Water: A regional view

TEQIP Workshop

12th Sept 2014

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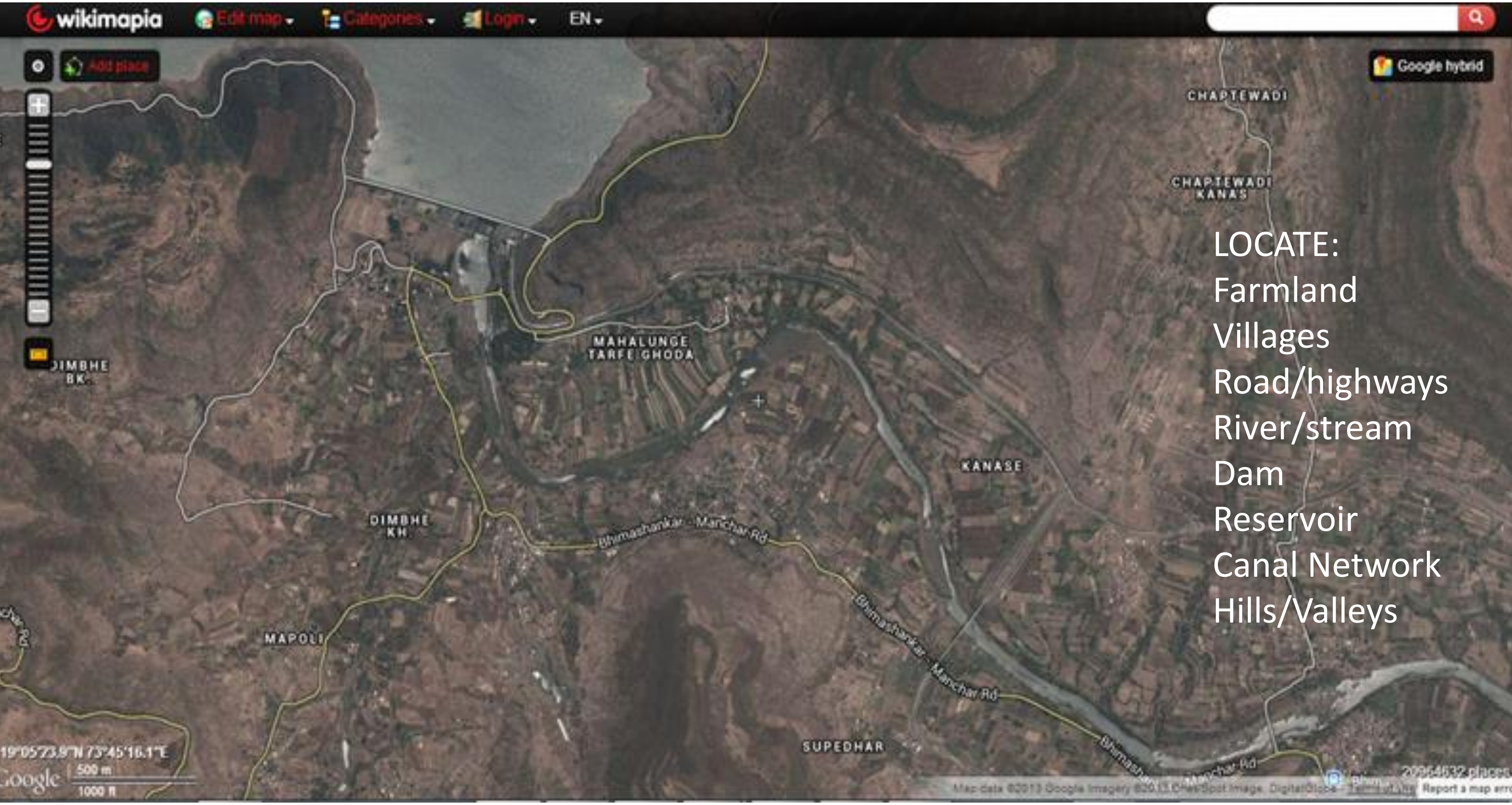
Agenda

- The regional perspective
  - Urban water
  - Rural water
- Regional water planning
  - Supply side, demand side
  - Planning activity
- Sample studies in surface water and ground water

The regional perspective

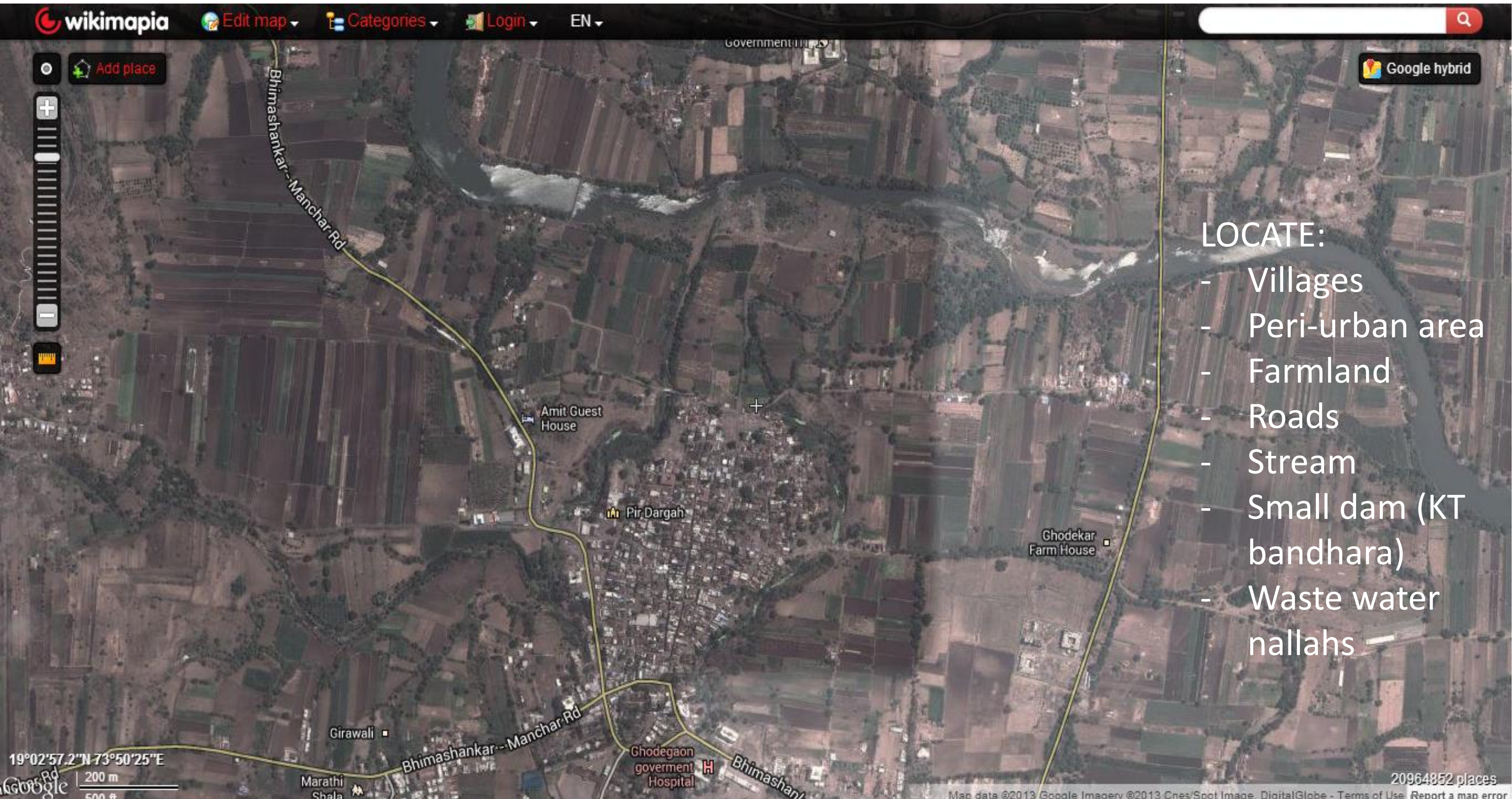
- TEQIP mandate: Colleges to be regionally relevant
  - Identify problems → academic projects → deliver to regional stakeholders
- The regional approach
  - The appropriate scale to observe trade-offs, interconnectedness of issues, stakeholders, policy
  - Requires interdisciplinary skills: makes an ideal case for the role of universities

Regional view



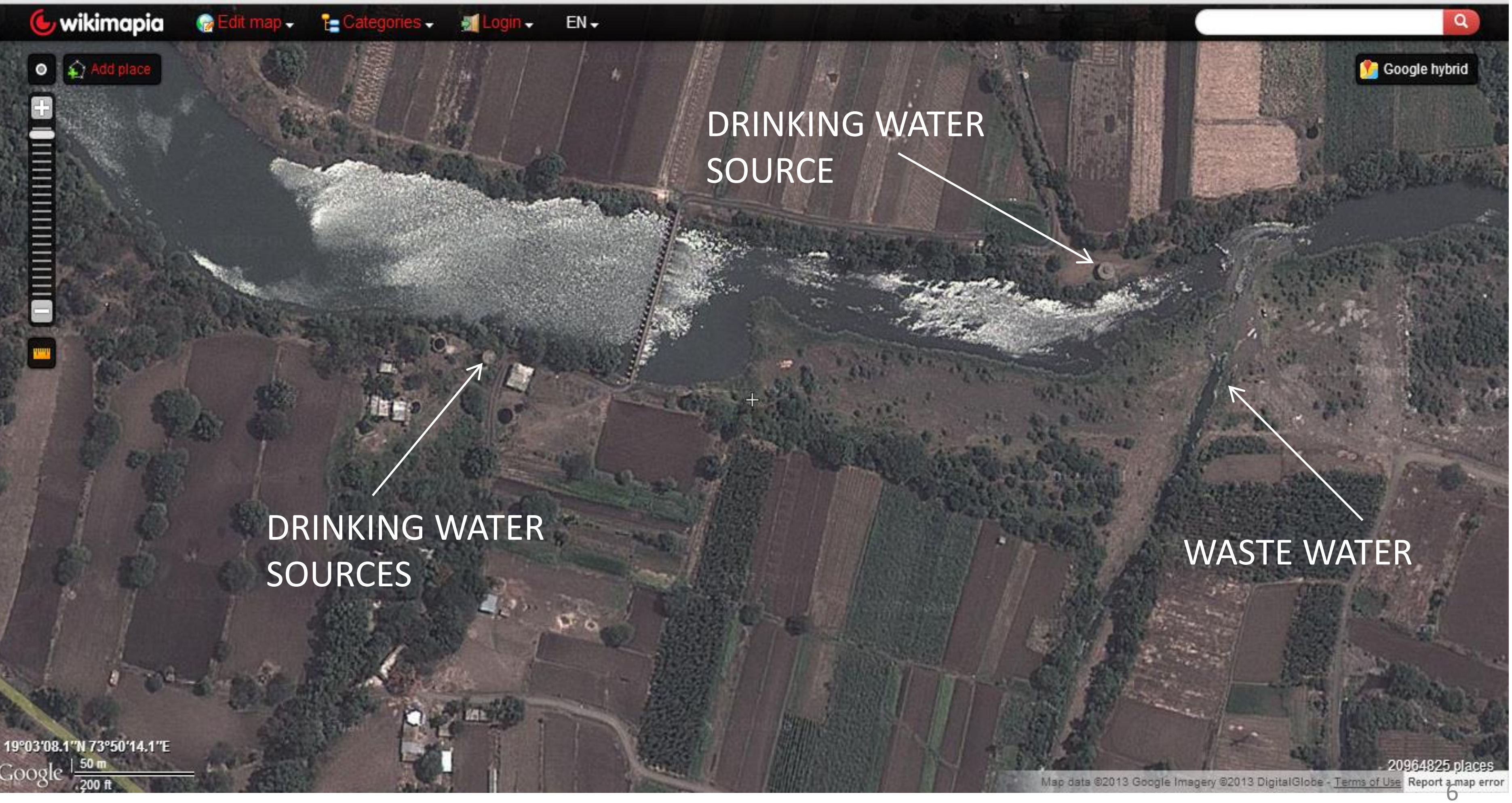
LOCATE:
Farmland
Villages
Road/highways
River/stream
Dam
Reservoir
Canal Network
Hills/Valleys

Urban/ peri-urban view



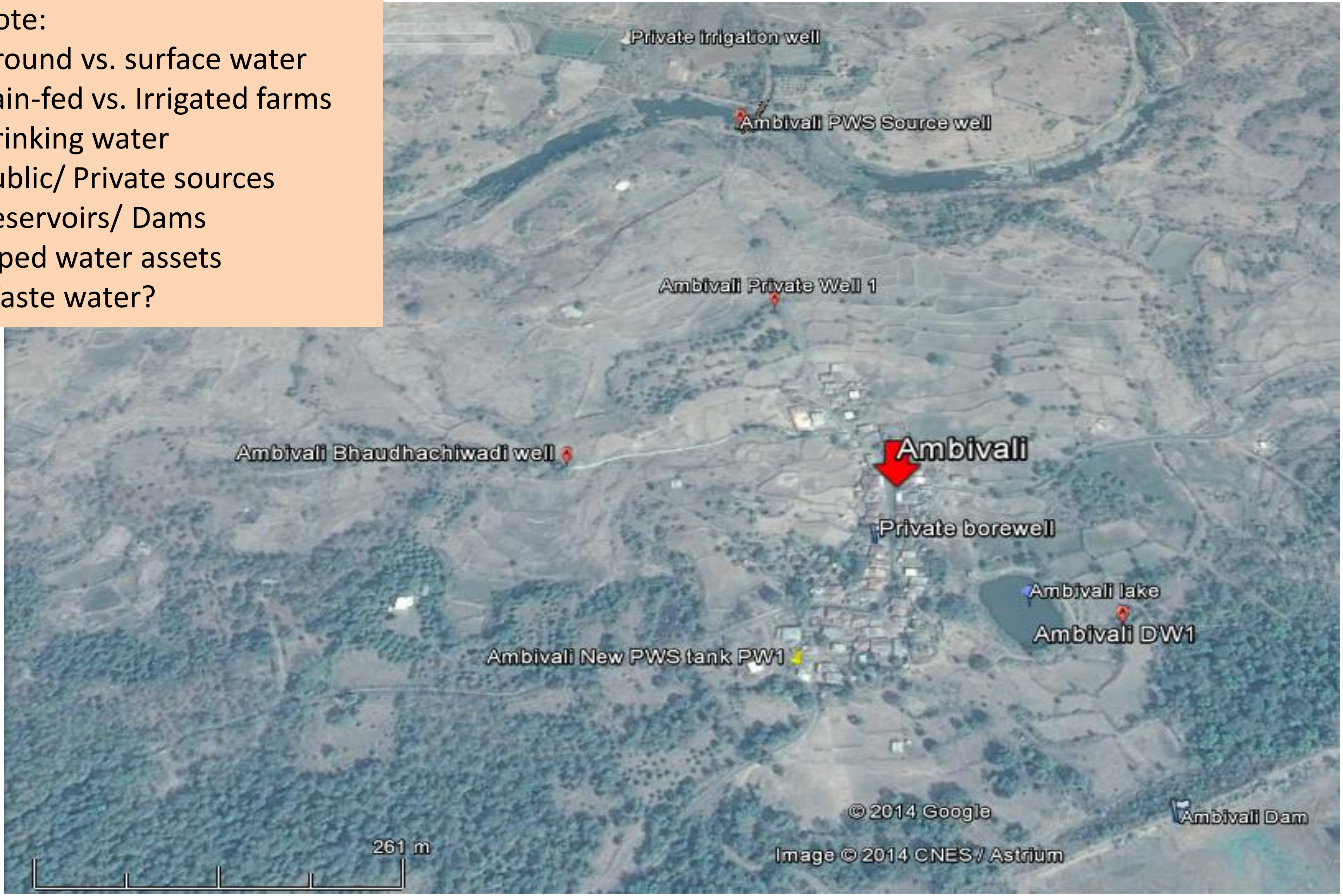
LOCATE:
- Villages
- Peri-urban area
- Farmland
- Roads
- Stream
- Small dam (KT bandhara)
- Waste water nallahs

Urban water cycle



Rural Water

Note:
Ground vs. surface water
Rain-fed vs. Irrigated farms
Drinking water
Public/ Private sources
Reservoirs/ Dams
Piped water assets
Waste water?



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Regional Water Planning – The Challenges and Need

- Competing demand from different sectors
- Overcoming seasonality problems in water availability and use
- Managing water quality
- Addressing normative concerns: efficiency, equity, sustainability

Regional Planning- Key Attributes

- The supply
  - Groundwater, Surface water, rain water
- The demand
  - Domestic use, agriculture, industry
  - Cities, towns, large GPs, villages
- Policy and Institutions
  - Current regulations and norms (e.g. reservation priorities, sewerage requirements, waste water regulations..)
  - Institutions and stakeholders (supply side, demand side, implementing agents)
- Planning process (quantity and quality)
  - Matching water supply with demand/ allocation, tariff
  - long term asset planning
  - Scarcity assessment and management
  - Long term issues of water balance, equity and sustainability

Agents

- End-users – provide service requirements
- User bodies (WUA, VWSSCs, ULBs): Representative bodies that implement, own and manage schemes
- Government departments (MJP, RWS, MI, GSDA): Technical design inputs
- Administrative bodies (Block/ district/ municipal level): approvals and channelling funds
- Elected representatives: people's voice
- Regional planning and monitoring?
  - we have a role here!

Estimating demand – Domestic use

- Rural norm
  - 55 lpcd of water available on a sustained basis within 100m of all households (NRDWP 2013)
- Urban Norm
  - Much higher
  - Norm ranges from 70 lpcd to 150 lpcd
  - Mumbai, Pune: 200+ lpcd
  - Sewerage requirements based on design lpcd

Purpose	Quantity (lpcd)
Drinking	3
Cooking	5
Bathing	15
Washing utensils and house	10
Ablution/Toilets	10
Washing of Clothes and other uses	12
Total	55

Estimating Demand: non- domestic

- Agriculture demand
  - Kharif crop typically rain fed
  - Rabi and Hot Weather crops irrigated
- Others:
  - Industries/ Non-farm enterprises
  - Public school, offices

We need to work with projected future demand!

Water Supply

- Surface Water – lake, rivers, reservoirs, canals dams, farm ponds
- Groundwater – dug wells, borewells, springs sub surface bunds, trenches, contour bunds etc.
- Rainwater Rain water harvesting structures

Planning – Putting it all together

- Design and logistics
  - Design and optimization of the distribution network (pipes, canals)
  - Design of water treatment plant
  - Logistics: cost of energy, capital and O&M
  - Simulation of the operation schedule

- Tariff, Subsidy and Ability to Pay:
  - metering, tariff structure
  - Industry/ commercial establishments subsidize domestic use
  - Irrigation: generally subsidized by state
  - Poor households generally subsidized within community

- Institutions, monitoring and feedback mechanism

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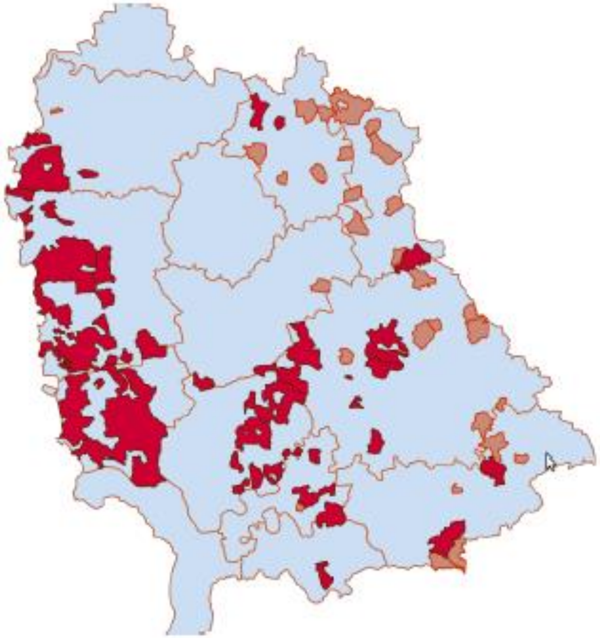
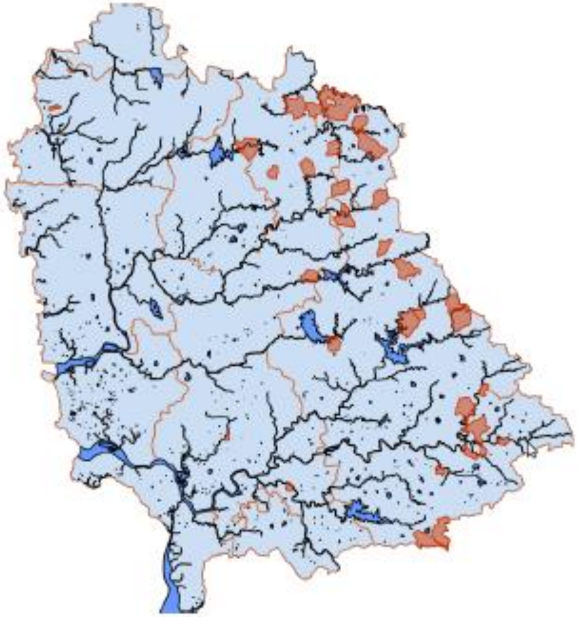
Example: Tanker fed villages in Thane district





Ongoing Projects

- Regional analysis of tanker-fed habitations – Mokhada, Shahpur
- GIS as a representation tool

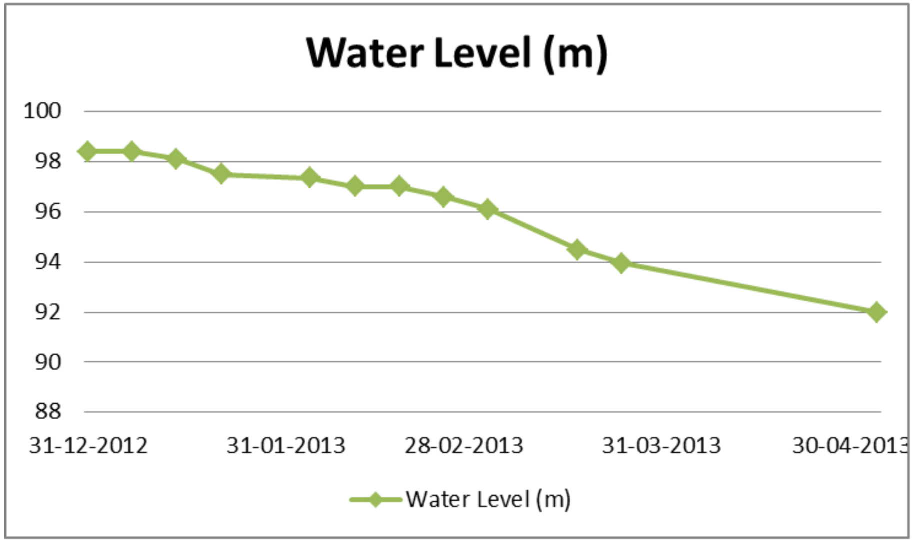
Surface sources

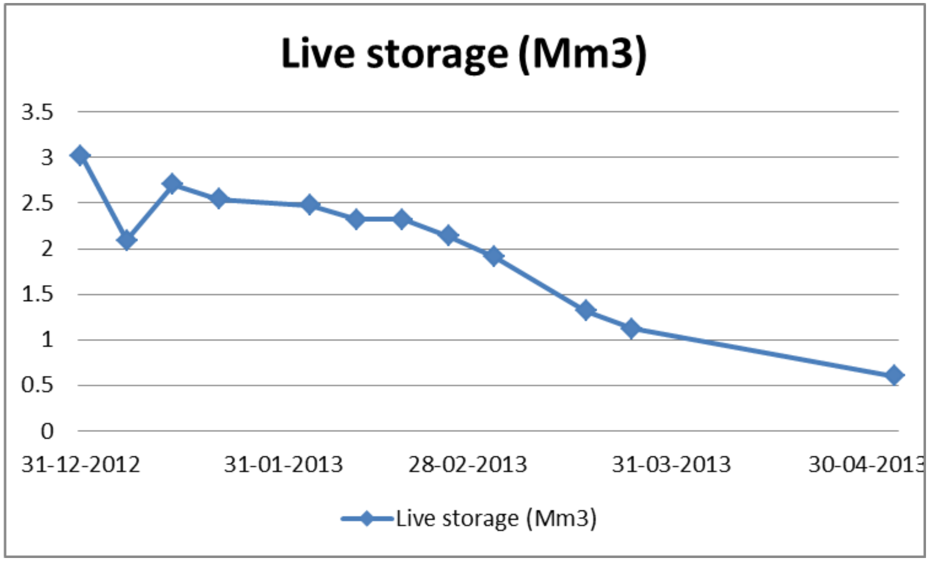
Tokarkhand reservoir

Thangaon, Nashik

Jambhe reservoir

Musai Reservoir





Small/ Medium Dams: Salient Features

1	Name of Project	:	Musai M.I.Scheme	Dolkhamb M.I.Scheme.
2	Source	:	Local Nalla	Local Nalla
	Location: State	:	Maharashtra	Maharashtra
	District	:	Thane	Thane
	Taluka	:	Shahapur	Shahapur
3	Village	:	Musai	Dolkhamb
4	Catchment Area	:	1.76 Sq.mile	3.68 Sq.miles
5	Average Annual Rainfall	:	107.7"	107.46"
6	75% dependable yield	:	244 Mcft.	-
7	Gross Storage	:	134.26 Mcft.	166.08 Mcft.
8	Dead Storage	:	5.75 Mcft.	9.32 Mcft.
9	Live Storage	:	128.51 Mcft.	156.76 Mcft.
10	Reservation for U/s	:	-	-
11	Annual Gross Utilisation	:	134.26 Mcft.	166.08 Mcft.
12	Top of Dam Level	:	103.00 m.	134.00 m.
13	H.F.L.	:	101.50 m.	132.50 m.
14	F.R.L.	:	100.00 m.	131.00 m.
15	M.D.D.L.	:	89.00 m.	120.00 m.
16	Max. Height of Dam	:	89.00 m.	19.76 m.
17	Type of Dam	:	17.90 m.	Earthen Dam.
18	Length of Earthen Dam	:	Earthen Dam.	213 m.
19	Length of Waste Weir	:	44 m.	60 m.
20	Max.Flood discharge	:	35.52 Cusecs	9284 Cusecs
21	Location of Waste Weir	:	Left side	Right flank
	Submergence area	:		65.59 Hect.

1	Name of Project	:	Musai M.I.Scheme	Dolkhamb M.I.Scheme.
	CANAL			
22	Canal length	:	3.00 Km.	7.17 Km.
23				
24	Canal Capacity	:	12.72 Cusecs	10.21 Cusecs, 4.875 Cusec
25	Area under command	:	600 Acres	196 Hect.
	(Irrigable)			
	I) Gross Command	:	1300 Acres	980 Acres
	ii)Cultural Command	:	1200 Acres	780 Acres
	iii) Irrigable Command	:	600 Acres	496 Acres
	Village benefitted	:	1) Musai, 2) Khaire.	1) Dolkhamb 2) Hedwali
	Village (Taluka wise)		-	3) Bandanpada 4) Sakurli
27	Total Cost of the Project	:	Rs.11,110.00	Rs.17,03,275/-
28	B.C.Ratio	:		2.31

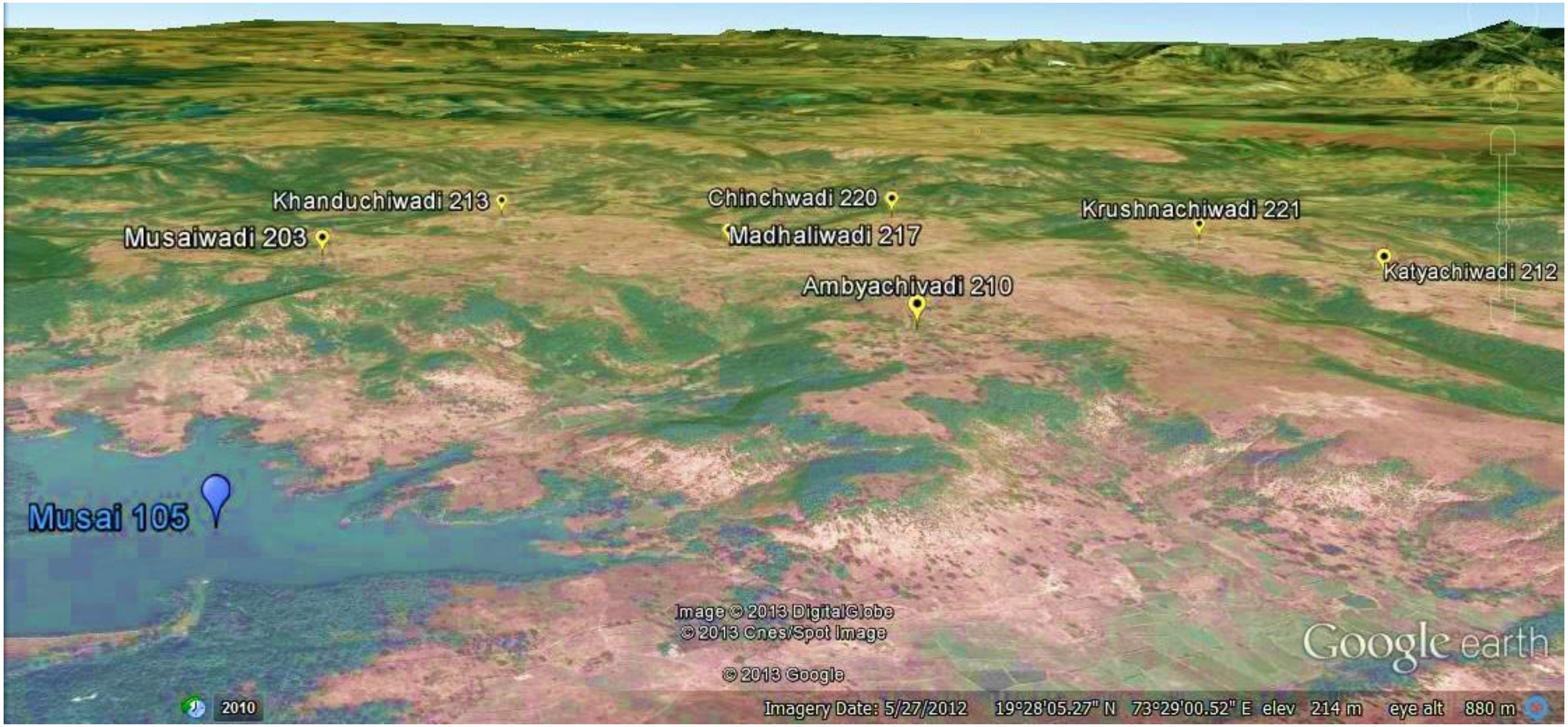
Annual Water Account for Minor Irrigation

Irrigation Year:- 2010-11

Name of Circle:- TIC Thar

Name of Division :- TMID Kalwa Thane	26	27	28	29	30	31	32
Project No.--->	635	636	637	638	639	640	641
Name of Scheme	Adivali	Dolkhamb	Jambhe	Kharade	Musai	Velholi	Hattipada
Type viz. LMI, MI, LIS, ST etc.	MI	MI	MI	MI	MI	MI	MI
District	Thane	Thane	Thane	Thane	Thane	Thane	Thane
Taluka	Shahapur	Shahapur	Shahapur	Shahapur	Shahapur	Shahapur	Vasai
Sub-basin No.	21	21	21	21	21	21	21
1. Designed Storage in Mcum							
a. Gross	2.220	4.703	5.182	2.316	3.800	3.245	2.058
b. Live	2.030	4.439	4.842	2.054	3.640	2.997	1.923
2. Maximum live storage observed in the year	2.030	4.439	4.842	2.054	3.640	2.997	1.923
3. Projected water use in Mcum for							
a. Kharif	0.000	0.000	0.000	0.000	0.000	0.000	0.000
b. Rabi	2.030	4.439	4.842	2.054	3.640	2.997	1.923
c. Hot weather	0.000	0.000	0.000	0.000	0.000	0.000	0.000
d Non irrigation	0.000	0.000	0.000	0.000	0.000	0.000	0.000
e.Total (3 a+3b+3c+3d)	**2.030**	**4.439**	**4.842**	**2.054**	**3.640**	**2.997**	**1.923**
4. Water drawn at canal head for irrigation							
a. Kharif	0.000	0.000	0.000	0.000	0.000	0.000	0.000
b. Rabi	0.945	0.400	1.357	0.950	1.290	1.560	0.300
c. Hot weather	0.000	0.000	0.000	0.000	0.000	0.000	0.000
d Total (4a+4b+4c)	**0.95**	**0.00**	**1.36**	**0.95**	**1.29**	**1.56**	**0.30**
5. Lifts From Tank							
a. Kharif	0.000	0.000	0.000	0.000	0.000	0.000	0.000
b. Rabi	0.000	0.000	0.000	0.000	0.000	0.000	0.000
c. Hot weather	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6. Evaporation Losses	0.179	0.609	0.350	0.195	0.515	0.420	0.240
7. Leakages through dam	0.668	1.887	0.000	0.028	0.625	0.260	1.271
8. Total (4d+5+6+7)	**1.792**	**2.496**	**1.707**	**1.173**	**2.430**	**2.240**	**1.811**
9. Actual Area Irrigated by Canals							
a. Kharif							
i) Area							
ii) Irrigation System Performance (ha/M	0.00	0.00	0.00	0.00	0.00	0.00	0.00
b. Rabi							
i) Area	39.70	18.30	106.90	70.00	65.00	90.13	15.00
ii) Irrigation System Performance (ha/M	42	46	79	74	50	58	50
c. Hot weather							
i) Area							
ii) Irrigation System Performance (ha/M	0	0	0	0	0	0	0
10. Actual Area Irrigated by Tank lifts							
a. Kharif							
i) Area							
ii) Irrigation System Performance (ha/Mcum)	0	0	0	0	0	0	0
b. Rabi							
i) Area							
ii) Irrigation System Performance (ha/Mcum)	0	0	0	0	0	0	0
c. Hot weather							
i) Area							
ii) Irrigation System Performance (ha/Mcum)	0	0	0	0	0	0	0
11. Non irrigation use	0.150	0.550	0.250	0.360	0.140	0.182	0.000
12. Live Storage on 30 th June	0.088	1.393	2.885	0.521	1.070	0.575	0.112
13. Replenishment in the month June							
14. Area Irrigated on wells/rivers/drains in	0	0	0	0	0	0	0

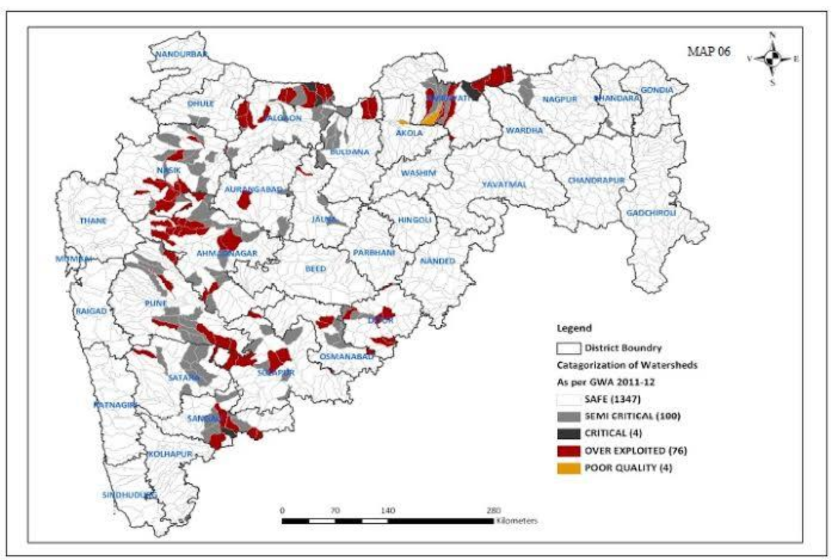
Musai Reservoir and tanker fed villages



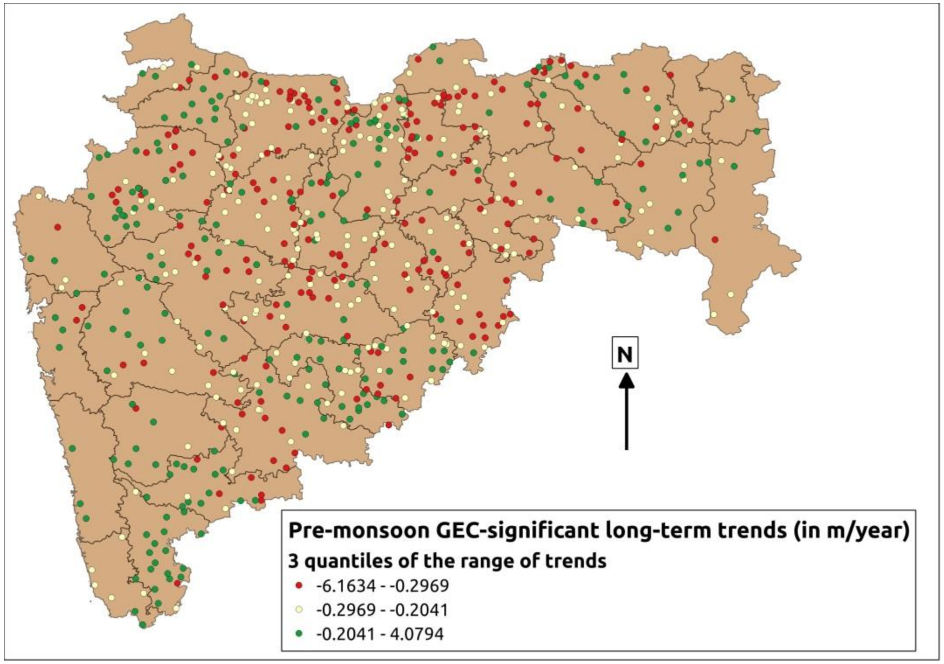
Musai reservoir- Proposed network

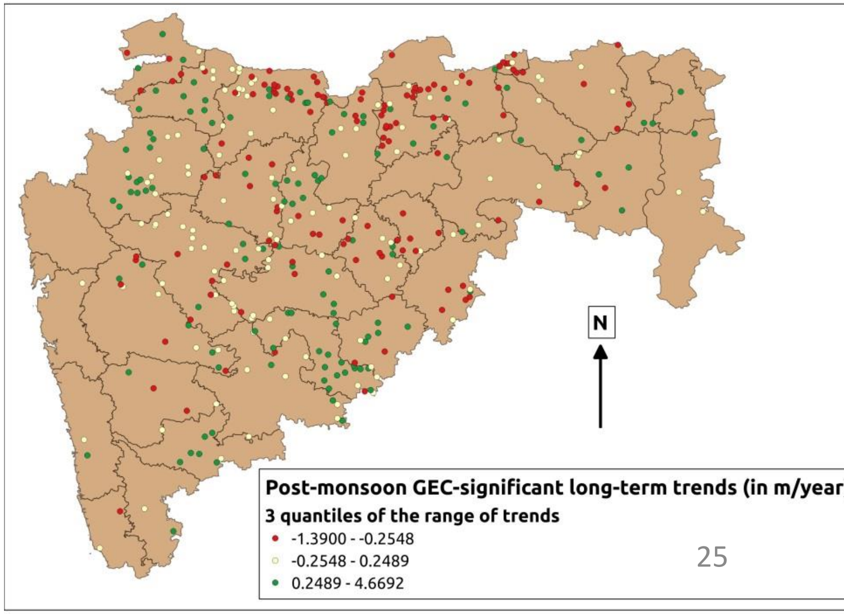
Ground water

- Primary source for drinking water and irrigation
- Increasing exploitation of groundwater a growing concern
- Planning questions – Scarcity assessment and management, interventions for increasing groundwater recharge, creating alternatives to GW use



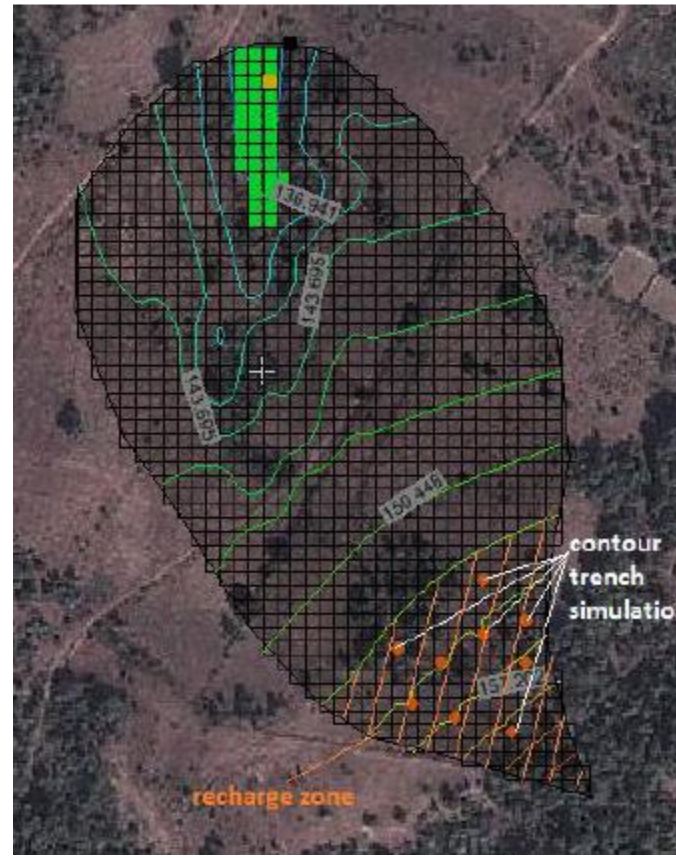
Regional groundwater modeling– Observation well data





Sample studies: Groundwater analysis

- Large scale watershed activities for GW recharge
  - Analysis of watershed interventions and programs
- Small- scale watershed modeling for designing interventions to strengthen drinking water wells



Key Engineering Activities

Urban

- Design of WS schemes
- Design of sanitation systems
- Energy and water efficiency
- Simulation of schedules
- Tariff structure

Rural

- Single and multi-village schemes, bulk water grid
- Ensuring source quality and quantity
- Regional GW enhancement through watershed activity

Planning

- Water balance computations – basin and district
- Scarcity and mitigation
- GIS and planning processes, annual action plans

Consultancy and Research

- Regional assessment expertise
- Failure analysis and alternatives
- Supporting programs like MSNA, NRDWP, IWMP
- Long-term drinking water security

Case studies

- Next up- 4 examples of CTARA's academic output
  - Groundwater and watershed analysis
  - Rural water supply planning and design
  - Urban water supply scheme analysis
  - Water quality/ sanitation

Thank you