Recent Action-Research and future course in Water Sector.

Milind Sohoni, CTARA, IIT-Bombay

The CTARA Perspective

- **The T&D core.**
  - Concrete beneficiary/stake-holder-the bottom 80%, households, hamlets, gram-panchayats, villages, towns and cities
  - Basic physical resources-soil, water, energy
    - ⋆ end-user defined or demand-driven-drinking water.
  - **Towards change**-deliver technology, policy, capacity-building, debate.

- **The corollaries**
  - foremost Engineering loop: analyse, design, deploy, satisfy
  - accept Inter-disciplinarity-necessarily so. geology, groundwater, dams and reservoirs, GIS, PRI, state policy
  - Engagement-with the unorganized sector, directly or through the State or the Market, if present. Through NGOs, CSOs.
  - Field work-sensitization, proofing, participative and beyond.

2005: Technology and Society project

Early in 2005, CTARA launched a project to examine:

- the relationship between technology and society
  - and development
- can IIT reach the last man or woman
  - the project has concrete deliverables
- is there sufficient formal research and teaching content
  - is this only an emotional project?
- should IIT be doing such projects?

Gudwanwadi-in Karjat Tribal Block

- 380 Thakar people.
- 200 animals.
- 40 households.

And an acute shortage of water for 5 months.

Technology Choice

Build a check-dam.

Partners and Task List

IIT

- Invite faculty experts
  - Profs. Singh, Eldho, Partha and others
- Raise 25 lakhs from alumni
  - Dr. Shridhar Shukla
- Organize student trips, open up for research and teaching

ADS-an NGO

- Social mobilization
- Land and labour agreements
- know-how in social project management

Gangotree: Technical executor

- surveying and design
- execution and sub-contracting
- experience in working with NGOs

Faculty and Students..

People

Our Director

Machines

On July 1st, 2006

Full!

Proof of the Pudding ...

What is the situation as the summer approaches?

Proof of the Pudding ...

What is the situation as the summer approaches?

Did the project succeed?

Mixed answer

- Water in check-dam till only Jan 15-30.
- Running water (for washing etc.) till about Feb 20th.
- Drinking water in borewells till about March 15.
- Acuteness of problem reduced by 2-3 months

See www.cse.iitb.ac.in/∼ctara

Where did the water go?

- The check-dam structure is sound
- Water may be percolating through the ground
  - unlikely as a major cause
- There are underground channels
  - likely

So then:

- Identify the channels ..
  - Geology
- And fill them.
  - Civil Engg.

Wider Goals

Rural Water Solutions-Jal Swarajya

- 2000 villages in Maharashtra alone
- No technical solutions seem available other than
  - lifting from existing reservoirs and
  - ground-water
- Many slated to fail!

We need

- Hydro-geology modelling in the small
- Protocols for geological investigation and design

In short ..

Such projects

- do serve as good platforms for research and teaching
- match our strategic agenda for visibility

IIT should indeed do such projects

In short ..

Such projects

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IIT should indeed do such projects

But will this interest us?

- Students: My hunch is yes.
  - "real-life" problems and solution driven
  - After all it may land them jobs at McKinsey or PWC.
- Faculty: Yes, again. It matches our stated applied research objectives.
- Research: Should fly.
  - After all, deep problems here too

The Karjat Project

- Disha Kendra: A popular NGO in Karjat-Khalapur area, led by Nancy Gaikwad.
- January 2010: approached CTARA with problem of widespread drinking water collapse in North Karjat taluka.
- Ashok Jangle (DK): various RTIs and collation of some information.
- Preliminary interviews with taluka officials.

Our plan:

- Question 1: Is there adequate groundwater at all?
  - GSDA, our own tests. (Sanjiv, Vishal)
- Question 2: Are there administrative problems?
  - lack of information, improper yield tests, etc.
- Question 3: What is to be done?
  - Groundwater recharge structures?
  - Surface water supply? (Abhishek, Vikram and Janhvi)

The Karjat Pipeline feasibility study

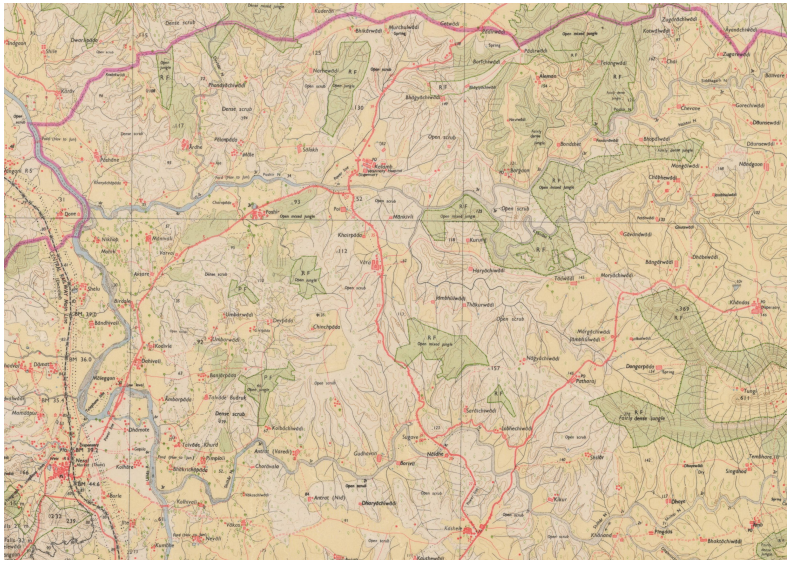
Study Objective

Is it possible to have a wide-area rural pipeline scheme for the area?-a basic techno-economic feasibility study.

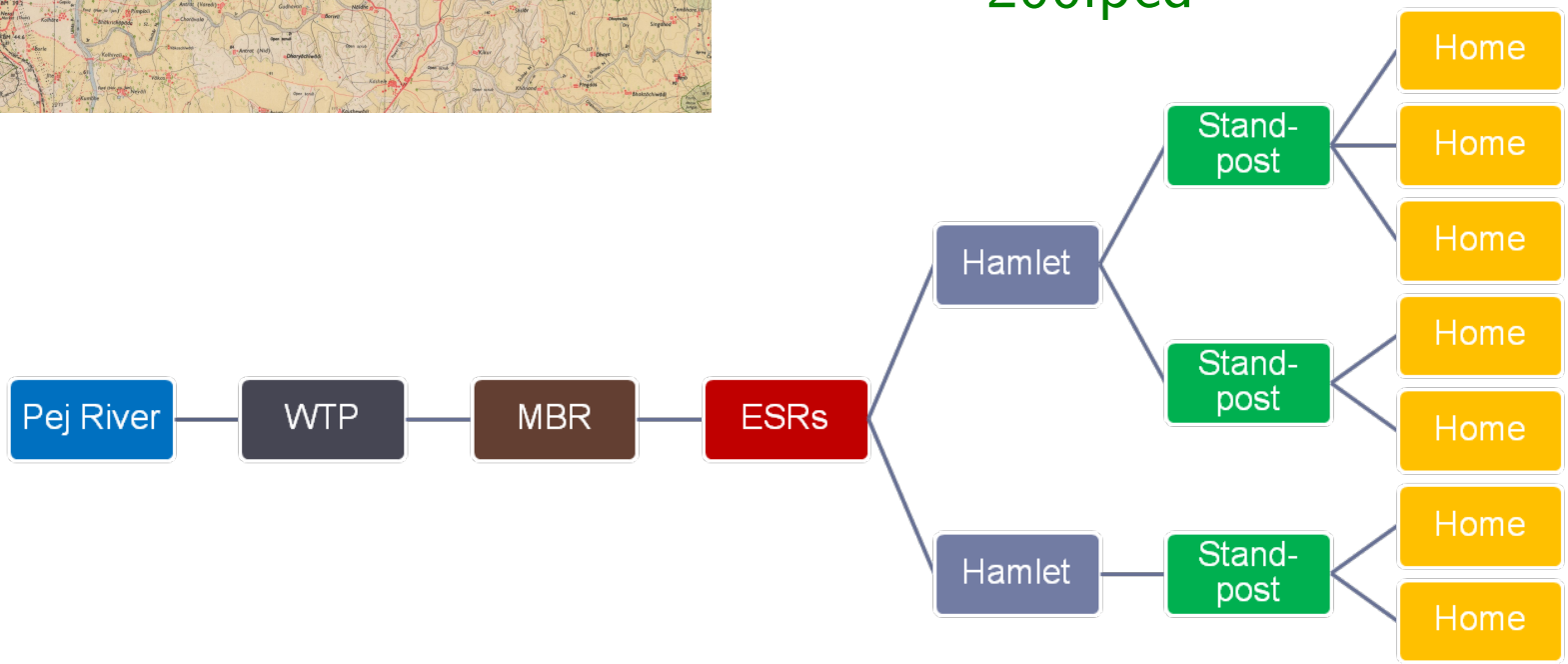
- primary and secondary, i.e., source to standpost. no tertiary.
- use MJP norms *exactly* as far a possible.
- See if capital costs and energy costs fit within norms.
- ownership, tariffs, cost recovery, metering etc., later.

- Abhishek Sinha, Vikram Vijay: two dual-degree Civil. Engg. students, Janhvi Doshi, 4th year B.S., summer intern from Rice University.
- 3 months of field work: May-July 2010. Report-writing 1-2 months.
- Rs. 1 lakh budget.

Scheme



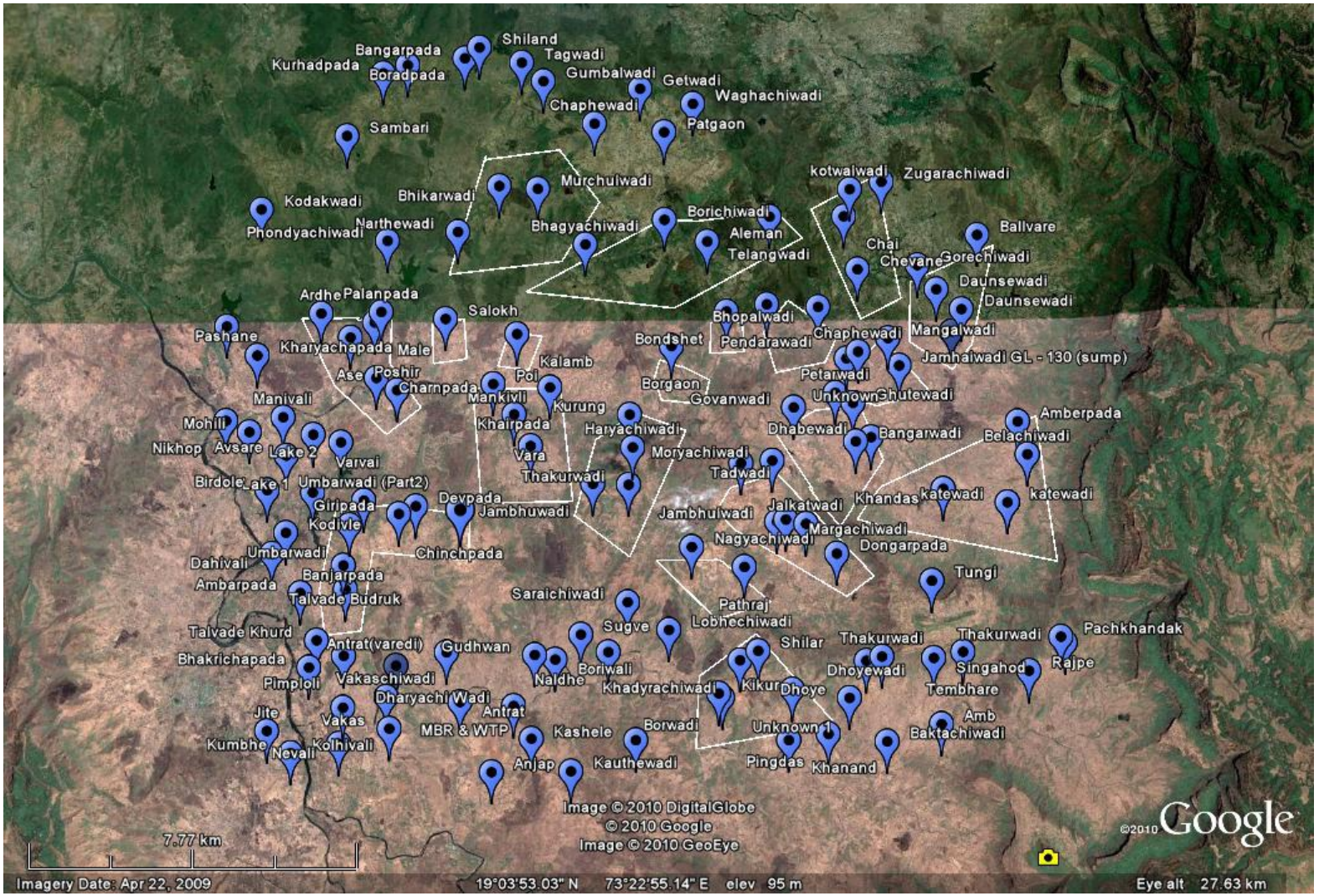
- Target area : 120 sq. km., 70 hamlets
- Design population 51,000 (2011).
- norm of 40 lpcd and 200lpcd



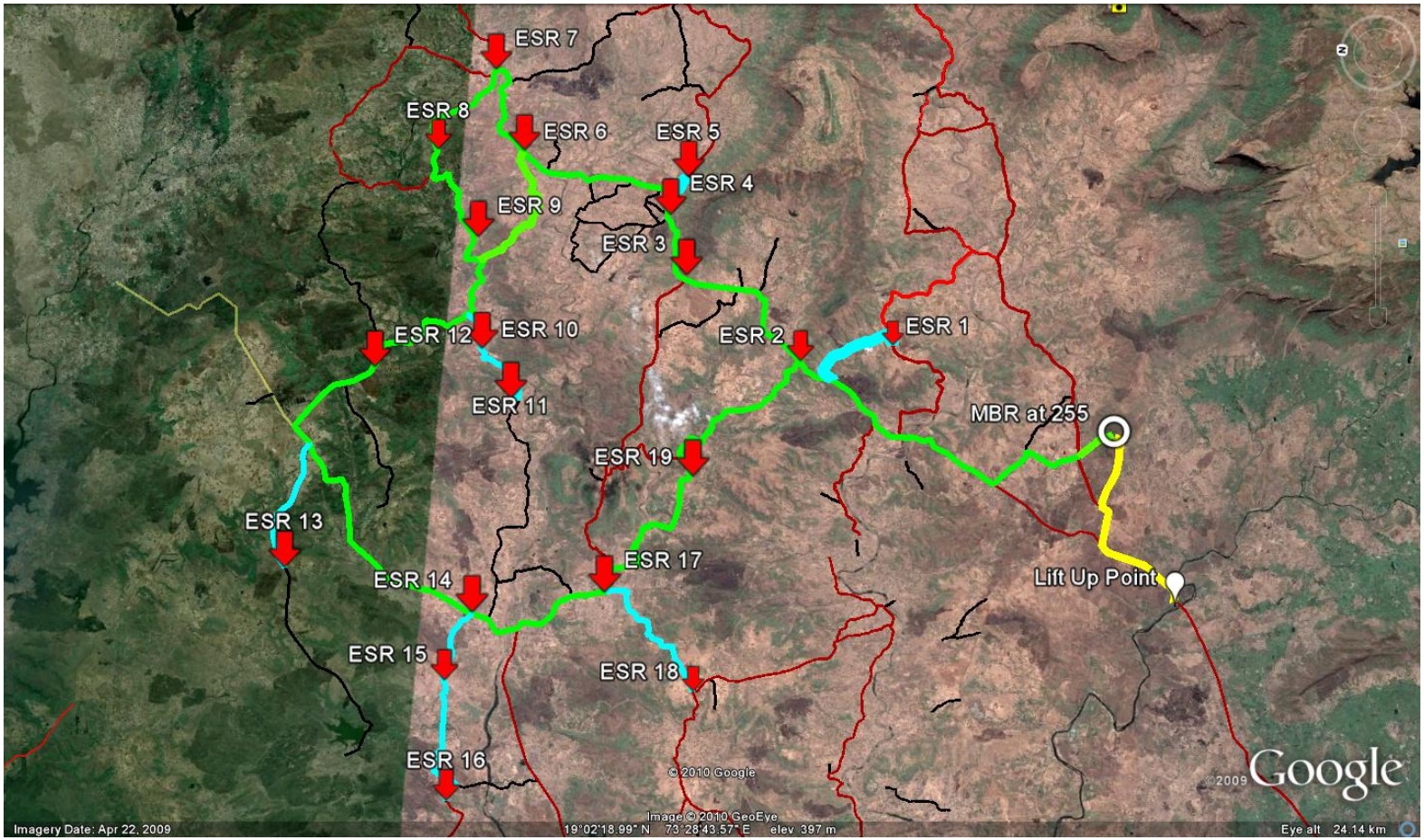
Tasks

- Understand Demand.Names of hamlets, GPs and their latitute, longitude and elevation. Population model as used by MJP.
- Clustering.Clubbing hamlets for ESRs.
- Locating source : Pej River, discharge of Bhivpuri hydel power station.
- Study MJP norms : materials, overheads, safety margins, schedules, procedures.
- **Design** : rising main, primary and secondary network.

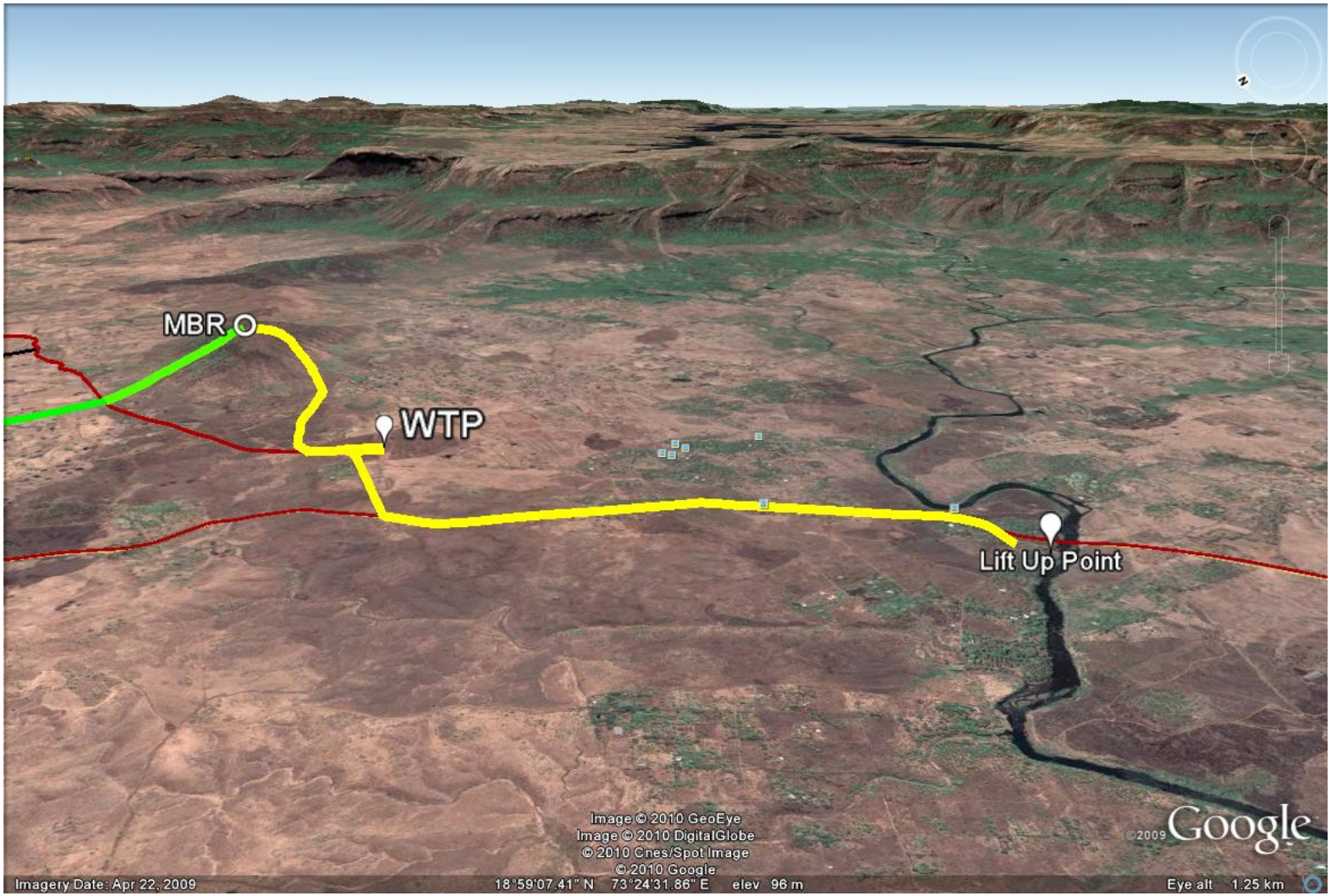
Hamlets and clusters



Overall map

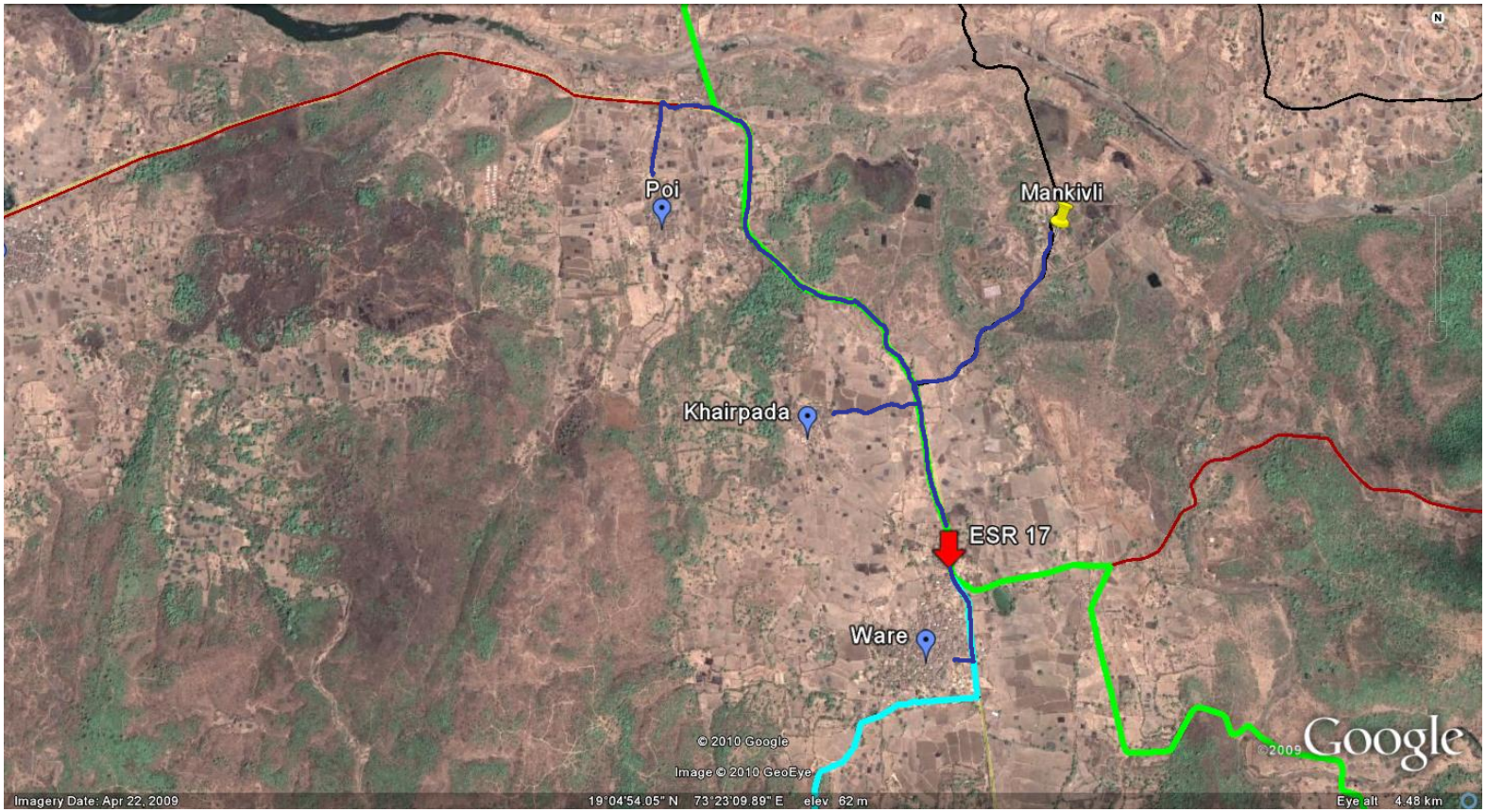

ESR 7
ESR 8
ESR 6
ESR 5
ESR 4
ESR 9
ESR 3
ESR 12
ESR 10
ESR 2
ESR 1
ESR 11
MBR at 255
ESR 19
ESR 13
ESR 17
ESR 14
Lift Up Point
ESR 15
ESR 18
ESR 16
© 2010 Google
Image © 2010 GeoEye
19°02'18.99" N 73°28'43.57" E elev 397 m
Imagery Date: Apr 22, 2009
©2009 Google
Eye alt 24.14 km

The lift-up



From *Pej* to an MBR at 255m.

A cluster



Note pipelines along road to reduce land acquisition costs.

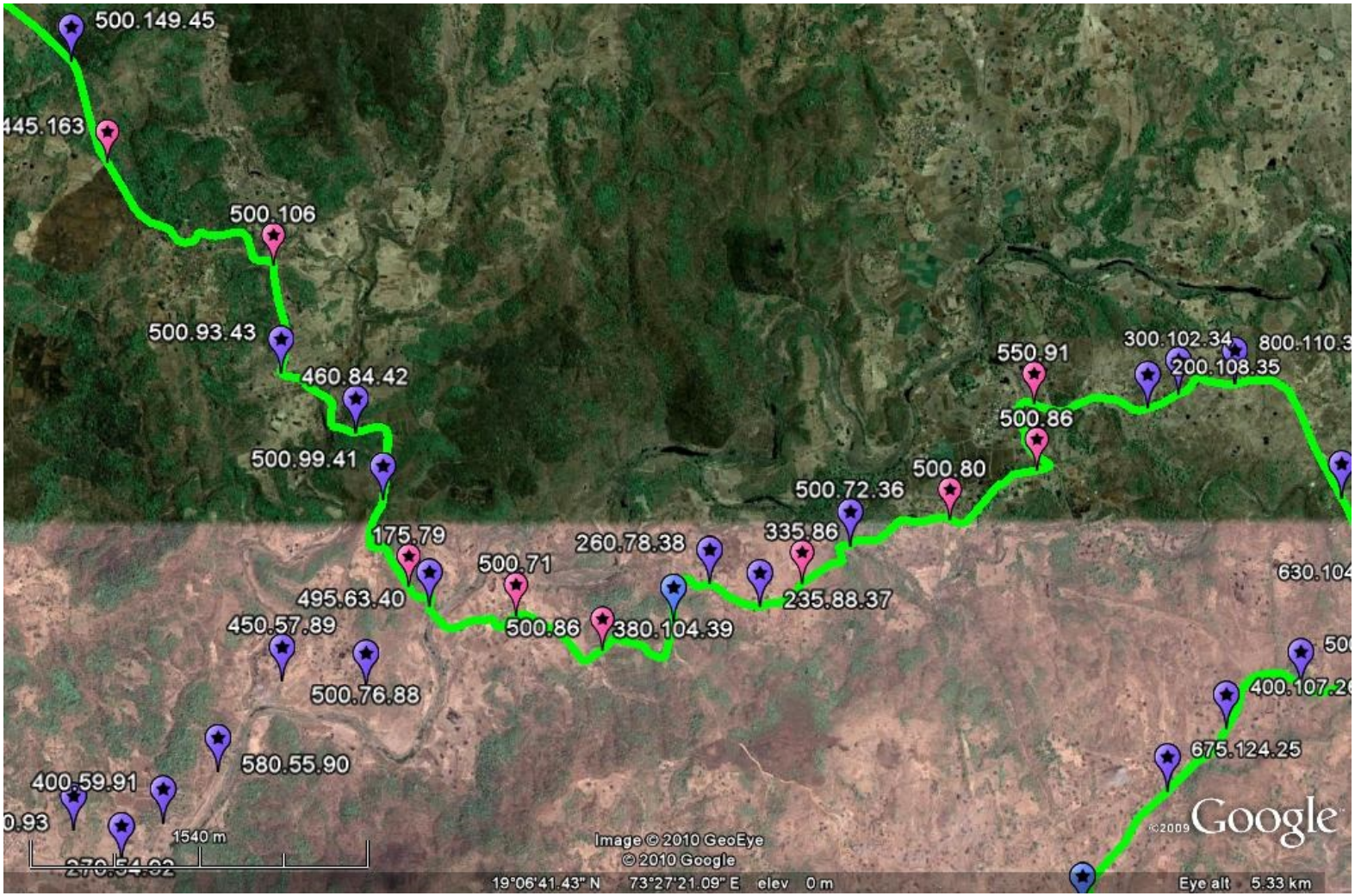
Basic tools and innovations

- Google Earth for basic planning and representation.
- Google Earth elevation data with some ground-truthing using GPS and known elevations.
- BRANCH 3.0 and LOOP 4.0, two free WB softwares for pipeline design.

Innovations:

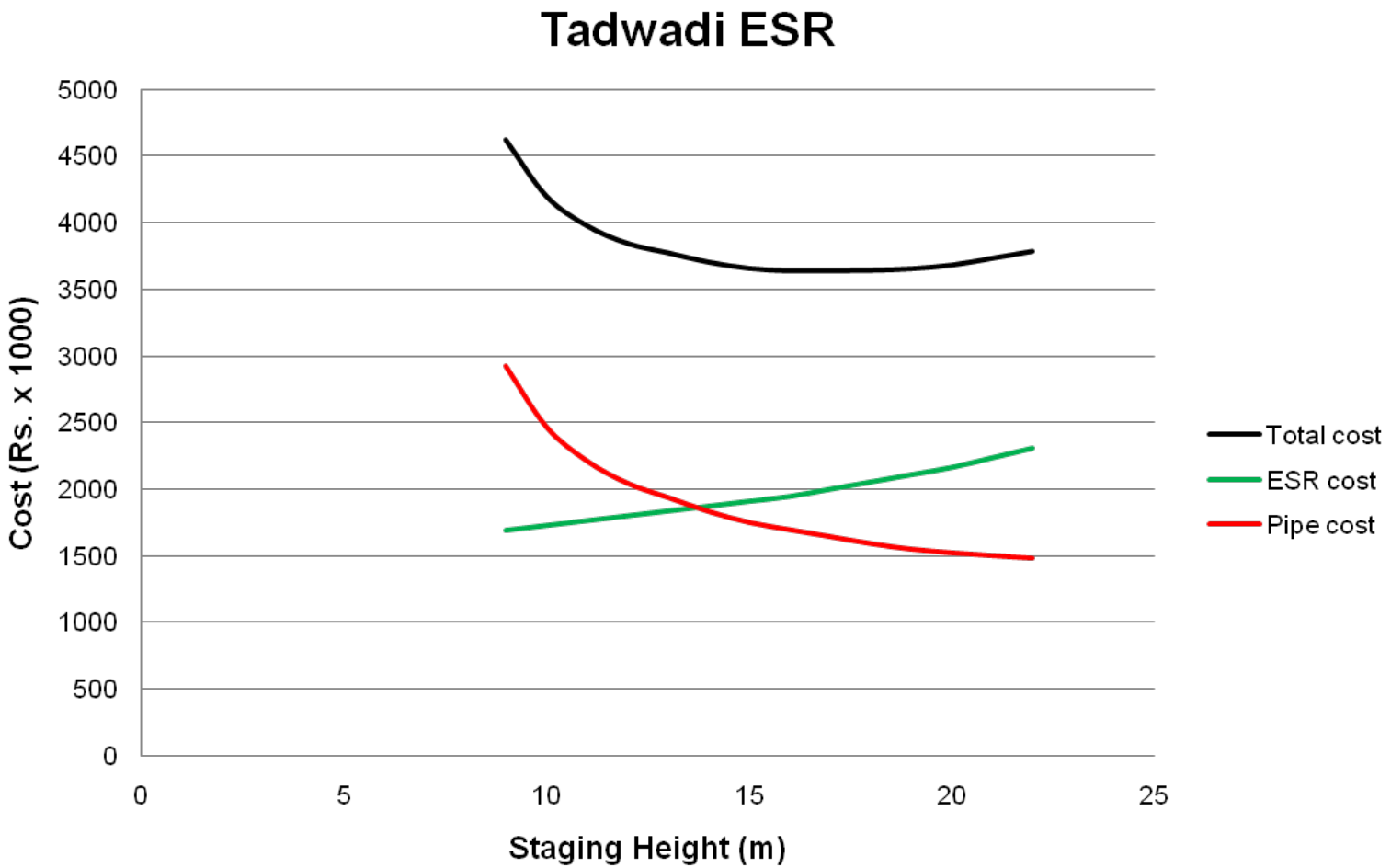
- A looped system for rural application.
- ESR staging height optimization.
- Dummy nodes for better quality design.
- A rapid feasibility study protocol!

Dummy nodes



Dummy nodes introduced in network to better reflect ground conditions.

ESR Staging height optimization



Key Findings[1]

	200 LPCD	40 LPCD
Daily Demand	19.47 MLD	3.90 MLD
Net Investment	Rs. 57.21 crores	Rs. 17.19 crores
Cost per person	Rs. 7051	Rs. 2119

- Energy costs of Rs. 4.51 per cubic meter, at Rs. 5 per unit and 75% pump efficiency.
  - This may reduce further from better choice of lift-up point, agreement between MJP, Irrigation and Tata Power.
- O&M costs and establisment costs to be added.

Pipeline water supply for North Karjat is techno-economically feasible.

[1] www.cse.iitb.ac.in/∼sohoni/karjatfinal.doc

Post-report

- Report submitted to Disha Kendra for dissemination.
  - Key knowledge input to serve as rallying point.
- Report submitted to Karjat MLA, Shri. Suresh Lad.
- And to MJP office and Minor Irrigation office in Karjat.

Towards adoption:

- Key resolution by GPs of expression of demand (scarcity). *done earlier*
- Resolution by GP accepting report and expression of interest in project. *ongoing*
- Submission to ZP and MJP.
- MJP to prepare proposal to ministry *and so on...*

More issues

Institutional issues

- Who is to pay for what and to whom?
- Experience of single village vs. multi-village schemes.
- Tertiary system design, metering and tariffs.

The role of TSPs.

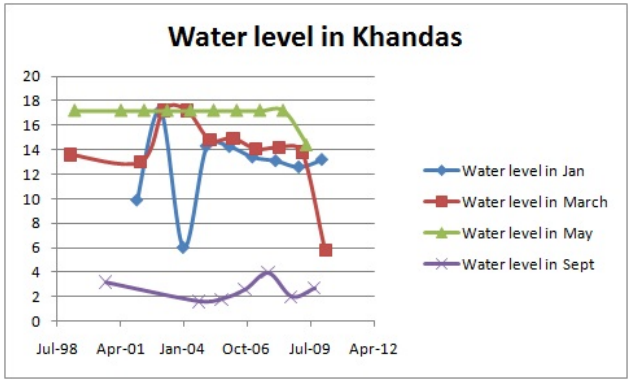
- Novel example of design and analysis in the public domain at GP/sub-taluka level.
- Role of educational institutions as trusted parties-standardized modules, e.g., solid-waste management plans.
- Eventual devolution of the design and analysis function.
- Who is to pay what and to whom?: GPs as customers.

The GP Water Document

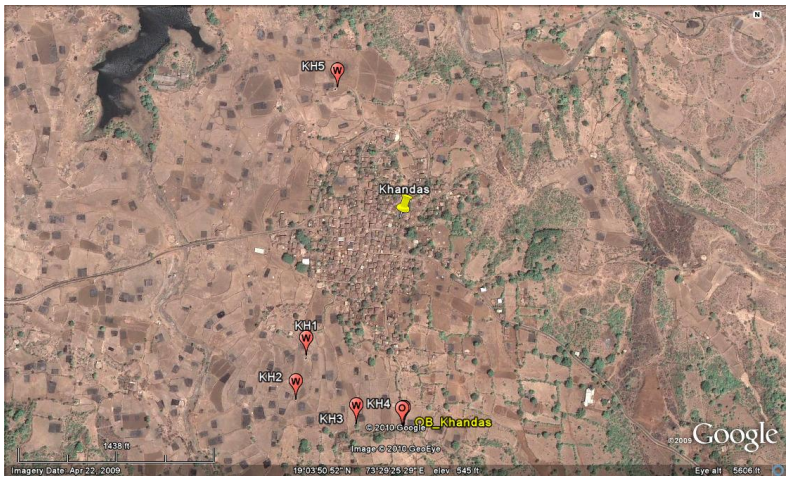
- To maintain reliable data and assess need.
- To prepare a framework for policy implementation.

Data:

- The demand: household and commercial. Seasonality.
- Ponds and tanks: storage and seasonal levels.



- Sources: open wells, handpumps and energized borewells.
- Location and Yields-*a new test?*
- Capacity building at GP level to maintain plan.



Simulator Project- since 2008

- Role in watershed development.
- Planning of small structures for drinking water.