Knowledge Infrastructure for Maharashtra
The beginning of a Public-University-Private (PUP) Partnership

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The basic argument

Maharashtra’s Development Demands
Water, Public Transport, SME, Energy
⇒
Need for Knowledge, New Practices, New Research
New Job Profiles, Avenues for Professionals.
⇒
The role of University and Higher Education
Knowledge Structures. Key Areas.
⇒
Mechanisms for a Partnership
Basic Well-being, Resources and Livelihoods

- Basic issues of water, food, health and *living*!
- Severe stress in natural resources. *Fodder, Firewood.*
The Data

Year-round drinking water availability.

<table>
<thead>
<tr>
<th>Year</th>
<th>Rural</th>
<th>Urban</th>
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</thead>
<tbody>
<tr>
<td>2012 per 1000 (69th NSSO)</td>
<td>858</td>
<td>896</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>745</td>
<td>931</td>
</tr>
<tr>
<td>2008</td>
<td>862</td>
<td>911</td>
</tr>
</tbody>
</table>

Also affecting livelihoods...

similarly about Milk, Electricity, Cooking Fuel.
Drinking Water and formal sector jobs

Transport and health also very important. Also see Kelkar Committee report.
Societal Outcomes

- Better nutrition for all, higher productivity in agriculture
- *sadak, bijlee, paani*
- More and cheaper buses, bridges.
- Better public transport, better sewage systems.
- Cheaper phones, better cars, less pollution.
- Quieter or more cultural *festivals*.
- More authors, better books, more olympic medals.
- A more equal society. Well being for all!
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Various Departments...But

Various needs-, but insufficient manpower, coordination and budgets. Few knowledge inputs.
Analysis-The Governance Gap

- **Under-staffing.** Example: 2 rural water supply engineers and less than one field geologist per taluka.
  - delays, poor monitoring, no time for assessments.
  - No expansion possible for current job description.

- **Poor Data, Outdated procedures.** Example: Design of multi-village schemes, watershed treatment. Regional planning.
  - MEETRA, MERI, Yashada, GSDA. State Statistical Board

- **No new business models or space for professionals.** Disinterest of the private sector. Very little collaboration with institutions of learning and very little relevant research.

Basic Question: How do we generate and transmit new knowledge products? *What are knowledge products?*
Knowledge Structures-Examples from CTARA

Water Supply

- **Monitoring and Execution**: Actual performance of programs. Taluka and district-level assessments of NRDWP. Assisting GPs and ULBs during execution. Testing. Organizing information, material and financial flows.

- **Evaluation and Assessment**: Evaluation of Groundwater quality, design of WTPs. Assessment of MSNA for Parbhani.

- **Planning and Designs**: Economic models, GIS, Optimization frameworks. Jalyukta shivar. Irrigation and Water-use efficiency.

- **Failure Analysis**: Failed rural regional schemes. Failed bandharas. Testing.

Anjap-Sugave Multi-village scheme analysis, 2011
Regional Planning for villages in Shahpur
PUP Model: Parbhani Urban WS

MOU with Parbhani Municipal Corporation

- Energy and water losses.
- Overall system performance.
- Assisting in absorption of MSNA.

Research

Groundwater-Sanitation connection.
Watershed Planning for villages in Mokhada

- CSR consulting for Siemens and Aroehan.
- Livelihood, drinking and water for second-crop.
- 10-15 habitations, careful need assessment.
- Concrete structures, watershed treatment, well repairs
- Energy systems.

Also see:
www.gise.cse.iitb.ac.in/gsda
http://www.gise.cse.iitb.ac.in/upload/thanedb.html
www.ctara.iitb.ac.in/water/
Structuring Knowledge Needs

Public Transport

- **Monitoring and Execution**: Maintaining schedules. Executing standard procedures. Organizing information, material and financial flows.


- **Planning**: Economic models, GIS, Optimization frameworks.

- **Failure Analysis**: Particular events. Under-performance in some localities. Cause analysis.

- **Feasibility Analysis**: New routes or new depots. New ticketing systems.
Society and the University-a virtuous loop

- The University
  - repository of knowledge and practices
  - training agents who deliver value
- The Elite University
  - thought leadership, the arts, long-term research, *destiny*
  - *symbolic of what a society values!*
The Indian University

- **Training role**: Employees for traditional Industry and State.
- **Disconnect between research and reality**.
- **Focus on placement and packages. IT dominance.**

<table>
<thead>
<tr>
<th>Research Papers since 2010</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Supply</td>
<td>87</td>
<td>Neural Networks</td>
</tr>
<tr>
<td>Public Transport</td>
<td>25</td>
<td>Fuzzy Logic</td>
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</tbody>
</table>
The New Institution

New jobs!

- Energy expert. Drinking Water consultant.
- District Public Transport Manager. Taluka-level planner.
- New research. New definition of rigour!
- Research which is accessible by society!
The areas of the future

- **SME and Informal Enterprises.** Bringing the benefits of technology, increasing efficiency, improving market access.

- **City and District Administration.** Improving planning, transport, infrastructure, logistics, optimization.

- **Core Sectors.** Water supply and sanitation, Electricity grid, Solar, Food, supply chains.

This would in turn create the demand for new instruments, gadgets, machines, tools for analysis and design, simulators ⇒ **better engineering, better efficiency, better value**
The University Re-defined

- **Objectives**: Prepare manpower, do applied and pure research. Keep up-to-date with social parameters and well-being.
- **Strengthen civil society**: Comprehend the working of the state and the market and make it transparent. **Publicness** of outcomes.
- **Natural partner of the civil and democratic state**.

**Avenues**:
- Most knowledge structures-amenable to partnerships.
- Access to innovation, labs and knowledge infrastructure.
- Access to students and faculty through project and thesis work.
- Should be happy to work on real problems and real data.
The Way Ahead

Three Questions:

- How to we design the new role of Higher Education?
- How do we incentivize and help them move to this new role? What other entities need to be modified?
- How do we measure progress and evaluate this?

- What are the short, medium and long-term action items?
Objectives: Water sector as a research area.
- Activities, case-studies, problems and solutions, curricula for development.

Highlights
- Participation from 17 colleges, TISS, Collector, Osmanabad, Unicef, WSSD, Meetra.
- Mechanisms of TDSL, TDSC for regional problems.
- Standard Templates: Rural DW security, water quality, MSNA as research areas.
First Steps


- **Clear guidelines for district and state agencies, ZP, Collectorate for supporting research.**: Access to data and access to funding. Liaison. Avenues for presenting research.


- **Empowered board.** Straddling Higher Education, Research, S&T, Development Outcomes. Designing curricula, vetting case-studies, organizing funding, liaising with departments and industry.
Concrete Suggestion 1: District Research Cell

Objectives

- Independent technical capacity.
- Assessment studies for the district-public transport, energy efficiency.
- Geographical Information and response (GIS).

Organization

- Headed by District Research Coordinator, dedicated staff.
- PUP-model. Joint partnership between regional colleges, district administration and say, an IT major.
- 1% of program budget + CSR.
Suggestion 2: Design and Analysis for JYS

Objectives

- Improve the design and outcomes of *Jal-yukta Shivar*
- Bring together social, agricultural, water, natural resource data.
- Excellent tool for students and researchers.
- Provide platform for a variety of efforts and analysis.

Organization

- **District Level Coordination** by district agencies, colleges, NGOs, civil society.
- Academic design and vetting by key state institutions.
CTARA at IIT Bombay


- Creating the Development Professional
  - inter-disciplinary training for engineers.
  - field-work, core sectors, people-centric.
  - Projects in *sadak, bijlee, pani*

- Project-based course for students, consultancy for development
  - [www.ctara.iitb.ac.in/tdsl](http://www.ctara.iitb.ac.in/tdsl),
    [www.ctara.iitb.ac.in/tdsc](http://www.ctara.iitb.ac.in/tdsc)

- works with governments, cities, GPs, local bodies, citizen groups.
Solar-steam based *Istry* in Parbhani
Optimizing Irrigation in Shahpur, Thane

[Diagram showing the irrigation system with labeled components: Diesel Pump, Water Source, Inlet water Pipe, Water Flow Meter, Pressure Gauge, Pressure Control Valve]
Processes at Ganapaty Factory in Pen
Water at CTARA
Past, Present and Future

NCN, Puru, Om, Milind, Bakul, Priya
Areas of Research

- **Water Supply Schemes**
  - rural water supply, single vs. rural regional
  - SW vs. GW as drinking water sources
  - Bulk water systems, tariff
  - simulation and design software, standard protocols for analysis

- **Groundwater: regional and local**
  - GSDA data set of 5000+ wells. Trends, scarcity and uncertainty.
  - Thumbnail conceptual models. Primary and secondary data.
  - SWAT models and taluka/mini-watershed level water balance.
  - Watershed modelling, regional data models

- **GoI and GoM policy and programs**
  - NRDWP, Jalswarajya and now MSNA
  - Membership in Planning Comm. WG on GW regulation
  - Participation in working group on data.
  - BoG, MEETRA (GoM), meetings on RWS
  - Leadership in Ganga Action Plan on policy
Upcoming Areas

- Regional DW security
  - Taluka and district level analysis, linkages between various departments, DPC and its role.
  - Multi-sector GIS for Thane

- Rural planning.
  - Water and sanitation for small towns-(Manchar, Karjat) and large GPs. Maybe Parbhani

- Water quality and linkages
  - DW quality, the 1 cu.m. scheme, vending, agriculture linkages.

- Water and Energy
  - PWS and lift irrigation schemes and their energy demands.

- Urban water and water treatment
  - Decentralized STP and case studies, effluent treatment
2010: North Karjat/Mokhada rural regional scheme: Feasibility Study
Anjap-Sugave Multi-village scheme analysis, 2011

Schematic of infrastructure currently used for seasonal supply

Not to scale; Not all valve positions are shown
Failure analysis of the Tadwadi-Morewadi Single-Village Scheme, 2011
2012 onwards: Regional and Village Groundwater Models
Thane District regional analysis of drinking water, 2012
Mograj GP level study and NRDWP

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<thead>
<tr>
<th>Village/Name</th>
<th>HabitationName</th>
<th>SchemeName/DP</th>
<th>SanctionYear</th>
<th>Scheme Type</th>
<th>Estimated Cost</th>
<th>Date Of commencement</th>
<th>sourceType</th>
<th>category</th>
<th>TypeOf Source</th>
<th>LocationWater Source</th>
<th>Status as per CIIAR survey as of March 2012</th>
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<td>DHANNI</td>
<td>CHODHARWADO</td>
<td>OWENBARIAN HANDPUMP</td>
<td>2002-2001</td>
<td>Hand Pump</td>
<td>5.00000</td>
<td>31/01/2002</td>
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<td>Functional</td>
<td>Failed</td>
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<td>DHANNI</td>
<td>DHANAM DUGWELL</td>
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<td>Open well in village</td>
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<td>2007-2008</td>
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<td>No data</td>
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</tbody>
</table>

Source: http://indiawater.gov.in
Course: TD 603-Water

Objectives

- to familiarize the student with water as a resource and key scientific variables
- to familiarize with some key policy issue—currently, large dams and water infrastructure
- to inculcate an operational approach to the sector

Contents

- Water and its uses and the water cycle, Ground Water, Watershed and interventions, and Water system principles, each 5 hours.
- Selected papers-20 hours.
- Field visit, typically PWS+GP+watershed interventions.
Project TITWI

Civil Society Collaboration
- District administration-DPC
- Interest groups.
- Regional Engineering and Research Institution (RI)
- CTARA and IIT Bombay.

Objective:
- year-round regional drinking water security
- medium, long-term and drought contingency

Key Knowledge Areas:
- design and analysis of DW schemes, bulk water
- integration of SW in regional DW planning
- Energy efficiency
- GW and watershed interventions
- GIS and planning dashboard
- Logistics, optimization, IT
- Socio-economic analysis
- District-specific Policy Design
- Ecology, History, Geography.
Publications and Reports

Water

- *The Anjap-Sugave Rural Regional Scheme*, Case Study, with Pooja and others.

Science and Engg. for India

- *Knowledge and Practice for India as a developing country*, Seminar, 2014.
- *The Elite University*, under preparation, with Vinish and Maunik.
- *The University and the Development Agenda*, appeared in EPW.