# TEQIP-IITB Water Sector Workshop

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# Key Objectives and TEQIP

**Key sub-agenda of TEQIP-I and TEQIP-II.**

- institutions to be geographically relevant,
- develop engineering as an interdisciplinary practice which is aligned to the states objectives and programmes and
- to carry out demand driven research and innovation

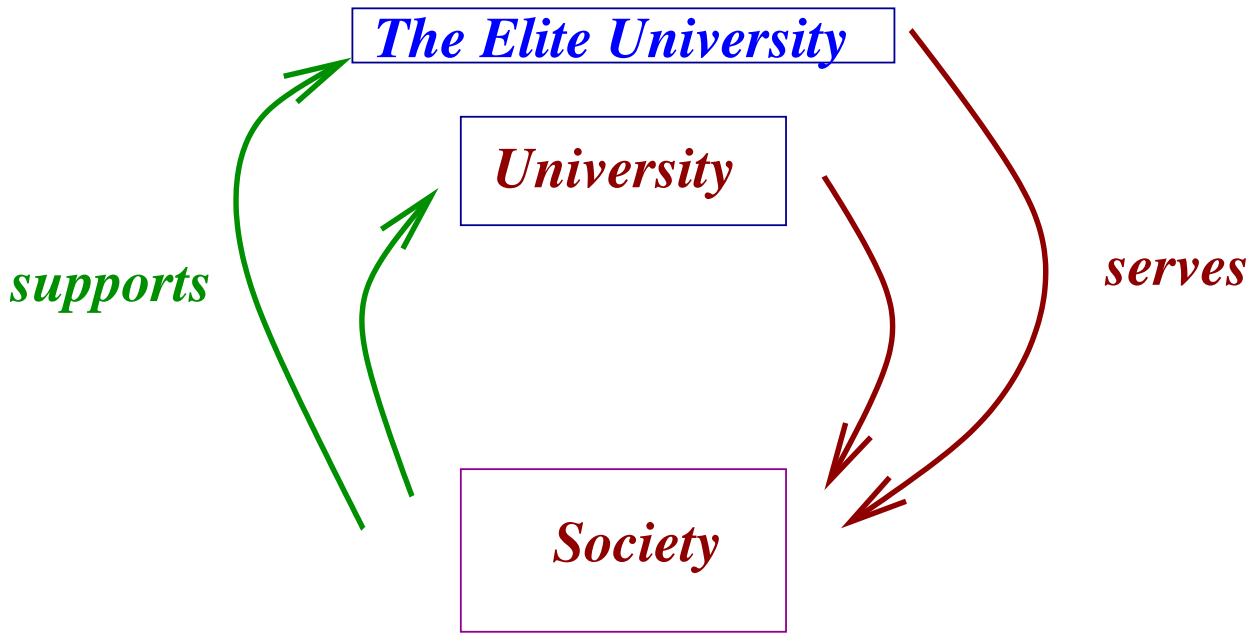
**What is required to do this?**

- Examine the regional role of institutions.
- Examine what needs to be taught and researched.
- How is one to develop the requisite knowledge.

# Organization of the talk

- Society and the university.
- Engineering in India and key problems
- Case-studies–rigour and research!
- New jobs definitions $\Rightarrow$ new jobs, better serve society
- Drinking water and the Project Proposal.

# 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!*

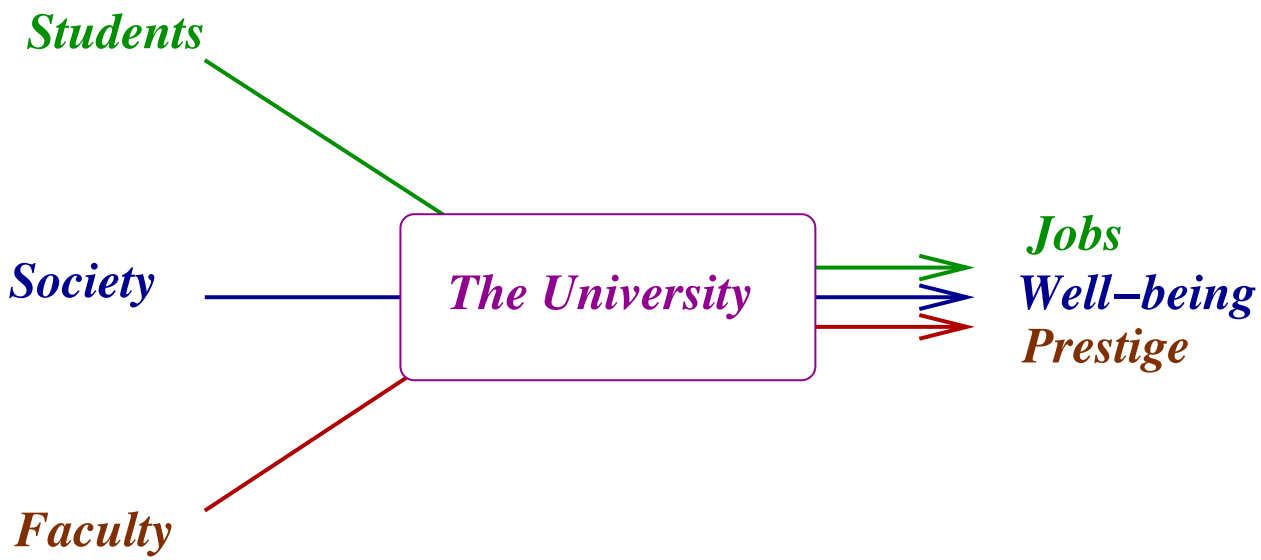
# Societal Outcomes

- 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 *ganeshotsavs* .
- More authors, better books, more olympic medals.
- Indigenous helicopters, submarines.

- A more equal society. Well being for all!

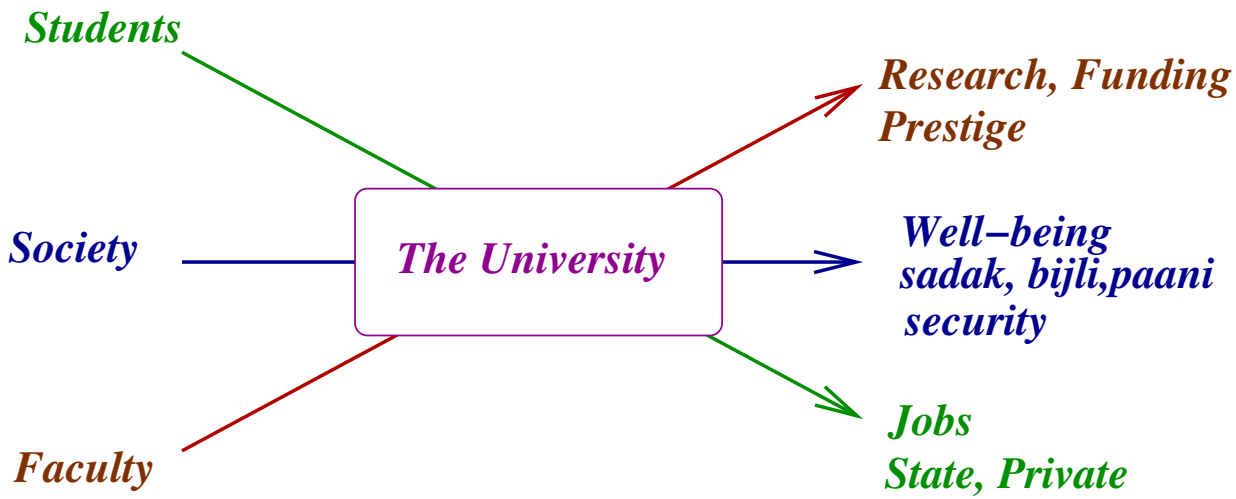
# Collaboration and Alignment

- Close collaboration between the Society, State, Industry and University.
- An alignment between faculty members, the students, and the design of the institution.



# However

However, It may happen that there is a *disconnect!*




## Two Questions?

- How are we doing?
- How do we get better?

# How is India doing?

How do you measure?

- Number of scientific instruments in schools.
- Number of buses per 1000 people.
- Number of liters of water per person per day?
- Number of factories. Number of manufacturing jobs.
- Length of roads per 1000 people.
- Units of electricity per person per year.

# Engineering in Sectors and employment

## Sector-wise GDP

| India | Agriculture | Industry | Services | Per capita ( in USD) |
|---|---|---|---|---|
| GDP (2012) (%) | 17.4 | 25.8 | 56.9 | 1.5K |
| Employment (%) | 51.1 | 22.4 | 26.6 | - |
| GDP China | 10 | 44 | 46 | 6.8K |
| GDP S. Korea | 3 | 40 | 57 | 25K |
| GDP Germany | 1 | 28 | 71 | 43K |

## Top Formal Employers

| Industry | Food | Textiles | Metals | Apparel | Non-metals |
|---|---|---|---|---|---|
| Wages (Rs. lakhs) | 0.70 | 0.80 | 1.35 | 0.67 | 0.69 |

## Formal vs. Informal: various definitions.

- About 75% workforce in informal sector.
- In manufacturing, the rule of 80%-20%.

## Engineering Placements 2013 (IIT Bombay)

| Sector | Engg. | Finance | Consulting | IT |
|---|---|---|---|---|
| Super-GG | 25 (27.7) | 10 (35.0) | 8 (49.6) | 41 (52.1) |
| GG | 116 (7.9) | 82 (11.7) | 110 (9.6) | 102 (10.0) |
| IG | 52 (6.5) | 19 (7.2) | 11 (5.8) | 28 (7.2) |
| GI | 24 (9.3) | 10 (14.2) | 10 (5.2) | 5 (9.3) |
| II | 64 (6.5) | 13 (9.5) | 8 (5.8) | 22 (7.9) |

Table: Numbers by sector and profile and average annual salary in Rs. lakhs

## So, why are our graduates not doing engineering?

# Effects!

Steel consumption.

| | | | |
|---|---|---|---|
| India | 57 | China | 477 |
| Other Asia | 69 | Japan | 506 |
| Egypt | 95 | USA | 306 |
| UK | 145 | Netherlands | 200 |

Year-round drinking water availability.

| Year | Rural | Urban |
|---|---|---|
| 2012 (69th NSSO), per 1000 | 858 | 896 |
| Maharashtra | **745** | 931 |
| 2008 | 862 | 911 |

similarly about Milk, Electricity, Cooking Fuel.

# And this is how we are ...

# Conclusion

- Mis-allocation! Our engineers are not doing what they are supposed to do!
- But are there adequate opportunities?
- And are they trained for these new opportunities?
- Has our training changed as per changing situations?

## *How can engineers deliver better value?*

- Create Opportunities!
- Explore under-represented sectors which are likely to be important?
- Develop new processes, products and protocols which deliver value.
- *Create new job profiles* and train for them!

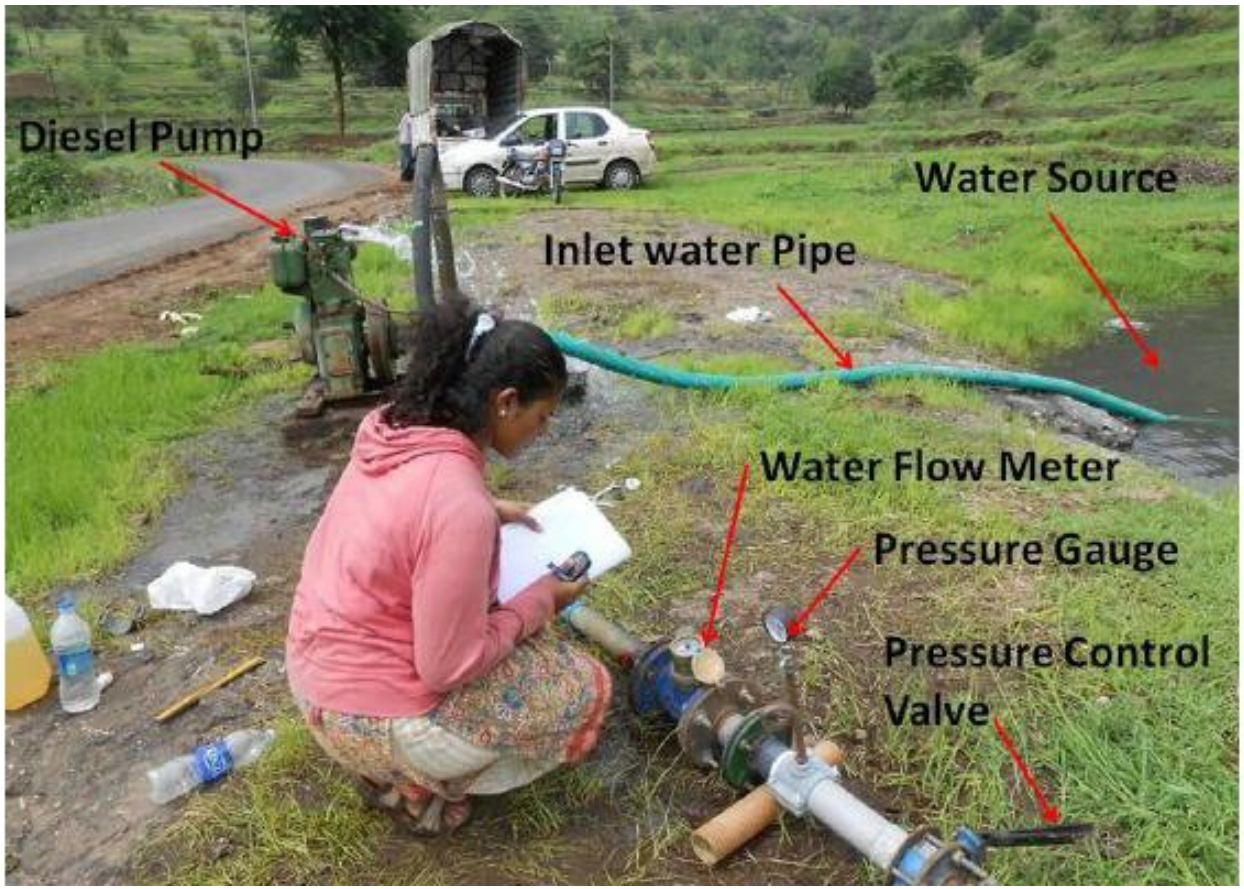
# The areas of the future

- 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 $\Rightarrow$ better engineering, better efficiency, better value

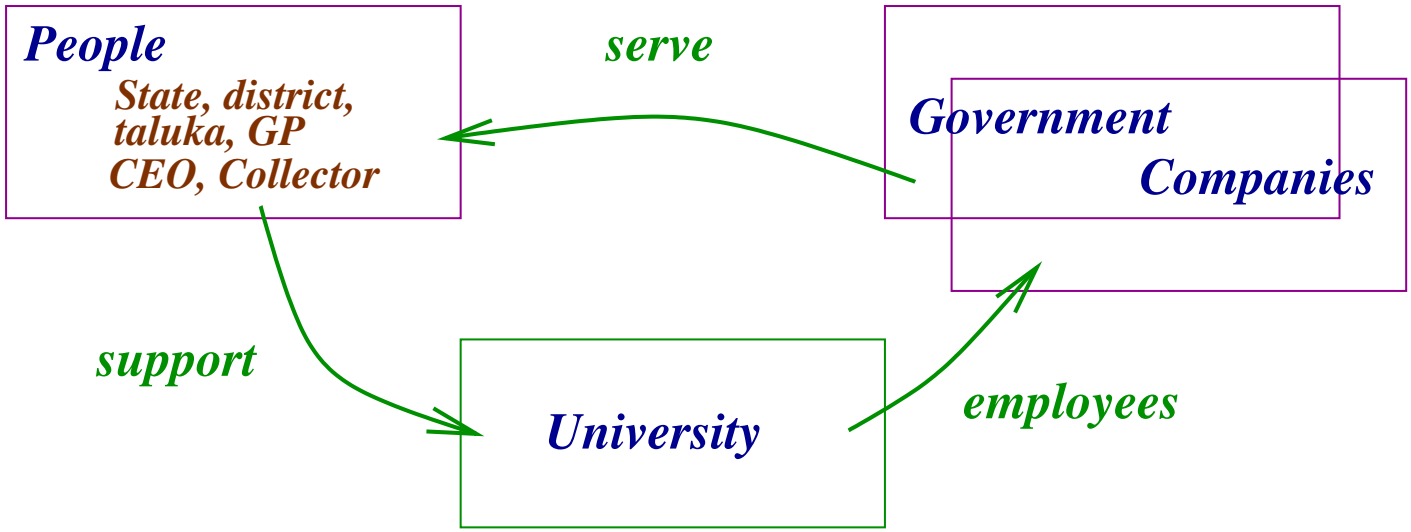
# Solar-steam based *Istry* in Parbhani

# Optimizing Irrigation in Shahpur, Thane



# Processes at Ganapaty Factory in Pen

# The Old Institution



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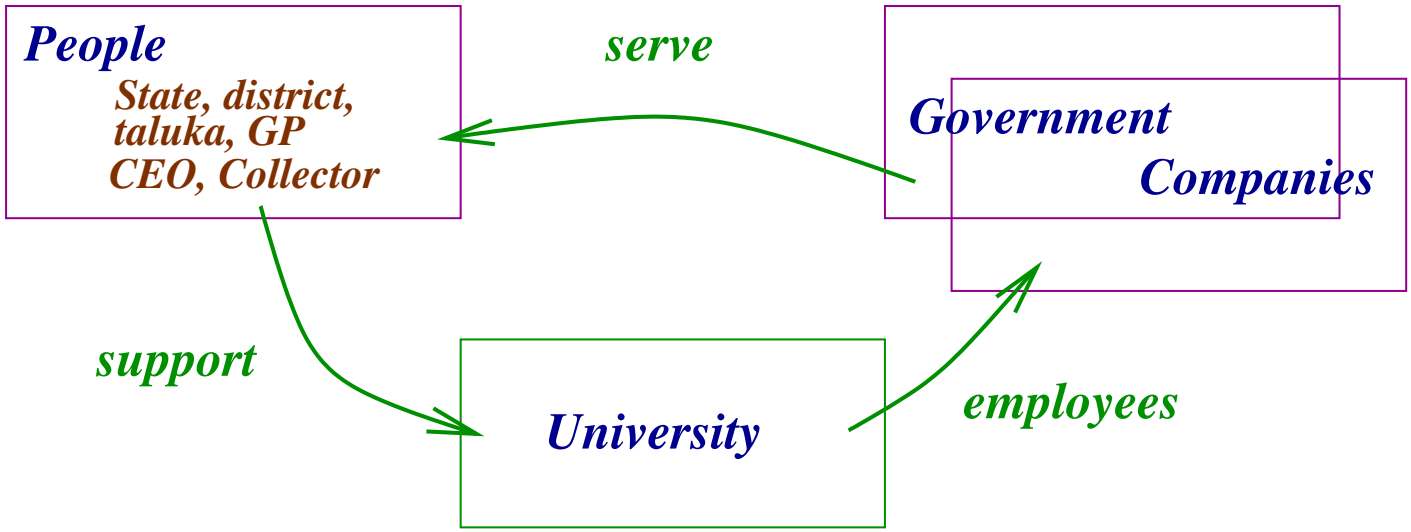
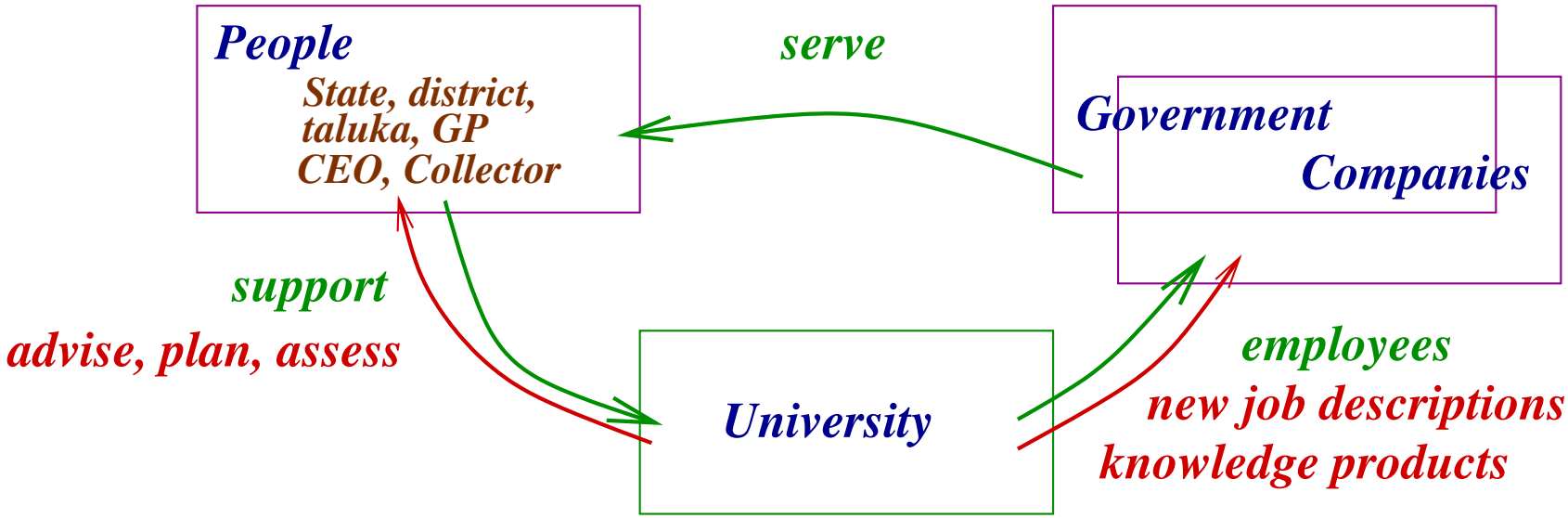



New jobs!

- Energy expert. Drinking Water consultant.
- District Public Transport Manager. Taluka-level planner.
- Access to research. Access to rigour!

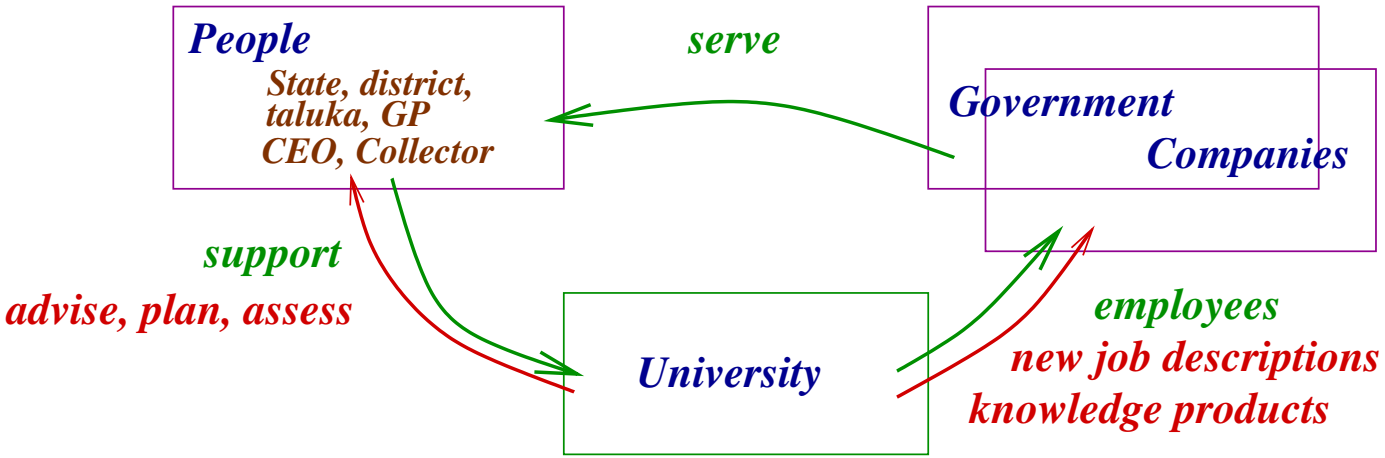
# The New Institution




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 New Institution




## The Mechanism: The Engineering Case-Study

- End-user defined, quickly usable and deployable.
- Concrete context and clear processes and protocols.
- *Rigorous!* Repeated case-studies in different situations.
- *International-quality Research!!* Development of practices as sites for innovation.

# The concrete cycle-I

- Energy bill reduction through the use of solar dish.
- How to make leaf-plate making more efficient.
- Temperature regulation in poultry farm.
- Supply chains for bio-mass power plants.

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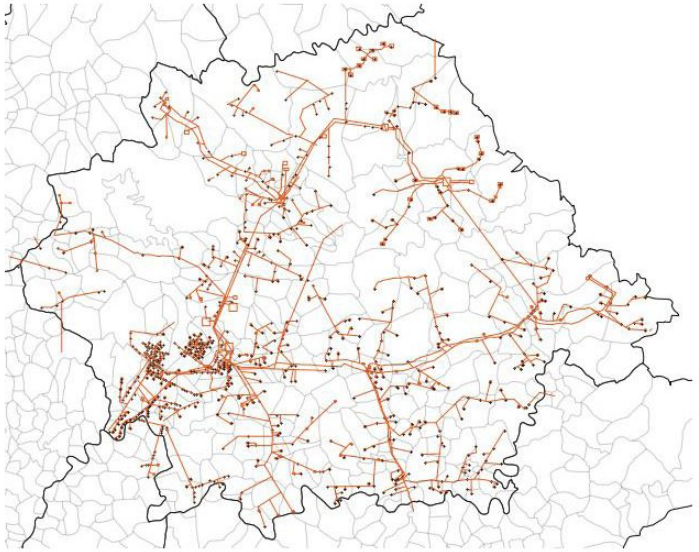
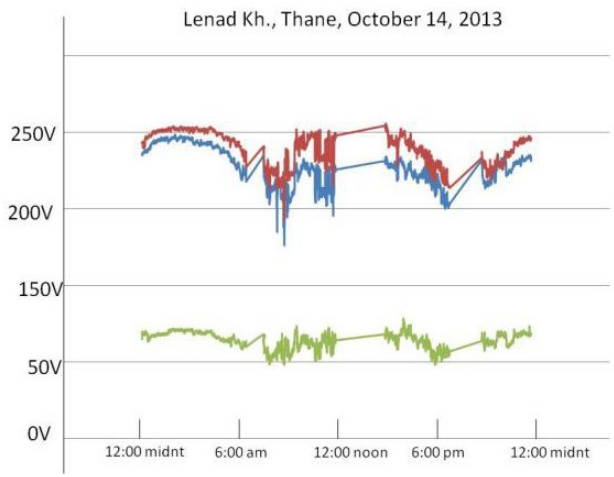
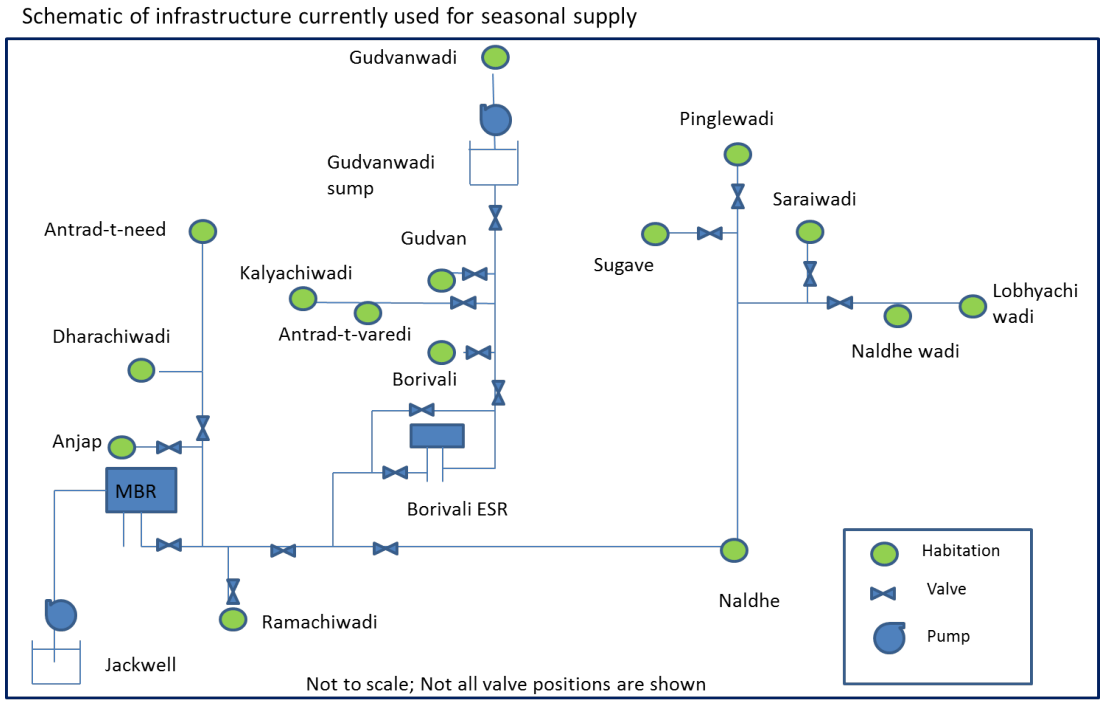





- Power quality meter-3-phase, voltage, power factor, harmonics
- Measurements at irrigation pumps
- Mapping of *taluka* grid.

# Simulation and Analysis

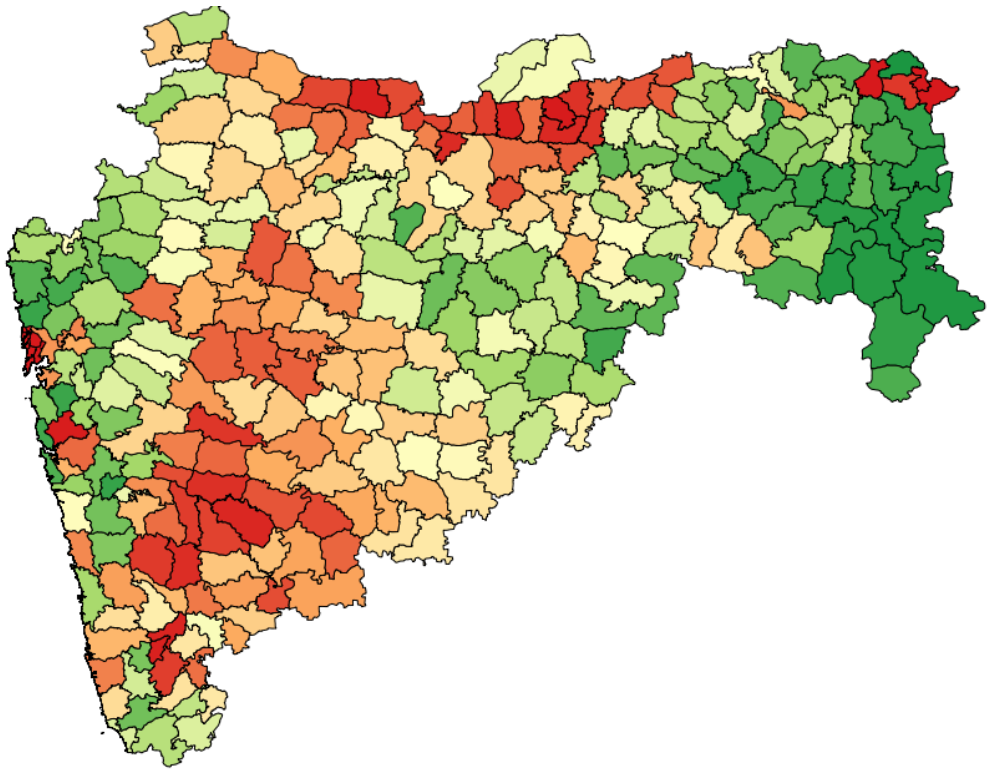



Analysis of a failed rural regional(RR) Water supply scheme. Designs for many other.

# More Development Oriented


Rooftop solar plan for a complete gram-panchayat (Kerala).

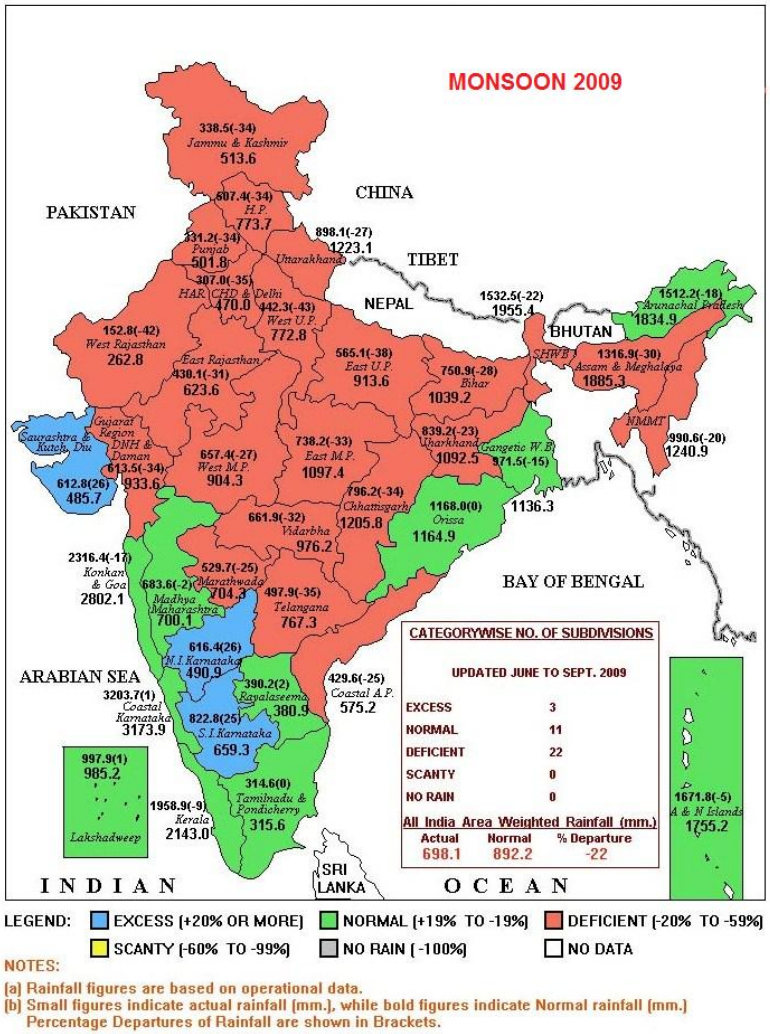
# State-wide policy research



Groundwater models for all watersheds in Maharashtra.

# This year, this project...Drinking Water

- Crucial and increasingly under stress.
- Largely scientific and analytical.
- Rich in inter-disciplinarity, region-specificity.
- New professions, PPP, managers.
- Clear stake-holders and partners.



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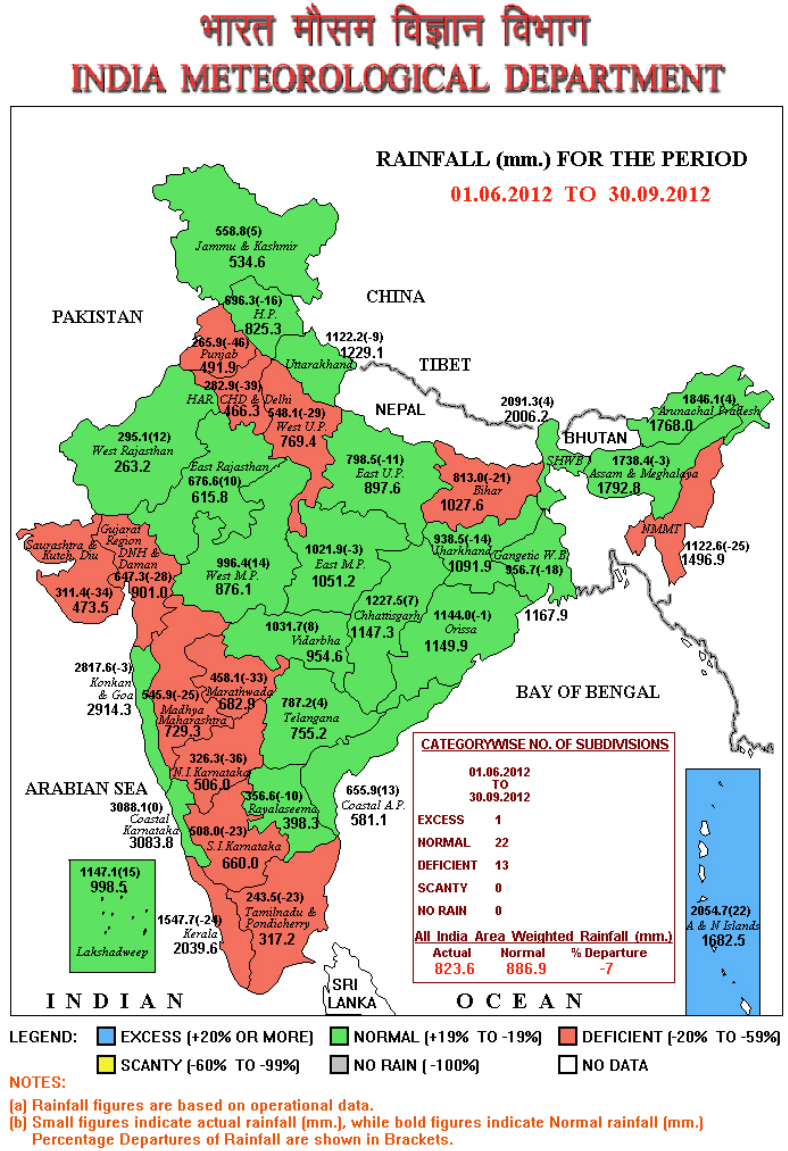

# Coming back...Key Objectives and TEQIP

- institutions to be geographically relevant,
- develop engineering as an interdisciplinary practice which is aligned to the states objectives and programmes and
- to carry out demand driven research and innovation

**What is required to do this?**: Use the drinking water sector as a vehicle!

- Examine the regional role of institutions.
- Examine what needs to be taught and researched.
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# Our Proposal

A structured collaborative project between IIT Bombay and participating TEQIP institutions.

To start with:-Water Sector, esp. Drinking Water and Sanitation

- to strengthen the outcomes of the TEQIP II programme , and
- bridge the gap between class room learning and field experience in the engineering curricula
- to develop a shared ability to undertake relevant research and training in the field of drinking water
- develop a state-wide knowledge network of regional institutions working in the drinking water sector and all its components
- provide for well trained professionals in the water sector

# ...and Today

- An overview of the Drinking Water sector and its components.
- Case studies in various components.
- Academic programs to support project-based/case-study research.

LUNCH

- Structure of Govt. of Maharashtra programs.
- From TEQIP institutions.
- The way ahead and wrapping up.

# The Steps

## Step I. Is your institution interested?

- Familarity with the sector?
- Will such academic and research programs be valuable?

## Step II. The Research Agenda.

- Design of research program. Selection of tools, case studies.
- Budgets, outcomes, people, liaisons.
- TEQIP related issues. Implementation and documentation.

## Step III. Academic Programs and Regional Presence

- UG and PG project based course-work.
- Seminar series, support cell, publications.
- Empanelment in state-level and district level programs.

# How can IIT help

- Joint training programs on special topics, e.g., Rural Drinking Water.
- Joint offering of courses, esp. project courses in the summers.
- Starting a Case-Study series and selection and publication of good projects.
- Provide coordination help with institute's Technology and Development programs.
- Share data.Initiate joint projects.
- Networking with other colleges and institutions to work with GoM and GoI.

Workshop website:
http://www.ctara.iitb.ac.in/water/teqip-iitb-water-2014

# Thanks