Unnat Bharat Abhiyan

IIT Bombay’s participation
Presentation at IIT Delhi on September 17, 2015

Mechanism & Activities
CTARA Highlights

- Centre at IIT Bombay since 1985
- M Tech. in Technology & Development since 2007
- Interdisciplinary in nature
- Focus on field experience, solving real life problems, targets the bottom 80%
- Technology, analysis and quantification – for development
- Research in Technology and Policy
CTARA Technologies

Innovation – reduced burden

Improved Herbal oil extraction process

Sold by local blacksmiths

Twisted tape swirlers
CTARA Research

- Water
- Energy
- Food & agriculture
- Environment
- Rural planning
- Agro-based industries

[Diagram showing various research areas and systems]
I. Unnat Bharat Abhiyan - Mechanism

- **Five GOALS of UBA**
  - introduce the development agenda within academic discourse and processes
  - inculcate a methodology of field-work and inter-disciplinarity in academic processes
  - make higher education institutions as regional knowledge providers for regional problems
  - improve development outcomes such as sadak, bijli, pani through better knowledge
  - inculcate a scientific thinking within society, esp.

However the work at CTARA is more systemic or sectoral and not only about specific villages and *yet satisfy the broad objectives enshrined by Unnat Bharat Abhiyan.*
Achieving goals of UBA through CTARA

Goal 1: introduce the development agenda within academic discourse and processes

### Academic Programs

- M Tech. program in Technology and Development (TD)
- Ph. D program
- The Technology and Development Supervised Learning (TDSL)
- Minor program in Technology and Development for B Tech.

### Students Enrollment

<table>
<thead>
<tr>
<th>Program</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>M Tech.</td>
<td>64</td>
</tr>
<tr>
<td>Ph. D</td>
<td>20</td>
</tr>
<tr>
<td>TDSL</td>
<td>&gt; 500 since 2010</td>
</tr>
</tbody>
</table>

M Tech. students interacting with students from all over the country through video-conference
Technology & Development Supervised Learning (TDSL)

- Design of watershed interventions
  - Drinking water security assessment
  - Brick making practices and interventions
    - NREGA analysis
  - Understanding public health systems
    - Design of piped-water supply schemes
    - Analysis of sewage mgmt. techniques
      - Techno-economic analysis of poultry farms
  - Survey and analysis of bio-gas plants

- Electricity supply monitoring
  - Documenting pottery making techniques
  - Oral histories of peoples issues
  - Agro-based industrial Development
    - Chulla dissemination and cooking practices
    - Soil and agricultural practices
    - Low-cost pulse recorder
  - Economic analysis of weekly markets
    - Analysis and design of solar based pumping systems
    - Village-level environmental planning
    - Failure analysis of water schemes
    - Low-cost power meters
A. Extensive field experience for most of the courses such as:

- TDSL - B Tech. fieldwork intensive course with 4-5 field visits
- TD 609 - Field stay (10 weeks field stay in a village)
- TD 602 - Soil, Land use GIS, Agriculture
- TD 605 - Appropriate Technology
- TD 691 - Development Protocol
- TD 603 - Water Resource Management

B. Interdisciplinary research work both by M Tech. and Ph. D students

Goal 2: inculcate a methodology of field-work and inter-disciplinarity in academic processes
Summer Field Stay

March
- Identification of Village and DR

April
- Student – Project – Guide Tieup

May - July
- Field Work, Faculty Visits

July
- Experience Sharing

August
- Draft Report, Development of Indices
Goal 3: make higher education institutions as regional knowledge providers for regional problems

Local Collaboration

- Resolutions of Government of Maharashtra
- Collaboration with local Engineering Colleges
- TDSL (project based B Tech. course)
- TDSC (consultant to NGO, GP, Municipal bodies and district authority)
- TEQIP (teachers of regional engineering colleges)

Parbhani city water supply scheme analysis

Rural piped water network design for Tembha village
Resolutions of Government of Maharashtra

GR-Water and Sanitation

GR-Higher & Technical Education

Mahrashtra Government

Water and Sanitation

GR-Water and Sanitation

Mahrashtra Government

Higher & Technical Education

Mahrashtra Government

Higher & Technical Education
Technology & Development Solutions Cell (TDSC)

- Address development consultancy / solutions requirements of regional bodies like municipal corporations & GPs
- Payment model!
- Develop Service model for the bottom 80% that engages young engineers
- Formulate development protocols & case studies for dissemination to regional colleges
- Provide launching pad for entrepreneurial careers in the development sector
- Development of course work, manuals and training modules

Watershed intervention at Kurlod Botoshi Mokhada, Thana Dist.

Drinking water model for Themba Village Shahpur, Thane Dist.
Achieving goals of UBA through CTARA

Goal 4: improve development outcomes such as sadak, bijli, pani through better knowledge

Collaborations with government agencies and impact through research works:

- Ministry of Rural Development fellowship (research to improve outcomes of flagship projects of MoRD)
- MoUs with towns, district administrations and talukas (e.g., Parbhani, Shahpur, Thane, Manchar)
- Technology and Development Solutions Cell (TDSC)
- Hindustan Aeronautics Limited (HAL) -CSR fellowships
- NGO (directed research during TD609)
- Rural Technology Action Group (RuTAG)
- Assessments/Evaluations for GoM and ZP

RuTAG project
Off shore fish cooling

RuTAG Workshop on Rain Water Harvesting
Achieving goals of UBA through CTARA

Goal 5: inculcate a scientific thinking within society, esp. about development

Interaction with communities through different activities such as:

Working with MPs, MLAs, GPs, civil society
Give talk, publish articles, contribute to scientific papers, conduct exhibitions by showcasing innovations & technology in the science community
Cooking energy solutions
Malnutrition among children
Community level biogas plan
Losses and poor voltage regulation on rural distribution network
Drinking water scheme for tanker fed villages in Mokhada taluka

PhD work on fuel efficient cook stove in a tribal village
Community level biogas
Challenges—Development!

- Development outcomes stagnant or worsening—*drinking water, cooking energy, small and medium enterprises, environment*
- Urgent need to reform Higher Education and Research

**UBA an important initial step**
### Challenges: Several Elephants in the room

<table>
<thead>
<tr>
<th>Poor understanding of the development agenda within the IITs/IISERS/NITs</th>
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</thead>
<tbody>
<tr>
<td>Cooking energy, drinking water, sanitation etc. require the highest amount of intellect and rigour</td>
</tr>
<tr>
<td>The road to global excellence is through solving concrete problems</td>
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<table>
<thead>
<tr>
<th>Incentives going the wrong way</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutions: Main accountability lies in holding JEE/GATE and writing papers</td>
</tr>
<tr>
<td>Faculty: Easier to publish and present in Hong Kong than to work in a district. <em>And it counts!</em></td>
</tr>
<tr>
<td>Students: Few go to Indian engineering. Very little training/research related to Indian situations.</td>
</tr>
</tbody>
</table>
Way Ahead

- Create space in current academic programs for *inter-disciplinary* development engineering.
- Develop case-study model as valid academic and research output. Start a Development Engineering Section on *Sadhana* and *Current Science*
- Allow for cross-disciplinary faculty and create intermediate and adjunct positions
- Reform TEQIP to enable collaborations with regional colleges on development agenda
- *Create engagement opportunities between state agencies and academia*
- Tie fraction of DST/DBT etc. funding to long-term engagement based research
II. Unnat Bharat Abhiyan- Activities

UBA Villages across Maharashtra
<table>
<thead>
<tr>
<th>Districts</th>
<th>Taluka</th>
<th>Village</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Thane</td>
<td>Shahapur</td>
<td>Bakul Rao</td>
</tr>
<tr>
<td>2 Thane</td>
<td>Vehloli BK</td>
<td>Bakul Rao</td>
</tr>
<tr>
<td>3 Thane</td>
<td>Kharade</td>
<td>Bakul Rao</td>
</tr>
<tr>
<td>4 Thane</td>
<td>Ambekhor</td>
<td>Bakul Rao</td>
</tr>
<tr>
<td>5 Thane</td>
<td>Ambivali</td>
<td>Bakul Rao</td>
</tr>
<tr>
<td>6 Palghar</td>
<td>Bhivandi</td>
<td>Savaroli</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S Kedare/U Bhandarkar</td>
</tr>
<tr>
<td>7 Palghar</td>
<td>Mokhada</td>
<td>Khoch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Puru Kulkarni / Milind Sohoni</td>
</tr>
<tr>
<td>8</td>
<td>Palsunde</td>
<td>Om Damani</td>
</tr>
<tr>
<td>9</td>
<td>Dolhare</td>
<td>Priya Jadhav</td>
</tr>
<tr>
<td>10</td>
<td>Koshimshet</td>
<td>N.C. Narayanan</td>
</tr>
<tr>
<td>11</td>
<td>Wada</td>
<td>Kochepepa</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S Kedare/U Bhandarkar</td>
</tr>
<tr>
<td>12</td>
<td>Vasai</td>
<td>Saivan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S Kedare/U Bhandarkar</td>
</tr>
<tr>
<td>13</td>
<td>Talasari</td>
<td>Paraspsda</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ganesh Ramakrishnan</td>
</tr>
<tr>
<td>14</td>
<td>Vikramgarh</td>
<td>Kondgaon (Bhopoli)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narendra Shah</td>
</tr>
</tbody>
</table>
| 15        |                    |                                  | Cont...
<table>
<thead>
<tr>
<th>Districts</th>
<th>Taluka</th>
<th>Village</th>
<th>Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Akola</td>
<td>Rajur</td>
<td>Narendra Shah</td>
</tr>
<tr>
<td>17</td>
<td>Ahmednagar</td>
<td>Kothale</td>
<td>S Kedare/U Bhandarkar</td>
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<tr>
<td>18</td>
<td>Sangamner</td>
<td>Pimpalgaon matha</td>
<td>S Kedare/U Bhandarkar</td>
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<tr>
<td>19</td>
<td>Amravati</td>
<td>Lawada</td>
<td>S Kedare/U Bhandarkar</td>
</tr>
<tr>
<td>20</td>
<td>Dharani</td>
<td>Kotha</td>
<td>S Kedare/U Bhandarkar</td>
</tr>
<tr>
<td>21</td>
<td>Aurangabad</td>
<td>Khamkheda</td>
<td>S Kedare/U Bhandarkar</td>
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<tr>
<td>22</td>
<td>Yeotmal</td>
<td>Tivsa</td>
<td>S Kedare/U Bhandarkar</td>
</tr>
<tr>
<td>23</td>
<td>Pandarikavra</td>
<td>Pathari</td>
<td>S Kedare/U Bhandarkar</td>
</tr>
<tr>
<td>24</td>
<td>Pen</td>
<td>Shedashi</td>
<td>Anand Rao</td>
</tr>
<tr>
<td>25</td>
<td>Raigad</td>
<td>Gagode</td>
<td>Anand Rao</td>
</tr>
<tr>
<td>26</td>
<td>Khalapur</td>
<td>Ransai</td>
<td>Anand Rao</td>
</tr>
<tr>
<td>27</td>
<td></td>
<td>Vavoshti</td>
<td>Anand Rao</td>
</tr>
<tr>
<td>28</td>
<td>Satara</td>
<td>Phaltan</td>
<td>Kapshi</td>
</tr>
<tr>
<td>29</td>
<td>Raigad</td>
<td>Hirewadi</td>
<td>Vikram Gadre</td>
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<tr>
<td></td>
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<td></td>
<td>Ganesh Ramakrishnan</td>
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</tbody>
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Research Themes

- Water – Milind Sohoni (15 faculty)
- Energy – Priya Jadhav (21 faculty)
- Agriculture – Amit Arora (14 faculty)
- Health – Santosh Noronha (12 faculty)
- Education – Raja Mohanty (11 faculty)
- Livelihood – D Parthasarathy (11 faculty)
- Sanitation, Food, Planning, Transportation, Governance – few faculty
  - Detail out goals and activities of thematic groups
Timeline of UBA team visit to villages

Kothale
Pimpalgao
matha
Lavada
Kotha
Khamkheda
Tivsa
Pathari

Nov 2014
Dec 2014
Jan 2015
Feb 2015
Mar 2015
Apr 2015

Sakadbav
Kharade
Savroli
Kochipada (2)
Saivan
Arnala
Rajur
Shedashi
Gagode
Vavoshi (2)
Ransai (2)

Savroli
Vavoshi

Mokhada

Toranmal
Pathari
Tivsa
Kharade

Kharade
GP Meeting at Shahapur
11th Dec 2014

Water Survey in Vavoshi
11th Jan 2015
Baseline Survey in Kharade GP
(14th Feb 2015)

- Survey was done mainly by NSS students, with the help of Mtech. students from CTARA and IDC
- Sample size: 173 HH from 10 padas
- Some of the findings are:
  - Around 80% people are in BPL status
  - 70% villagers leave waste water in open due to lack of proper waste water disposal system
  - Around 64% people have well as their source of drinking water, which may be contaminated
  - Due to absence of any hospital facility in the village, more than 50% people go to private hospitals in Dolkham, Shahapur or sometime as far as Kalyan for treatment
  - More than 90% people depend on firewood as fuel for cooking
PRA in Kharade GP (2\textsuperscript{nd} April 2015)

- Covered 3 padas- Padwalpada, Kharade and Changyachapada
- Around 30 students conducted this activity
- Activities: Transect walk, Seasonality, Timeline, Venn diagram, Daily routine, Resource map, Social map, Focused group discussion, Issue ranking
Projects in UBA villages

- RuTAG Projects in rural areas
- Technology and development of mobile lab (water, energy, soil, agriculture, envt.)
- Affordable ice making machines for boats and affordable desalination machine for boats from available heat in engine exhaust (applied under RuTAG)
- Kurlod-Botoshi integrated plan
- Developing a computer workflow system for filing and tracking scheme form and use of mobile based IVRS (Interactive Voice Response System) with TRTI
- Medical nutrition therapy (MNT) testing
- Water quality of available drinking water and other water-related issues conducted, devt. of software EPANET and water quality mapping
- Deshelling machine for the marking nut via a project through a Tata Center.
- Training and documentation center for Bamboo workers near Kotha and Lavada villages.

Proposed work in thematic areas

- Livelihood opportunities: bamboo artisans, organic farming, brick klin
- Energy: Biogas, solar, biofuels
- Health-care: Self-learning material and low-cost vital sign measuring device
- Alternatives to traditional stoves - biogas, improved chulhas, swirlers
- Rural supply chain of LPG
- Low cost solution for agro products
  - Cashew nuts disinfection
  - Rice puffing
  - Agri produce drying
Kurlod-Botoshi integrated plan & Horticulture opportunity in Mokhada villages

Biogas and IVRS projects in Talasari
Unnat Bharat Abhiyan

- Ideas / comments welcome
- Active Participation requested
- Student engagement – CTARA + rest of Institute
- Modalities
- Integration with existing projects, courses
- Detailed plan – November 2015
- Subsequently – interactions with Govt, NGOs, Local leaders and request for feedback/ support/ funding

Thank you