

# DRINKING WATER

for the millions



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The Hinduja Foundation In India

Lack of adequate clean drinking water is a major problem shared by many developing countries. Water borne diseases such as cholera, typhoid, jaundice, gastro-enteritis and dysentery are rampant wherever people drink unclean water. Infants are particularly vulnerable, and even those who survive suffer from malnutrition, debility and a slowing down of growth.

India receives more than adequate rainfall, but only a tenth of this water is put to productive use. This has led to widespread water scarcity reflected partly by the acute shortage of clean drinking water. This shortage is compounded by contamination and mismanagement of water sources, inappropriate technology used for harnessing water and very low levels of awareness among villagers for the need to drink clean water.

DRINKING WATER FOR THE MILLIONS is a HINDUJA FOUNDATION programme aimed at finding rapid solutions to the drinking water problem in villages. The programme was holistically designed by Development Alternatives, incorporating innovations in technology, communication and management. The use of a specially designed communication package engendered a high level of community participation in the areas selected, and encouraged local contribution during the planning and implementation of the programme. This in-built flexibility was both significant and successful in addressing local conditions and achieving the best results. At the same time, the whole process was closely monitored to ensure that the best approach could be identified and easily replicated elsewhere.

The insights gained from the first phase of the programme will be valuable inputs into the design and implementation of subsequent phases.

# DRINKING WATER FOR THE MILLIONS

October 1988  
The Hinduja Foundation

# THE WATER PROBLEM IN INDIA

## Water, Water Everywhere

*India is blessed with excellent water resources.*

Rain and snowmelt annually provide about 400 million hectare metres (m.ha.m) of water, while rivers flowing in from other countries bring in another 20 m.ha.m. The total water thus available is equivalent to 1.2 metres of rain falling on every patch of Indian soil. This also means that every Indian could get upto 14,000 litres of water daily.

## Yet, Not a Drop to Drink

*And cursed by extremely poor utilization.*

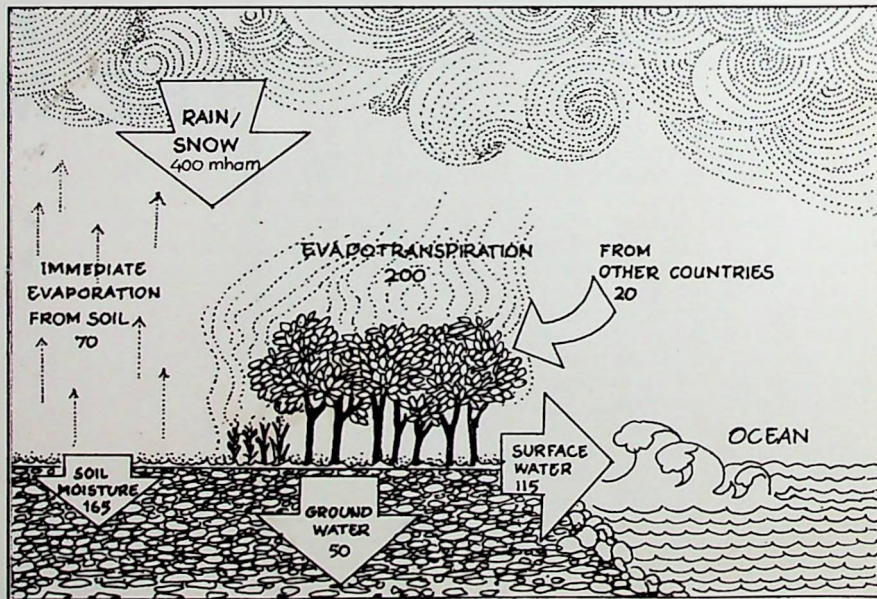
Despite abundant rainfall and other water sources, nearly 500 million Indians do not have clean drinking water.

In thousands of villages, everyday women and children walk several kilometers to get a few precious potfuls of water. Often this water is contaminated, the most poignant indicator being

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The Hydrological Cycle : India utilizes a mere tenth of its water resources



## Government efforts

Several programmes have been initiated by Government and allied agencies to counter the drinking water problem. Despite the mobilization of large sums of money, most of these programmes have only had limited success as insufficient attention is paid to key areas, such as people's participation, innovative and low cost technologies, prioritisation of problem areas and a systems approach in planning efficacy of implementation. The launch of the Technology Mission on Drinking Water could provide a fresh and systemic thrust to governmental efforts in this area.

the fact that 70% of infant deaths in the country are due to water related diseases.

The acute scarcity of water can be attributed to:

Uneven distribution of rainfall - three quarters of the country's rain falls during the four monsoon months and nearly half falls on only 15% of Indian soil.

Prolonged spells of drought, that have drastically depleted ground water recharge.

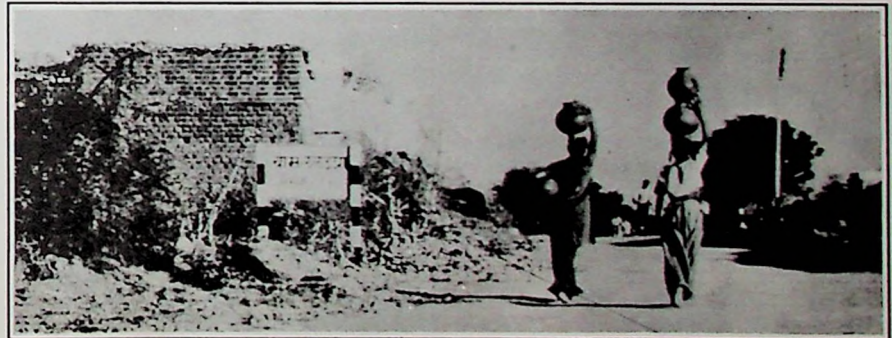
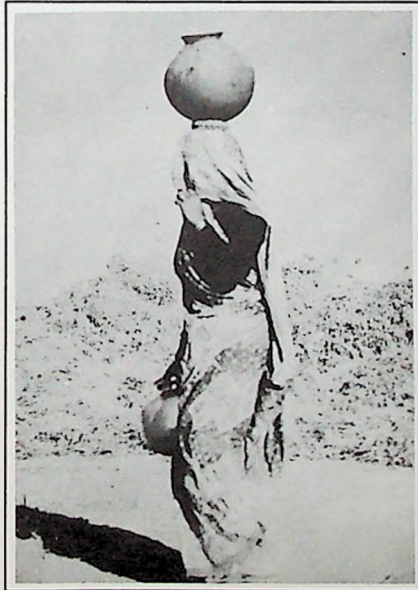
Pollution of water by industry, agriculture and sewage.

Mismanagement and improper allocation of water resources.

Deficiency in research and transfer of appropriate technologies for harnessing and utilizing water.

Ineffectiveness of existing institutional arrangements for proper installation and maintenance of hardware.

*In thousands of Indian villages, women walk several kilometers everyday for a few precious potfuls of water.*



## THE HINDUJA FOUNDATION PROGRAMME

The Drinking Water for the Millions Programme has been initiated by the Hinduja Foundation to help alleviate the acute scarcity of drinking water in areas across the country.

The major objectives of this programme are:

To provide sufficient clean drinking water in deficit villages, using technological and institutional innovations.

To create community awareness on the relationship between hygiene, clean drinking water and health.

To develop effective methodologies that can be replicable in micro-level projects elsewhere.

### Programme Management

The Hinduja Foundation Programme was conceptualized, designed and managed by Development Alternatives a non profit organization working in the areas of:

- environmental management
- appropriate technology
- institutional design.

*Clean drinking water : essential to health and happiness.*





**STATES SELECTED**

As sustained success of the programme would require local involvement, Development Alternatives commissioned ACORD (Asian Centre for Organization of Research and Development) to develop a communications package using techniques that are easily understood by a village community.

### **Which Villages ?**

While selecting the villages, priority was given to those not covered by Government schemes, where:

The existing source of water was more than 1 km. away.

The water table was below 15 meters.

The water source was chemically or biologically contaminated.

The availability of water was highly seasonal.

The demand for water peaked seasonally (e.g. pilgrim centres).

Social conditions (such as caste), that denied certain villagers access to drinking water were a major criterion for site selection. Final installation followed extensive geophysical and hydro-geological surveys.

## LEARNING WITH PEOPLE

Community involvement is crucial to the sustained success of any development activity. The first step in the implementation of this programme was to involve the community by imparting information that would help in :

preserving hygienic conditions around the installation

utilizing water resources judiciously

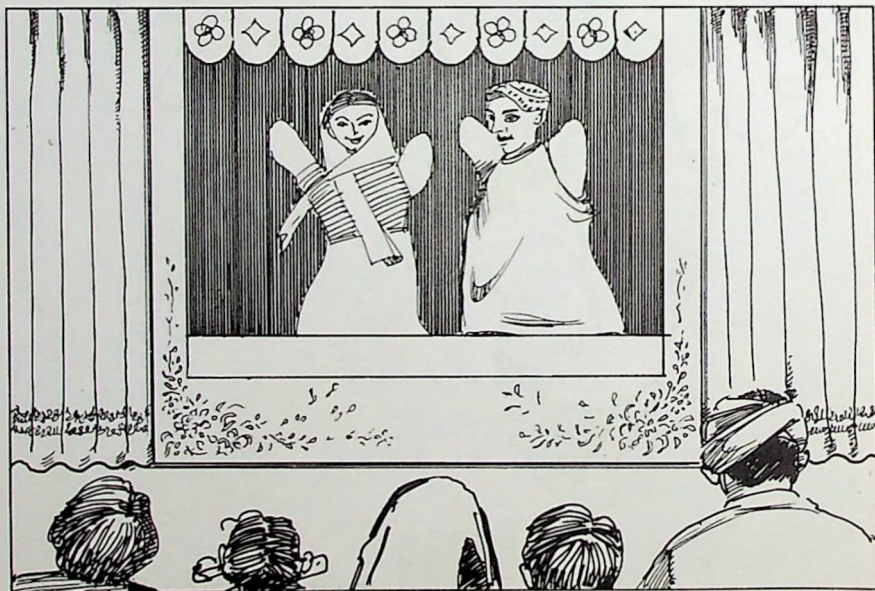
storing and using water hygienically

Unless the community perceived the relationship between clean drinking water and health, they would be unlikely to make the on-going effort required.

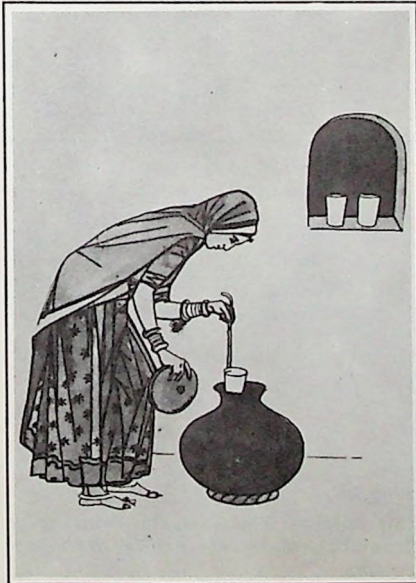
### Communication Methods

Innovative methods of communication were devised to boost the necessary perceptions. In order to interest the villagers and hold their attention, all communication was designed to partly entertain. Puppet shows were staged in village clearings. Local women were involved in the performance of songs on the importance of clean water. Flash cards reinforced the messages at impromptu gatherings.

*Puppet shows . for entertainment and education.*



Flash cards impart  
the message of health and hygiene.



All these forms of communication were adapted to the local milieu and dialect, a fact facilitated by the involvement of the community and local organizations.

## Grass roots involvement

In order to increase the effectiveness of the software, some community workers were recruited from the selected villages, by means of specially designed questionnaires (visual and written). Their continued presence in the village ensured a constant reinforcement of messages on the benefits of drinking clean water.





## CHILDREN'S SONG FOR CLEANLINESS

मक्खी बोली मच्छर से  
गांव है देखा ऐसा मैंने  
जहाँ न कोई गंद,  
वात सुनी जब मक्खी की  
तो मच्छर रह गया दंग।  
मच्छर रह गया दंग  
कि बोला होता ऐसा कैसे?  
मक्खी बोली आ भैया,  
बतलाऊँ तुझको कैसे।

गांव भर में अब नाली है  
जिससे बहता पानी,  
कीचड़ दूर रखने की  
यूँ गांव वालों ने ठानी।  
कोई न बैठे जगह-जगह पर  
करने को अब शौच,  
साफ रखेंगे गांव को  
अब करली ऐसी सोच।  
खोदे गड्डे दूर गांव से  
अब शौच से बनती खाद,  
रहे सफाई और खेतों को  
होता उससे लाभ।

घर के बाहर कोई न फेंके  
अब अन्दर का गंद,  
गंद ले जाये दूर गड्डों में  
कर ढक्कन से बन्द।  
बोला मच्छर, मक्खी बहना,  
अब होगा क्या तेरा-२  
बोली मक्खी, मच्छर भैया,  
जो तेरा सो मेरा।  
दोनों बोले —  
यहाँ तो अपना नहीं बनेगा धाम,  
गंदा गांव तलाशें चलकर  
वहीं करेंगे काम।  
रोग फैला सकते हैं हम तो  
जहाँ पड़ा हो गंदा,  
कूड़ा, शौच, खड़े पानी पर  
चले हमारा धन्धा।

*The 'Machar Bhai Makhi Behn' song:  
Generating awareness among the village  
children.*

## HARDWARE

The water technology package was selected on the basis of low per capita cost, ease of maintenance and proven efficacy. The main objectives were to:

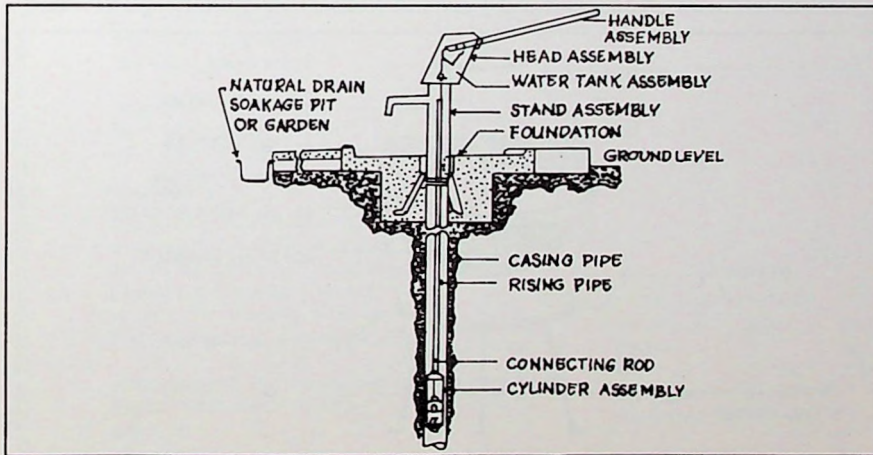
Increase the quantity of clean water supply

Improve the quality of water through purification devices

## Handpumps

In Phase I, almost 80% of the installa-

*The India Mark II handpump:  
Proven efficacy.*



tions to increase water quantity consisted of handpumps. Given its demonstrated efficacy, the India Mark II was the model chosen.

All installations included a platform and drain, to prevent the accumulation of stagnant water so common in the vicinity of handpumps.

In Rajasthan, an innovative effort was made to curb water wastage through overflow - small storage tanks leading from the handpumps have been constructed and fitted with taps at a convenient height.

Ideal sites for the installation of the handpumps were determined after assessing hydro-geological conditions such as depth of aquifers and discharge per hour.

## Soak Pits

Experimental soak pits were dug around the handpumps to absorb seepage from the drains. With a volume of one cubic meter, these soak pits were filled with pebbles and lime in order to trap solid pollutants and maintain the purity of the aquifer.

In Datia, trees were planted around the handpump drains to absorb waste water. These would be maintained as village common property.

## INNOVATIONS

Several experimental techniques were explored to facilitate the extraction, storage and purification of water.

### Solar Stills

In the Tamil Nadu Project, experimental solar stills were set up for the purification of drinking water.

Due to the heat generated by solar radiation, water evaporates from a pan, condenses on the sides of the conical structure and trickles down into a vessel, distilled to a high level of purity.

### Clay Filters

In the Uttar Pradesh project, selected villages were provided with experimental pot filters to trap suspended particles and remove biological impurities in the water.

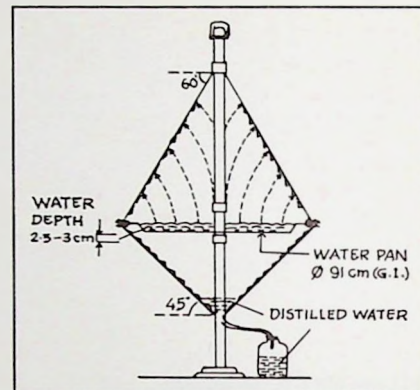
Two earthen pots are placed one on top of the other, the lower one on a steel tripod stand. The first pot contains layers of sand, charcoal, pebbles and gravel. The purified water that emerges from this filtration collects in the pot below, and can be conveniently drawn through a tap.

In other villages, similar two pot filters using commercial filter candles, have also been installed.

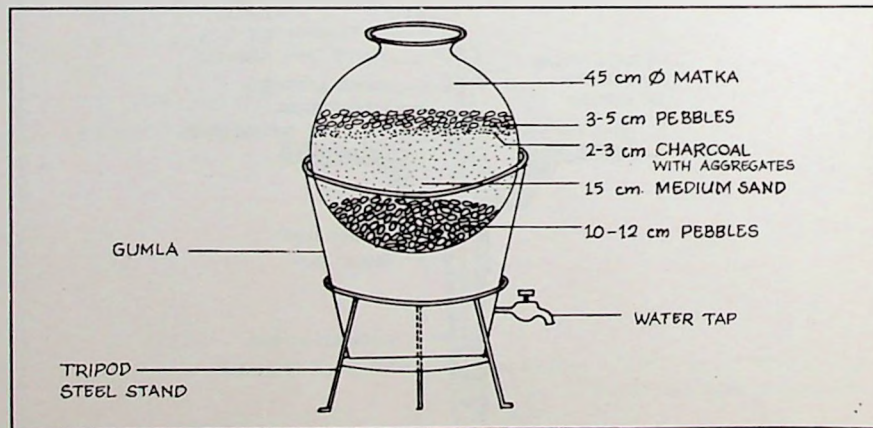
### Other experimental techniques

Several new technologies for water improvement were experimented with. These included UV filters, reverse osmosis, electro-dialysis, solar photo-voltaic cells and wind pumping systems and purification through halogenated resins.

However, the high investment and lack of maintenance facilities were a deterrent to their inclusion in Phase I of the programme. They will now be taken up on an experimental basis during Phase II.



*An experimental solar still (above) and clay pot filter (below): low cost water purification*



# DRINKING WATER - PROGRAMME PROFILE

Quantity

HP = Handpumps

TW = Tube wells

EP = Electric pump

NW = New dug wells

DW = Deepened wells

Quality

SF = Sand filters

CF = Candle filters

SS = Solar stills

NN = Not needed

Figures in parentheses refer to awareness on drinking water before the Hinduja Foundation Programme started; others reflect the situation after the programme was completed.

Averages are for the Jaipur, Datia, Budaun and Madras projects.

STATE	RAJAS- THAN	MADHYA PRADESH	UTTAR PRADESH	TAMIL NADU	MAHA- RASHTRA	TOTAL	
DISTRICT	Jaipur	Datia	Budaun	Chengal pattu	North Arcot	Bhan dara	
VILLAGES COVERED	21	8	19	15	30	24	117
POPULATION BENEFITED	50000	2500	15000	22000	22500	20450	132450
<b>FOR INCREASED QUANTITY (*)</b>							
H A R D W A R E	TYPE/no	HP 21	HP 8	HP 21	TW 2 HP 13 NW 2 DW - EP -	2 2 2 23 2	TW-4 EP-2 NW-4 DW-23 HP-115
<b>FOR IMPROVED QUALITY (**)</b>							
E	Type/no	NN	NN	CF 20 SF 52	SS 6	NN NN	SF-52 CF-20 SS-6
<b>% AWARENESS ON WATER (***)</b>							
S O F T W A R E	Knowledge	70 [40]	70 [35]	50 [35]	80 [65]	50 [45]	AVERAGE 64 [54]
	Attitude	50 [40]	50 [30]	40 [20]	70 [50]	40 [30]	50 [34]
	Practice	50 [30]	50 [20]	35 [15]	70 [50]	40 [30]	49 [29]
<b>PROJECT COORDINATION</b>							
MA NA GE ME NT	Voluntary agency & technical agency	D-A & TARA	D A & TARA	Commu- nity based group	Social service agency	State Govt agency	
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# THE MADHYA PRADESH PROJECT

## Geography

Datia Tehsil, in the eastern part of the Bundelkhand massif, is characterized by a barren landscape of shrubs and grasses. Composed of crystalline igneous and metamorphic rocks, this area receives a mere 75 cm of annual rainfall. Tributaries of the Sind river flow through the region, but the water sources are not easily replenished, due to extensive deforestation.

Datia is a comparatively backward region, with a low population density of 153 persons per sq.km. 25% of its population belong to scheduled castes.

## Water sources

Many villages of Datia faced a severe drinking water problem. Existing handpumps had dried up and people relied on wells. In some villages the situation was so deplorable that the District Administration had to send water tankers to meet the drinking water needs of the people. Yet, due to the small number of people in each vil-

DATIA DISTRICT, MADHYA PRADESH



lage, they did not qualify for Government sponsored installation programmes.

## **Implementation**

The sister organization of Development Alternatives, T.A.R.A.(Technology and Action for Rural Development), has been working in Datia district for a number of years, in the areas of afforestation, bio-mass utilization and installation of improved chulhas. As an implementation agency, T.A.R.A. has extensive knowledge of the area, and was the natu-

ral choice to carry through the drinking water project as well.

## **Software**

The community awareness package was implemented by the community workers with the help of flash cards, songs and puppet shows.

## **Hardware**

A total of eight handpumps were installed, bringing clean water to over 2500 village residents. In addition, the provision of a handpump at Sonagir benefits busloads of pilgrims who visit the Jain temples every day.

## **Improvement in lifestyle**

The results of the community education package were extremely encouraging, not just in terms of knowledge, but also as expressed through a change in attitude and practice - washing clothes at handpumps is now a rare sight and livestock are kept away from drinking water sources.



# THE RAJASTHAN PROJECT

## Geography

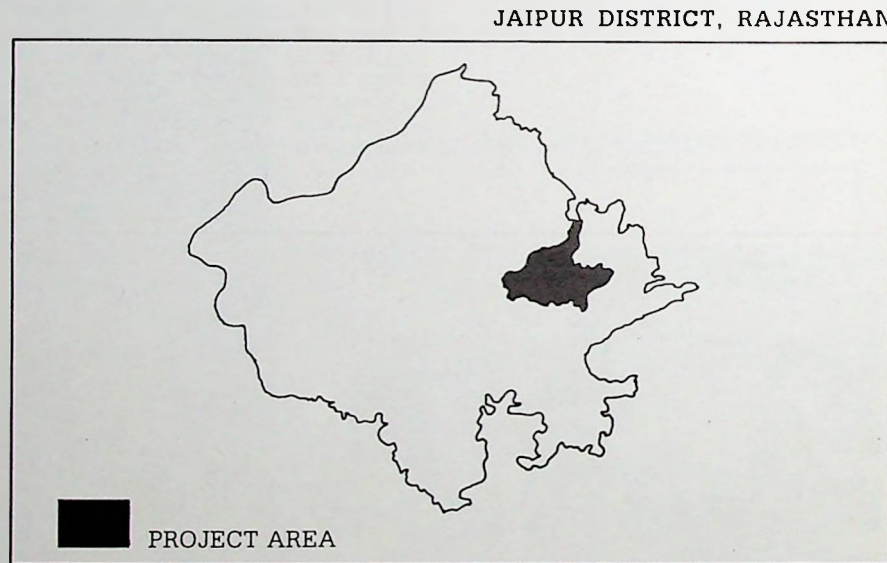
Chaksu tehsil of Jaipur district consists mainly of the remnants of the Aravalli range, with undulating hillocks and a highly weathered landscape. The Banas river drains the area. With a low average rainfall of 55 cm, the vegetation is rather scanty. Chaksu has a population density of 242 persons per sq.km., 28% of whom belong to scheduled castes.

## Water sources

Rajasthan has been severely affected by drought in the past few years. In the villages of Chaksu tehsil, most wells and pumps had dried up. Some saline or brackish water was accessible, but in most cases, even this was insufficient to meet village requirements.

## Implementation

Based in Jaipur, since the early 80's ACT (Action through Cooperation and Technology) has undertaken a number



of projects in Chaksu Tehsil, with technical support from GWMICC (Ground Water and Mineral Investigation Consultancy Centre), and

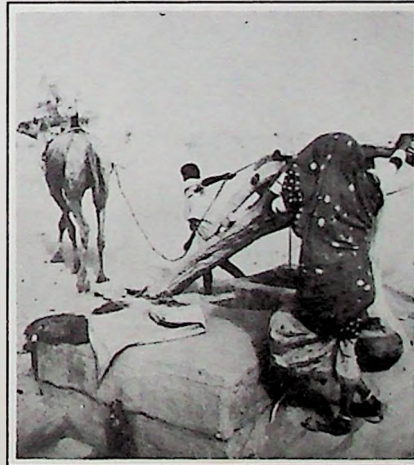
was responsible for implementing the Drinking water project. GWMICC conducted ground water surveys with the help of computerized, digital resistiv-

ity monitors, and were particularly successful in finding sweet water. While the coordination and supervisory functions were carried out by ACT, local community workers were intimately involved in implementation.

## Software

The education package was a great success. The "Machar Bhai and Makhi Behn" song was extremely popular with children. At the Nimodia village

*An open well in Rajasthan: unhygienic and unreliable water sources.*



school assembly, children now sing a prayer for hygiene and health, taught to them by the local community workers.

## Hardware

Sweet aquifers were located in all the target villages and twenty one hand-pumps were installed. Each of these handpumps was connected to innovatively designed storage tanks to avoid waste of water.

## Improvement in lifestyle

The provision of handpumps in these areas has led to dramatic changes in many lives. On grazing land near Nimodia, a group of nomadic snake charmers had set up temporary abode, trekking three km to the nearest water source. The installation of a handpump in the settlement has proved a major incentive for the Kalbelias to create a permanent home for themselves - already some families have moved from makeshift tents to huts. This installation has been particularly successful for another reason as well - the discharge is so plentiful that the Chaksu municipality is considering tapping this aquifer for town supply.

*A handpump with a special storage tank in Rajasthan*





# THE UTTAR PRADESH PROJECT

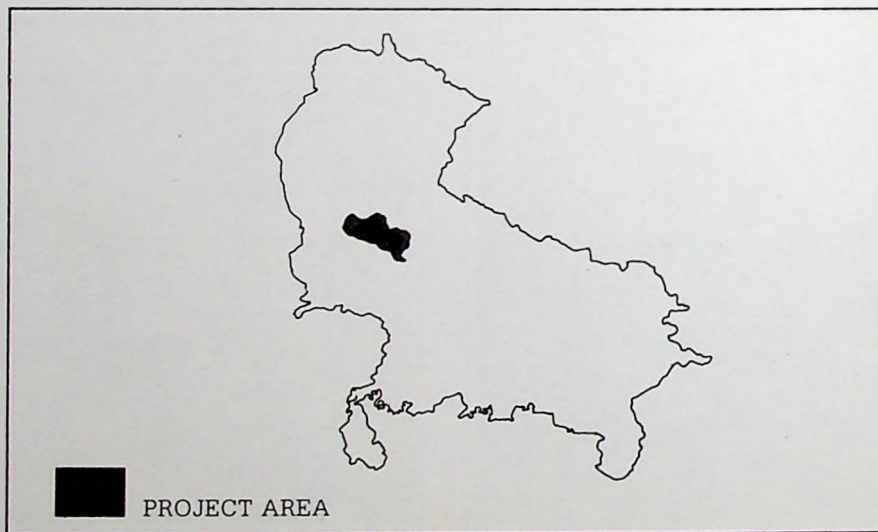
## Geography

Situated in the Gangetic alluvial plain, Budaun district is drained by the Ramganga river and its tributaries. The soil is extremely fertile and the annual rainfall is 100-200 cm. The population density is 380 per sq.km., with 17% scheduled castes. 86% of the labour force is occupied in agriculture.

## Water sources

As the water table at Budaun is about 8 meters deep, handpumps and tube-wells are common, though many existing handpumps lie derelict due to lack of maintenance. In addition, the caste factor restricted access to these handpumps. Many villagers thus relied on wells where the water was biologically contaminated, and were victims of water borne diseases.

BUDAUN DISTRICT, UTTAR PRADESH



## Implementation

T.A.R.A. has done extensive work in low cost construction in the Budaun area. Familiar with local attitudes and living conditions, T.A.R.A. carried through the Drinking Water project in this area.

## Software

Interaction with the community revealed many strange perceptions about the causes of commonly prevalent diseases. For example, it was

*An experimental clay pot filter in Budaun:  
low cost water purification.*



thought that malaria was caused by eating too many mangoes, and although Ballia village reeled under a typhoid epidemic, the villagers did not know that the disease was water borne. The software was specifically designed to correct these perceptions, and establish the link between clean drinking water and community health.

## Hardware

Besides the installation of twenty one handpumps, experimental techniques were utilized to improve the quality of water. Sand and charcoal filters and candle filters which purify water meant for drinking, were provided to those who had to rely on polluted water sources.

## Improvement in life style

Today, even village children appreciate the importance of clean drinking water, and can recite the names of water borne diseases. Thanks to the success of our software programme, the communities maintain the hardware in the manner required to preserve the quality of drinking water. Most importantly, the handpumps installed under the programme are accessible to all villagers.

# THE TAMIL NADU PROJECT

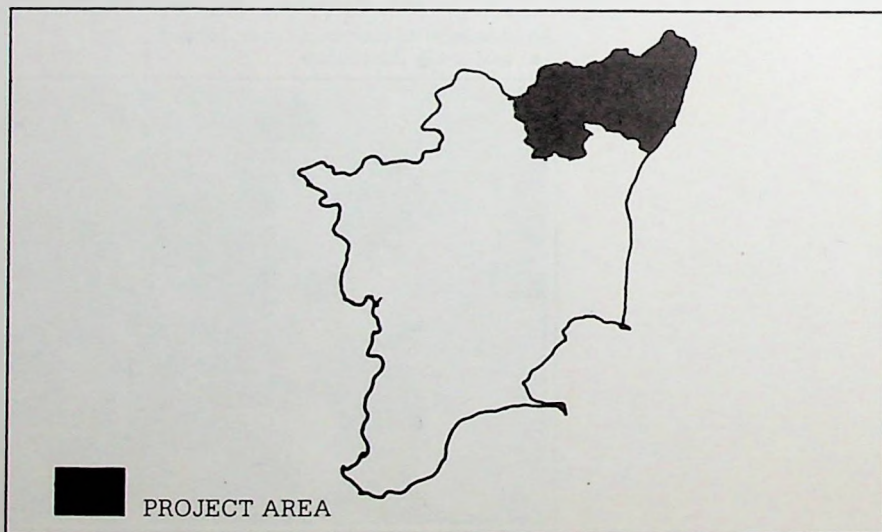
## Geography

The project villages of Chengalpattu and North Arcot lie in the eastern coastal plain, which consists of recent alluvium underlined by charnockites and hard rocks. The region is drained by the Arani and Palar rivers. The soils are mainly laterites, and the mean rainfall is about 100 cm. The population density is very high and approximately 13% of the population are scheduled castes.

## Water sources

Ground water sources have been greatly depleted through overuse. In Chengalpattu, saline sea water has seeped into coastal aquifers and contaminated drinking water sources. Due to the recurrent failure of the monsoons in recent years, the water table has dropped sharply, resulting in the drying up of a number of wells and handpumps.

DISTRICTS CHENGALPATTU AND NORTH ARCOT,  
TAMIL NADU



## Implementation

In Chengalpattu district, the implementation of the programme was undertaken by Ullaipavar Panchayat (literally, Toiler's Forum). This grass roots organization has spent several years in generating community involvement for working on development issues in the area.

In North Arcot district, the project was executed by the Vellore Social Services Society.



## Software

In many respects, this area was unique - the community was already aware of the importance of clean drinking water, and knowledgeable about the hardware possibilities for remedying the situation. It was therefore decided to implement the hardware installations in consultation with the people. Community involvement in the programme is highlighted by the fact that Indranagar villagers contributed to the cost of the programme.

## Hardware

The installations in this project include sixteen handpumps, four tube-wells, two electric pumps and four open wells. Six experimental solar stills were installed for water purification. In addition, twenty five existing dug wells were deepened.

## Improvement in life style

For 45000 Tamil Nadu villagers, the days of consuming contaminated well water now belong to the past. As an outcome of the project, they now have easy access to clean drinking water.

# THE MAHARASHTRA PROJECT

## Geography

Bhandara district is characterized by undulating topography and deciduous vegetation. This semi-arid zone is drained by the Wainganga and receives an average annual rainfall of about 120 cm.

The population density is about 150 persons per sq.km., 25% of whom belong to scheduled castes.

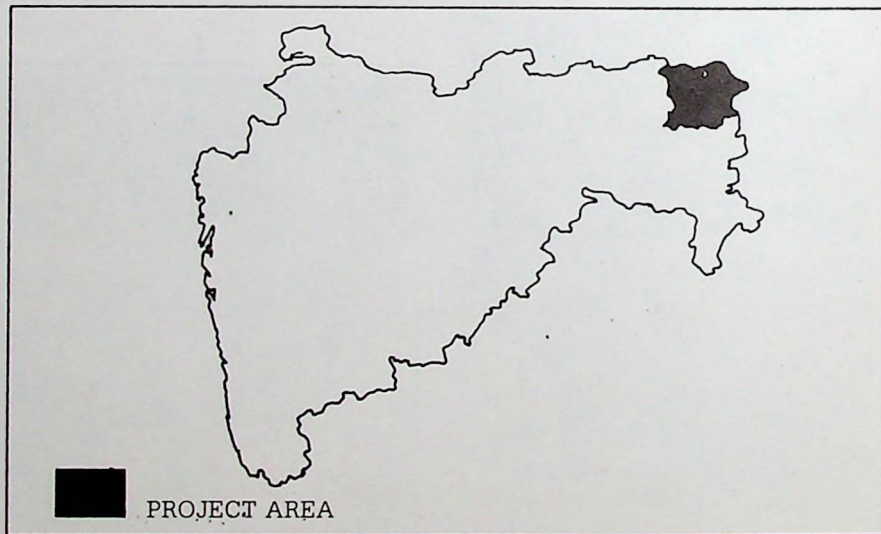
## Water Sources

As a result of the recent drought, Bhandara district suffered from acute water scarcity. Most villages depended on open wells for drinking water. For villages in Saorgaon and Donad, streams were the only source of drinking water. Several villages had to make do with less than half their water requirements as most of their wells had dried up.

## Implementation

The implementation of the project in Bhandara was different from the oth-

BHANDARA DISTRICT, MAHARASHTRA



ers. Whereas other projects were implemented by voluntary agencies under the supervision of Development Alternatives, this project was managed entirely by the Maharashtra State Government.

The Hinduja Foundation Programme and the State Government invested a sum of five lakh rupees each towards the project. The allocation of these funds was determined by the State Government.

Coordination duties were carried out by the Regional Office at Nagpur and the District Senior Geologist's Office at Bhandara.



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## Software

As a traditional Government programme, there was no separate community awareness generating component in this project area.

## Hardware

Extensive geological data was obtained by the State Groundwater Surveys and Development Agency through surveys, remote sensing techniques and aerial photographs. Both Government and private rigs were employed in drilling operations. In several areas, the hilly terrain considerably hampered mobility.

As all the resources of the project were concentrated on the installation of hardware, a total of forty nine handpumps were installed in various villages.

## Improvement in lifestyle

With the collaborative efforts of the Foundation and the Government, 24 villages of Bhandara district have been provided with sources of clean drinking water. Twenty thousand villagers now have access to water free from contamination.

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## MAINTENANCE AND FOLLOW UP

To facilitate proper functioning of the handpumps, regular maintenance is essential. Local supervision has been deemed the best for this purpose. Various maintenance systems were devised, and circulated for discussion. Ultimately, the system that emerged as being most appropriate was:

### The modified two tier system

Under this maintenance system, most of the responsibility for the handpump maintenance lies with the village community. One woman from each village has been identified as the caretaker of the installation to ensure cleanliness of its surroundings. If the handpump malfunctions, she is to inform the local coordinator, a procedure considerably simplified by the use of specially designed postcards.

The local coordinator is the same person who executed the project in the village. On receipt of the complaint card he contacts an identified mechanic (in some cases the village mistri) or a local artisan trained in handpump maintenance.

### Reinforcement of education package

It is the responsibility of the local coordinator to ensure proper reinforcement of the messages through repeated group discussions and meetings with the villagers. He will periodically evaluate the level of hygiene in the village and ensure that the message of the education package is not forgotten.



## TESTIMONIALS

"It is really fortunate that we found you. We tried, a lot of Government agencies and other organizations to get water to the people of this settlement. But we almost lost hope. Now you have given us water".

Shri G. Shanmugam  
Indiranagar  
Perumbakam Panchayath  
Madras

"Oh dear God! You are giving us water! ... Dear Son, we are not giving you anything but you have come to provide us with water. Raja, you'll live long!".

An old lady  
Karanai Village, Panchayath Madras

हम हिन्दूजा फाउन्डेशन के आभारी हैं, जिन्होंने हमारे गाँवों में लोगों, बच्चों व स्त्रियों को शिक्षा दी। इससे पहले हमारे गाँव वाले कूएँ से पानी लेते थे। इनका मानना था कि कूएँ के पानी से बीमारी नहीं है तथा पानी से भी कभी बीमारियाँ हुई हैं? लेकिन आप द्वारा इस अज्ञान को दूर किया तथा बीमारी से छुटकारा दिलाया है।

राधाकृष्ण शर्मा  
दयापुरा

यह है मेरी ग्राम पंचायत काठावाला प. स. चाकसू में ग्राम शिलकी व ग्राम बिहारीपुरा में एक-एक हैण्डपम्प लगे हैं। इन पम्पों में पानी मीठा व अच्छी मात्रा में आ रहा है। वर्तमान में सही चल रहे हैं। कृपया हमारे निम्न ग्रामों में हैण्डपम्प लगाए जायें।

नन्दलाल मक  
सरपंच



## THE FUTURE

The results of the first phase of the Drinking Water for the Millions Programme have indeed been heartening. The success of the programme has vindicated our innovative approach and the involvement of the local community.

The future holds greater possibilities, for the introduction of new technologies, communication methods and much more.

Phase II envisages the use of new techniques of chemical purification, solar devices, filters, etc.

Communication methods will include modern technologies such as posters, audio visuals and video screening.

A great deal still remains to be done. Collective efforts of local, governmental, and private bodies are a must before significant improvements in rural life can be achieved and people have a future to look forward to.

The Hinduja Foundation in India, during the two decades of its existence, has grown both in size and scope. Its activities have left few areas untouched. It has built a most modern hospital in Bombay, with advanced facilities that can be compared to the best in the world. Besides another hospital in Bangalore with its own cardiac centre where open-heart surgery is performed, the Foundation supports the number of educational institutions like the K.P.B. Hinduja College of Commerce in Bombay and the P.D. Hinduja Sindhi Model Senior Secondary School in Madras, as well as a polytechnic in Aurangabad. In addition, the Foundation awards scholarships to deserving students for study abroad and within India.

In January 1988, the Hinduja Foundation had launched a major new programme 'Drinking Water for the Millions' to improve the availability of clean potable water in rural areas. The positive results of this programme clearly show the effective impact of involving community participation and imaginative methodologies in project implementation.

*Implemented by*



**Development Alternatives**