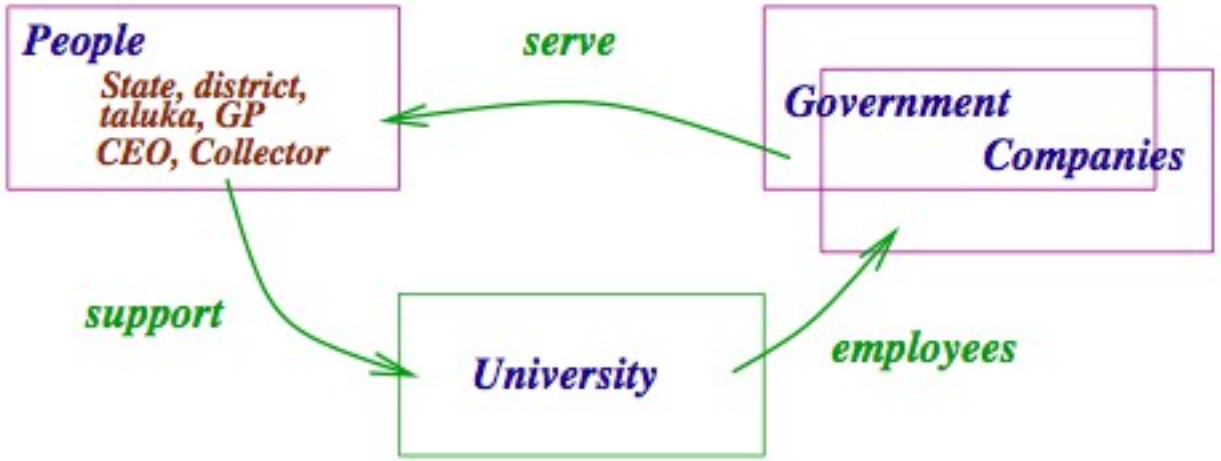
Development and Academic Programs

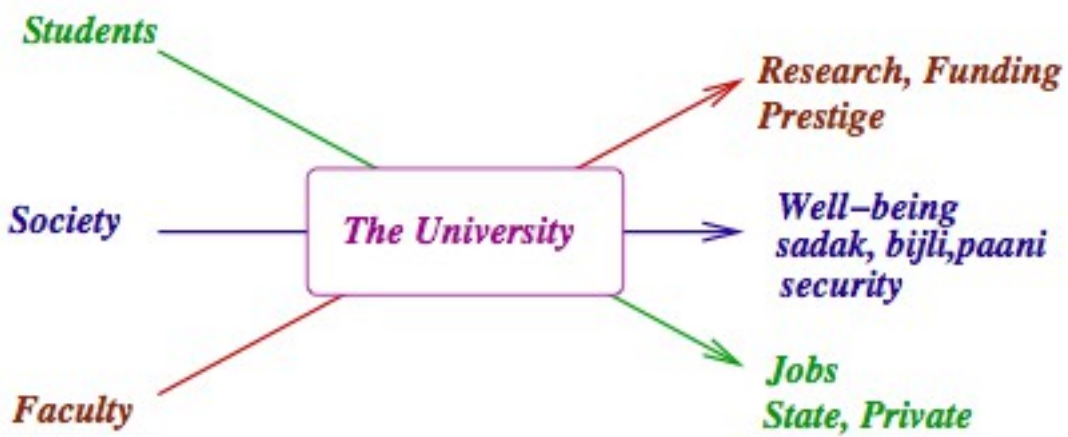
Puru Kulkarni
CTARA and CSE, IIT Bombay

TEQIP-IITB Consultation Meeting
Research and Innovation in the Water Sector

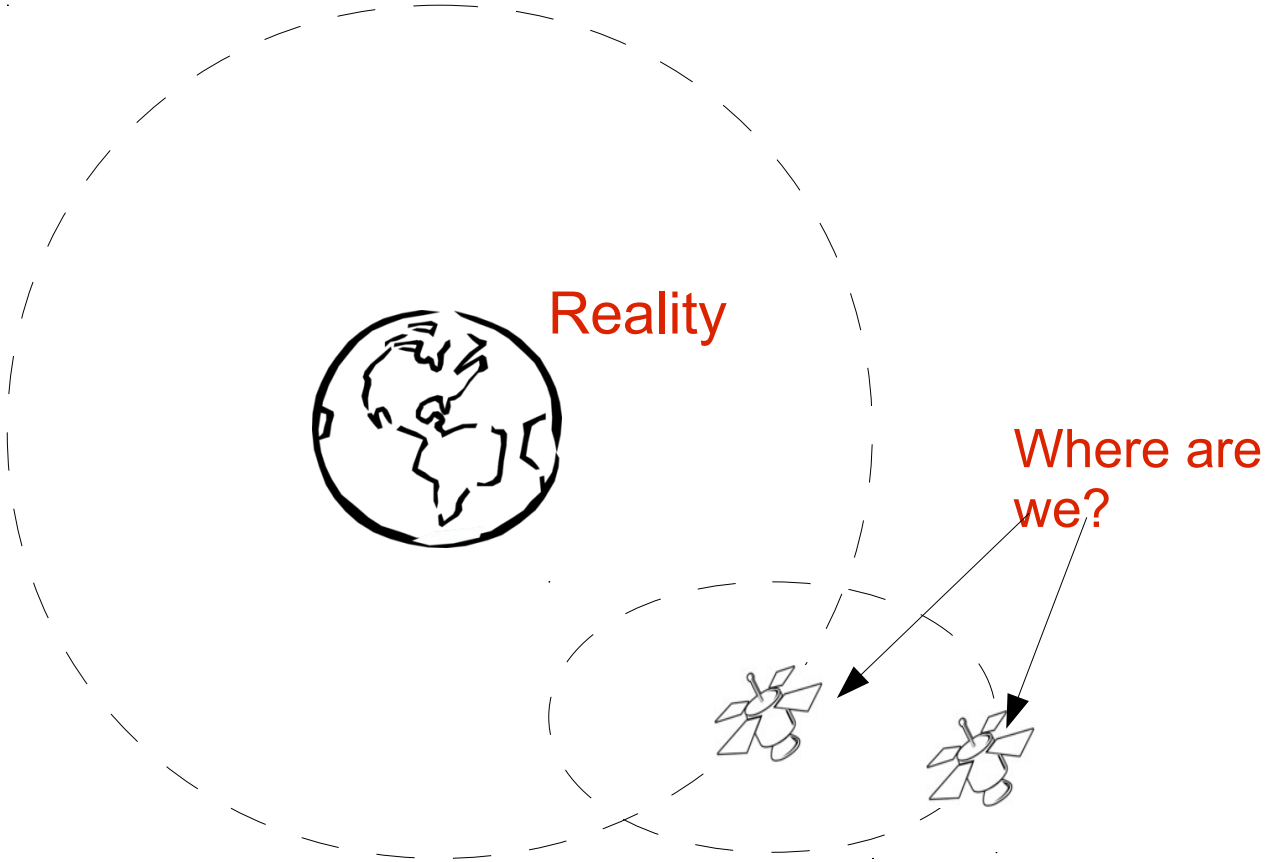
12th September 2014

Recap: The University *disconnect*



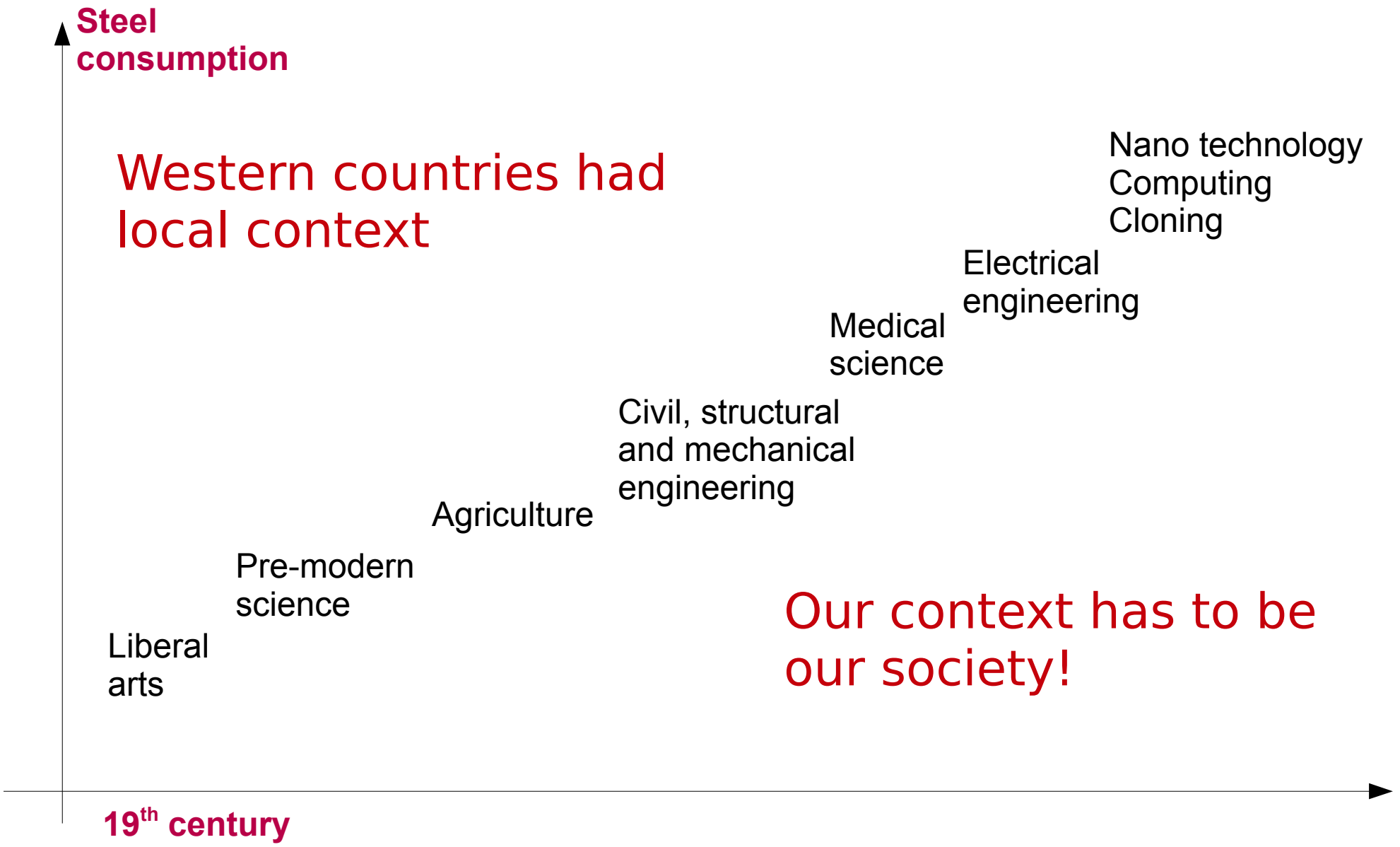


Reality/context for Universities

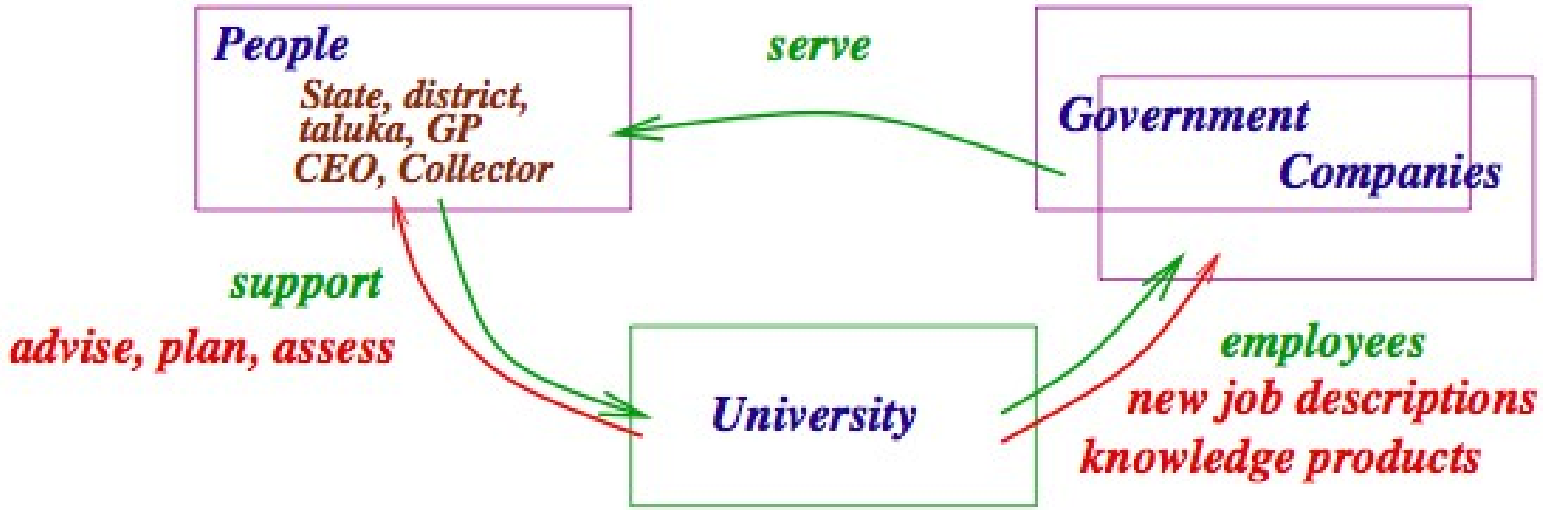


- Should road to Kurlod go via MIT or ... ?

Trajectory of the University



Recap: The New Institution



- The University
  - Largest civil society organization
  - Third-party *peoples* consultant
  - Knowledge development for *our* society

What about academic requirements?

thermodynamics

heat transfer

structural design

fabrication

air quality testing

experimentation
& analysis

technology design
& dissemination

people-centric

environment

health

opportunity costs
(important gender issue)

employment

TDSL

Technology & Development Supervised Learning

TDSL mandate

- Knowledge generation for direct intersection with society
  - Enable from within academic program
- Focus on development issues
  - water, energy, health, agriculture, environment, malnutrition, infrastructure, ...
  - all issues people

TDSL principles

- Pre-requisites
  - Bottom 80% of the society
  - Core issue and sectors
  - Delivery is prime
- Development problems require good/sound engineering methodology
  - In fact “real” problems are harder!
  - Use primary experience to understand intersection of engineering and society
  - Our reality is our problem and solution domain

TDSL structure

- td390 study
  - introduction to field work, stakeholders
  - identification and formulation of problem
- td490 analysis
  - knowledge generation for specific situation
  - analyse problem and solution space
  - stakeholder inputs, situation analysis
- td491 design
  - knowledge application and creative component
  - field testing of outputs

TDSL and IITB

- Passed by IITB Senate as a formal academic course
  - On par with any other credits-course
- Important part of Institute's presence in the development sector
- Stakeholder's day
  - MoRD, WSSD, GP

TDSL execution

1. Question, narrative and expected deliverables

   Background, stakeholders, scope of problem, context

   Secondary data, related literature, govt. schemes ...

2. Methodology

   Basic tools, protocols, surveys, interviews, softwares, design of gadgets/solutions ...

3. Schedule

   Timelines, meetings, field visits, budgets ...

4. Closure and delivery

   Report, presentation, reporting to stake holder

TDSL offering

- First offering: Autumn 2009

- Targeted towards under-graduate (B.Tech) students
- Students earn course credits for TDSL
  - Post-graduate offering in the pipeline

  - Student participation encouraging
    - ~100 students per year
    - Repeat registrations

- Summer interns

TDSL expectations

- ~100 hours over the semester
  - ~9 hours per week (6 credits equivalent)
  - ~5 field visits + time at IIT

- Interest to learn about real problems and its connections with engineering/technology/design

TDSL topics

- All faculty members of institute invited to float topics
  - Often used to do initial field work for research
  - To understand problem components
- TDSL co-ordinator works with faculty members to align topics with TDSL goals
- All topics need field visit component
- Each topic/project has 2-3 students/group

Sample projects

Drinking water security assessment

Documenting pottery making techniques

Brick making practices and interventions

Oral histories of peoples issues

Water sources status mapping

NREGA analysis

Chulla dissemination and cooking practices

Understanding public health systems

Low-cost pulse recorder

Design of piped-water supply schemes

Economic analysis of weekly markets

Analysis of sewage mgmt. techniques

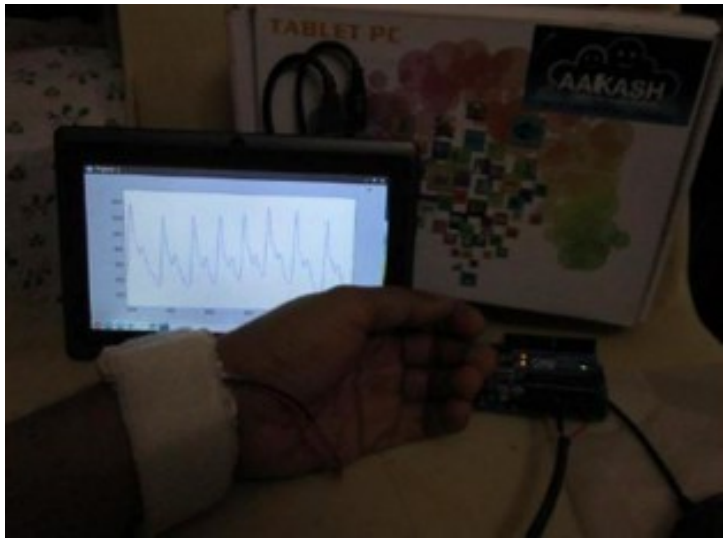
Failure analysis of water schemes

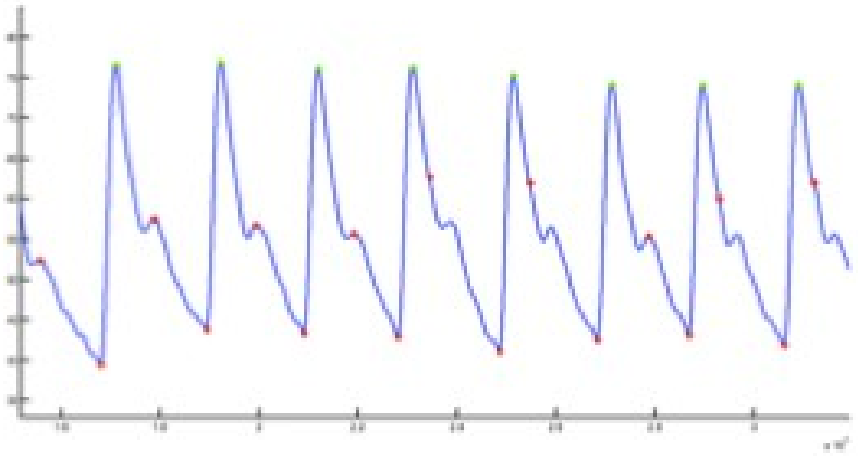
Techno-economic analysis of poultry farms

Survey and analysis of bio-gas plants

Village-level environmental planning

Design of low-cost pulse analyzer





- Diagnosing cardio-vascular diseases is expensive
- Need a low-cost early detection system
- **Output**
  - Design and implementation of a low-cost device to be used at PHCs

Piped network for 70 villages

- Severe water scarcity in the summer
- Is a regional piped water supply scheme feasible?
- Process
  - Demand assessment, source identification, hydraulic simulations
- **Output**
  - Demonstrated feasibility of regional scheme meeting govt. norms

Feasibility of solar pumps for irrigation

- Feasibility study of solar/grid/diesel pumps
- **Process**
  - Survey of 4-5 solar pump installations
- **Output**
  - Understanding of maintenance protocols, pump sizing, community management process, battery

TDSL summary 1/2

- Understand problems of society to improve society
  - Start with problem not with solution
  - Study, analyse and design based on local context
  - Stakeholder is prime
- Modular design
  - Can be incorporated in local/regional colleges
  - Local knowledge centers
- An important experiment in the pedagogy of engineering and society
  - TDSL not about charity!
- Enabling the *development professional*

TDSL summary 2/2

- Interdisciplinary by design
- Student-driven development outputs
  - Manuals, training modules, case studies, audits, data collection and representation ...
  - Improve regional knowledge archive
- Applied engineering solutions are *publishable*
  - *Reforming Rural Drinking Water Schemes, The Case of Raigad District in Maharashtra, EPW*
    Pooja Prasad, Vishal Mishra, and Milind Sohoni
    Vol - XLIX No. 19, May 10, 2014
  - *Thermal performance evaluation of a four pan jaggery processing furnace for improvement in energy utilization*
    Vishal R. Sardeshpande, D.J. Shendage, Indu R. Pillai
    3rd International Conference on Sustainable Energy and Environmental Protection, 2010

The way ahead

- Can TDSL be instantiated in your college?
  - TEQIP offers leeway
  - IITB can help formulate structure, whet projects
- Develop regional knowledge centers
  - Documentation of all chullas in a taluka
  - Water security status of a taluka
  - Ground water level monitoring
  - GISE cell for data representation
  - Energy audits of public services
- TDSC (Technology and Development Solutions Cell)

thank you

puru@cse.iitb.ac.in

http://ctara.iitb.ac.in/tdsl