned developed and conserved as such, and on an integrated and environmen-

tally sound basis keeping in view the needs of the states concerned."

It clearly spells out the priorities in apportioning water; drinking water first, followed by irrigation, hydro-power, navigation, industrial and other uses. The lower order can be switched in particular regions depending on the area-specific conditions.

However, the National Policy has largely failed to spur the federal states into action as only the state of Kerala has adopted the policy and enacted laws on the prescribed guidelines. Priorities must be properly codified and the laws must provide the necessary safeguard, however, if codification works outside the rights of people then, once again, it will remain only on paper or work itself out in political wrangles.

With an annual precipitation of about 400 million hectare-metre (mham), and rivers from neighbouring countries bringing another 20 mham, the utilisable component is estimated to be 110 by the Central Water Commission. Hence the problem facing the country is one of efficient and equitable utilisation rather than lack of availability. Towards the end of the last decade it was estimated that the country was using only about half of its exploitable potential.

If utilisation rather than availability is the crux of the problem then utilisation must be integrated within the socio-political fabric. Decisions by the apex bodies cannot resolve the dilemma, the will of the people have to be taken into account. It is ironic that the suffers of the political debates are the deprived sections of society.

Ram Singh of Namunda village in Panipat district, Haryana, voices the lack of initiative among fellow farmers to press their rights and demand their share of canal water. In other parts of the country, tribals and people living in remote areas have either been bypassed in the development process or forcibly evicted for constructions of large dams and irrigation canals. This has happened, says Dr Singh, because they had neither the capability nor the voice to express their concerns.

But as movements for safeguarding their rights grow, as is happening in the Narmada valley in the protest against the mega Sardar Sarovar Dam, the question of rights over natural resources with water at the helm, will become increasingly pronounced.

# Quetta: A Case Study

by Beena Sarwar from Pakistan

**F**ROM the air, Quetta looks waterless and barren, incapable of supporting life. A false impression if there ever was one. This is one of Pakistan's most prized fruit-growing areas, irrigated by underground water reserves traditionally tapped by an ancient water collecting system known as the Kareze.

But today tubewells pump up water faster than can be replenished giving rise to fears that Quetta will be a ghost city by 2015.

Being outside the monsoon belt, Baluchistan receives rain mostly in winter. Along with spring snowmelt from several ranges — Koh-e-Murdar to the east, Takatu and Zarghoon to the north, and the Chiltan to the west — this recharges groundwater in the catchment areas. "Deposits of sand and gravel in alluvial fans are good water conduits," says Nasir Karim, a hydrogeologist at Baluchistan University.

The 2,000 year old Kareze are a series of tunnels dug deep into the alluvial fans, following the hydraulic gradient to the surface. open wells connect the often several kilometre long tunnels underground. Where the tunnels surface, their water is diverted to orchards at homes.

"The Kareze were a perennial no-cost system, recharged when the melting snow and winter rains formed streams and the water sank into the ground", explains Tahir Mohammad Khan, a fruit grower, "but now it is almost obsolete because we don't get as much snow and rain as we used to. All of Quetta was an orchard once, but now there's no vegetation to attract clouds or rain. Without proper planning, in 30 years, it will be a complete desert."

Maximum temperatures which seldom rose above 26° C in the 1950s, now soar to 40° C in summer. Rainfall has dwindled from 10" annually to a mere 4" in the last decade and the snows which lasted from December to March now fall only during January and February. Locals attribute the climatic changes to Quetta's increasing population, pollution and deforestation.

Overgrazing and fuel gathering has left the mountains bare. Their shrubs, bushes and junipers helped water infiltrate the soil and recharge groundwater, reducing evaporation losses.

Besides the danger of flash floods — which cost 57 lives and disrupted the valley's communication system in 1982 — "surface run-off increases where the gradient is steep and infiltration decreases," says Karim. The water ends up thousands of kilometres away leaving Quetta literally high and dry. Also lost are layers of fertile topsoil.

Established by the British as a border town of 20,000 in the early 19th Century to contain Russian expansionism towards imperial India, Quetta was re-planned after the great earthquake of 1935 for up to 60,000 people. But being the only major urban centre for thousands of kilometres around meant an ongoing influx of rural migration. This, added to large numbers of Afghan refugees settling here, has meant a population increase of 400% over the last two decades.

Quetta's current population is over one million, and expected to top two million in twenty years at its current growth rate of 7.2% — over double the national average. Its boom town potential is increased by its location on the highway and tourist route to the middle east, Turkey and the newly independent central Asian republics", says Abdul Hussain, secretary of Quetta's hotel association. It could even "serve as a fuel route with oil pumped into Pakistan through Iran".

Quetta's recently established Serena Hotel has become popular for conferences and business meetings. Its 22 feet deep tubewell supplies the 140-room hotel with 50,000 to 60,000 gallons of water a day on average. "People used to avoid Quetta," because there was no good accommodation here", says Ismail Zehri, Serena's Public Relations Manager.

Quetta's only other "quality" hotel was the ten room Lourdes built in 1918. It now has 30 rooms and a recently installed 640 feet deep tubewell.

There are other indications that Quetta development is booming; a 500-strong Chinese mining team at nearby Saindak expects to strike Copper and Gold by next year.

Businessman Saifur Khan says, "we never had a problem with water before but now we get two tankers a week because what's coming in the taps is just not enough."

Those who can't afford the going rate of Rs 150 to Rs 200 per tanker manage with a limited water supply. Wealthy landowners and proliferating private companies, hoteliers and housing scheme contractors install tubewells.

300 tubewells, including a hundred belonging to the municipality, deplete the 120 to 160 feet deep water table by five to seven feet annually — 20 feet in the last 30 years — draining 55.5 billion gallons of groundwater. Water percolating underground remains a static 44 billion gallons a year. 24 million gallons of water are extracted daily, "uncontrolled and unchecked," by private tubewells, says the QDA report.

Many hydrologists believe that engineering projects like tubewells and dams provide at best a short term solution, causing irreparable long term damage to natural resources. Dams "are disturbing the state of natural equilibrium that results from millions of years of evolution. It's not just butterflies or fish or reptiles, its groundwater, soils and vegetation," says Ernest Razvan of Netherlands International Hydraulic Institute.

The Water and Sanitation Authority (WASA) recently installed 20 tubewells in the western and eastern by-passes of Koh-e-Murdar and Chiltan. "When those tubewells run dry, they'll big more further up, and then further up. How far can you go?", asks Parvez Ashfaq, an Orchard Manager.

Nasir Karim says there should be a distance of 1,600 feet between tubewells, "but until recently, anyone could dig them anywhere." Quetta

Plans are underway for a huge dam at Burj Aziz Khan 60 kilometres north-west of Quetta on the river Lora. The Rs 4 billion World Bank financed project, undertaken by the National Engineering Society of Pakistan (NESPAK) and WASA, "should be completed in five years and supply Quetta with 20 million gallons a day", says Saleem Durrani, Managing Director of WASA until recently and now with the Planning and Development Department. Quetta's current water needs are 15 million gallons a day. The plan includes a treatment plant for piped drinking water. "There is no other solution", says Durrani.

Jalaluddin Qureishi thinks the dam will take ten years to complete. "The problem with dams", he says, "is that they probably don't recharge the groundwater as expected because their evaporation rate is high. They also silt up fast — clay (a non porous sediment) settles into the bottom and prevents water from recharging."

He gives the example of the picturesque Hanna Lake, 15 kilometres outside Quetta, which once supplied the city with much of its drinking water and is now used primarily as a picnic spot. "The water there is just evaporating because the layer of clay at its bottom doesn't allow it to recharge." Dredging could be a solution but it is an expensive often self-defeating exercise.

In collaboration with Italian scientists at the Upland Participatory and conservation project, Qureishi is making isotopic analyses of water samples from the Pechi dam at Ziarat, from Karezes running ahead of it and from rainwater. "If the dam's water is being recharged, it will show up in the Kareze of samples". The final result two years later will



Authorities have banned the installation of any more private tubewells and restricted commercial tubewell timings, but this is not enough.

"There needs to be a water law to prevent the irregular use of tubewells, currently operated by the government itself at night for agricultural projects", says Jalaluddin Qureishi, a hydrogeologist who set up Quetta's Water Resources Research Centre under the Ministry of Science and Technology in 1987.

Quetta was once watered by the Katch dam, 12km outside the city, built by the British in a gorge between the Takatu and Zarghoon ranges to capture their precipitation. The bumpy drive to it leads from the cantonment through vast expanses of barren brown land sprinkled with shrubs and bushes. The road, built by the British with large rocks, was left uncarpeted at independence in 1947. It is still there, solid, rocky and uncarpeted.

But the dam is dry; a couple of decades ago, it suffered a major breach caused by decreased capacity due to siltation. Today, camels and goats graze upon shrubs and grasses on its fertile silt bed. Water still springs up through a Kareze ahead of the dam, and the pipe which once transported water to Quetta is broken in several places.

Among the 60 dams in Baluchistan is the spin Kareze, a clear blue lake that collects water from the Zarghoon. Pipes transport its water to Quetta 20 kilometres away, some cantonment areas are supplied by the Walitang dam on the Urak, usually little more than a stream.

Indicate whether delay action dams actually recharge ground water supplies. A five year monitoring project to gauge the amount of dam water lost to evaporation is also underway.

Qureishi says the Kareze system could be profitably revived, although the process has been complicated by the lowering of groundwater levels. His organisation is rehabilitating a Kareze near Ziarat, where they are still in use. Drip-trickle irrigation could reduce evaporation by as much as 50%. Tree planting could also help. "Forests and trees are part of the main hydrological system and increase precipitation", says Qureishi. "It may be expensive and slow but trees save 40% of water losses."

"The choice facing Quetta today is whether to expand the city or to maintain its orchards, to continue being wasteful in using water, or learning to re-use water", says Ayub Qutub, a national conservation strategy coordinator in Islamabad.

He gives the example of Gunyar village in Malakand agency, where villagers agreed to close 150 acres of pasture land for their needs, as well as to sell them.

"This could work in Quetta, if there is social discipline and political will", says Qutub. There are no easy choices here, what is certain is that Quetta's administration and people will have to make some decisions and take collective action — now — if their quality of life is to be sustained.



Water, water everywhere, not a drop to drink.

Photo: Shezad Noorani

(The writer is a Panos fellow) — PANOS

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