The CTARA Drinking Water Project
A Research and Teaching Initiative
Status Report and a Proposal
13th February, 2009

Phase-I Overview

The CTARA drinking water project was launched on 2nd October, 2005, with the following objectives:

- To provide drinking water to the tribal hamlet of Gudwanwadi.
- To provide a multi-disciplinary teaching and research field experiment for faculty and students.
- To examine through direct experience the role of technology in development.

The first objective was of providing water to Gudwanwadi, a hamlet of 365 persons. The hamlet suffered a severe shortage of water, typically beginning in the end of November every year. People had to resort to walking down to the Shilar river, more than 2 km. away and fetching water for domestic use. The proposed solution was an earthen check-dam which would hold about 20,000 cubic meters of water, hopefully till the end of summer and beginning of monsoon.

The planning, design and construction of the check-dam would yield a multi-disciplinary platform for students to experience, first hand, a social and technical development project. Our partners for the project were the Academy of Development Science, a local NGO, and Gangotree, our contractor who executed the project. Many faculty members (including Prof. Eldho, Prof. Jothiprakash, Prof. T. N. Singh, and Prof. Parthasarathy) from different departments participated in the project.

Four student reports came out of the project and are listed below:
<table>
<thead>
<tr>
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<th>Name</th>
<th>Degree/Project</th>
<th>Title</th>
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<tbody>
<tr>
<td>1</td>
<td>Digvijay Singh (CSE)</td>
<td>Dual Degree Mini-project</td>
<td>Storage Calculations from Topological Data</td>
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<tr>
<td>2</td>
<td>P. Prashant (HSS)</td>
<td>M.Phil (1st stage)</td>
<td>Socio-Economic Survey of Gudwanwadi</td>
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<tr>
<td>3</td>
<td>Uttaran Datta (IDC)</td>
<td>M.Des (1st stage)</td>
<td>Visual Communications Study in a tribal society</td>
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Besides this, over a 100 students of IIT Bombay visited the project site during various stages of work. Our former Director, Prof. A. Misra visited the site on 16th April, 2006.

The project cost was roughly Rs. 24.70 lakhs. CTARA raised an amount of Rs. 25.85 lakhs directly from IIT Bombay alumni. No funding was required from IIT Bombay. Detailed accounts and other data is available from the project website: [www.cse.iitb.ac.in/~ctara](http://www.cse.iitb.ac.in/~ctara).

The construction was started on 1st January 2006. An important milestone is the completion of the the cut-off trench (COT), which serves as the base of the dam. There were several fractures discovered at this stage and they were filled, on the advice of experts, by gravity grouting. The check-dam was completed on 1st June, 2006. Subsequent to this, along with many experts, we evaluated the structure post-monsoon in 2006, and again in 2007 and 2008. We observed that the storage reservoir would dry up by 15th January. Ground-water is available till about 15th March, as seen in the village well and run-offs in nearby streams. Thus the primary objective of meeting the needs of Gudwanwadi was met half-way. The remaining period 15th March-30th May remained stressful in terms of water availability. There is agreement that though the dam structure was sound, the fractures underground may not have been filled completely during the process of gravity grouting. Experts also suggest that a pressure grouting procedure be adopted to rectify the problem.
The Proposed Phase-II

We now propose to undertake Phase-II of the project, viz., that of pressure grouting procedure. There are broadly two steps here:

- Execute sample bore-holes to establish a first-cut analysis of the local geology.
- Design and execute a multi-hole multi-pattern pressure grouting.

The net Phase II project outlay is estimated to be about **Rs. 6 lakhs**. It is, of course, hoped that the procedure will succeed in blocking all existing underground channels and that the water retention of the reservoir extends by 2-3 months. This is contingent, to some extent, on the technical know-how that we develop in the course of Phase-II.

**In other words, success is not guaranteed.** The region is geologically fault-prone and solutions may require some technical innovations. Overall, the rural drinking water problem is central to national development. While there are policy and governance aspects to the problem, the engineering and scientific aspects are of foremost importance. In view of this, the project will enhance our knowledge base and encourage research in this important area.

Prof. A. Juneja, Prof. Ramakrishna and Prof. T. N. Singh have shown an interest in participating in Phase-II. It is expected that students, esp. post-graduate students will also participate in the execution of the project. At this point, we should also point out that two M.Tech students are working on related problems for the M.Tech projects. Mr. Nilesh Naik (CTARA, guide: M. Sohoni) is studying ground-water data in Thane district and the efficacy of rural drinking water projects. Mr. Dharmvir (CSE, guide: M. Sohoni and T. I. Eldho) is developing protocols for simulating typical ground-water situations. Prof. Subodh Wagle, Prof. N. C. Narayanan and Prof. M. Sohoni are formal respondents to various disclosures by the Govt. of Maharashtra water regulatory authority. In the long run, we expect that a composite multi-disciplinary group emerges within IIT Bombay which will study water solutions (rural and urban) and its connections with technical aspects such as ground water, and governance and policy aspects such as tariffs and regulations.