Advanced Center for Water Resources Development and Management (ACWADAM)
Plot 4, Lenyadri society, Sus road, Pashan, Pune-411021.
☎020-25871539;
Email: acwadam@vsnl.net;
Website: www.acwadam.org

Introduction
IMPORTANCE OF GROUNDWATER

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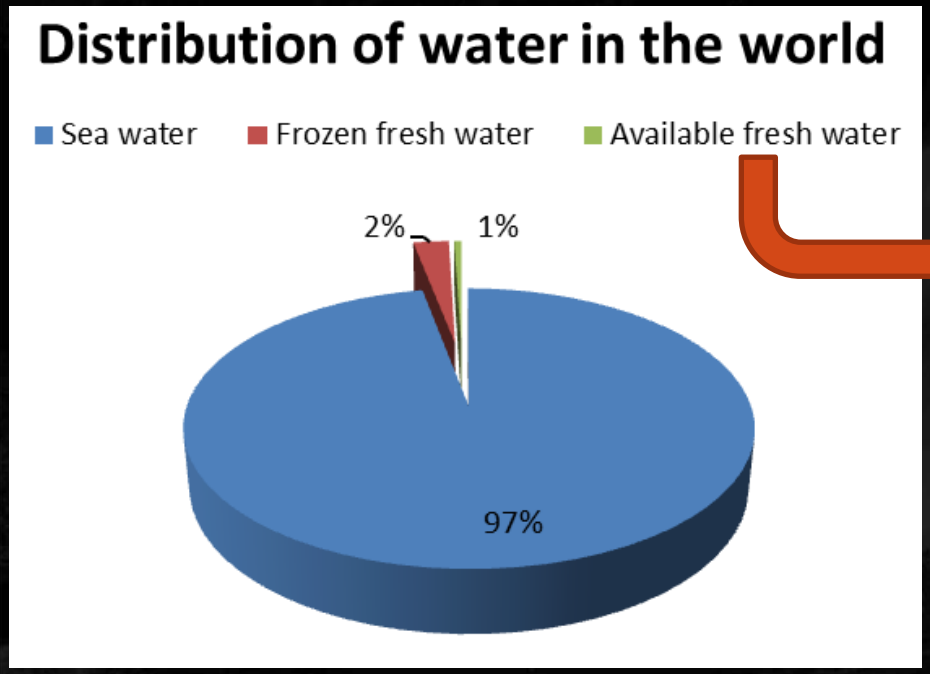
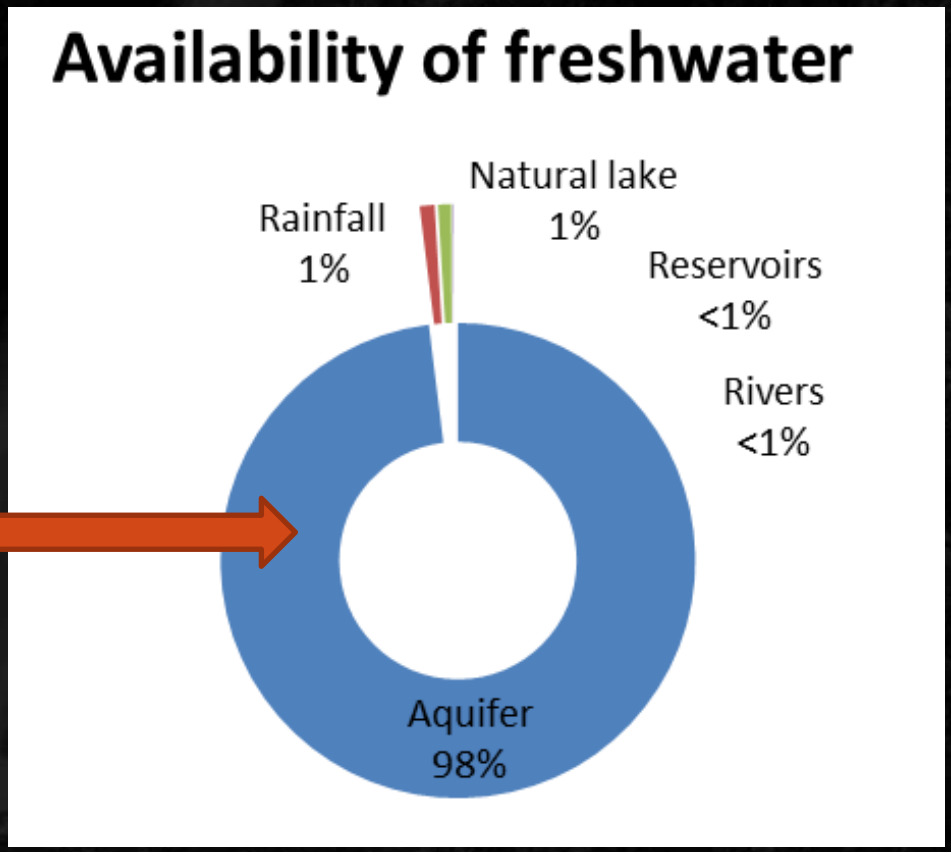
Global groundwater scenario

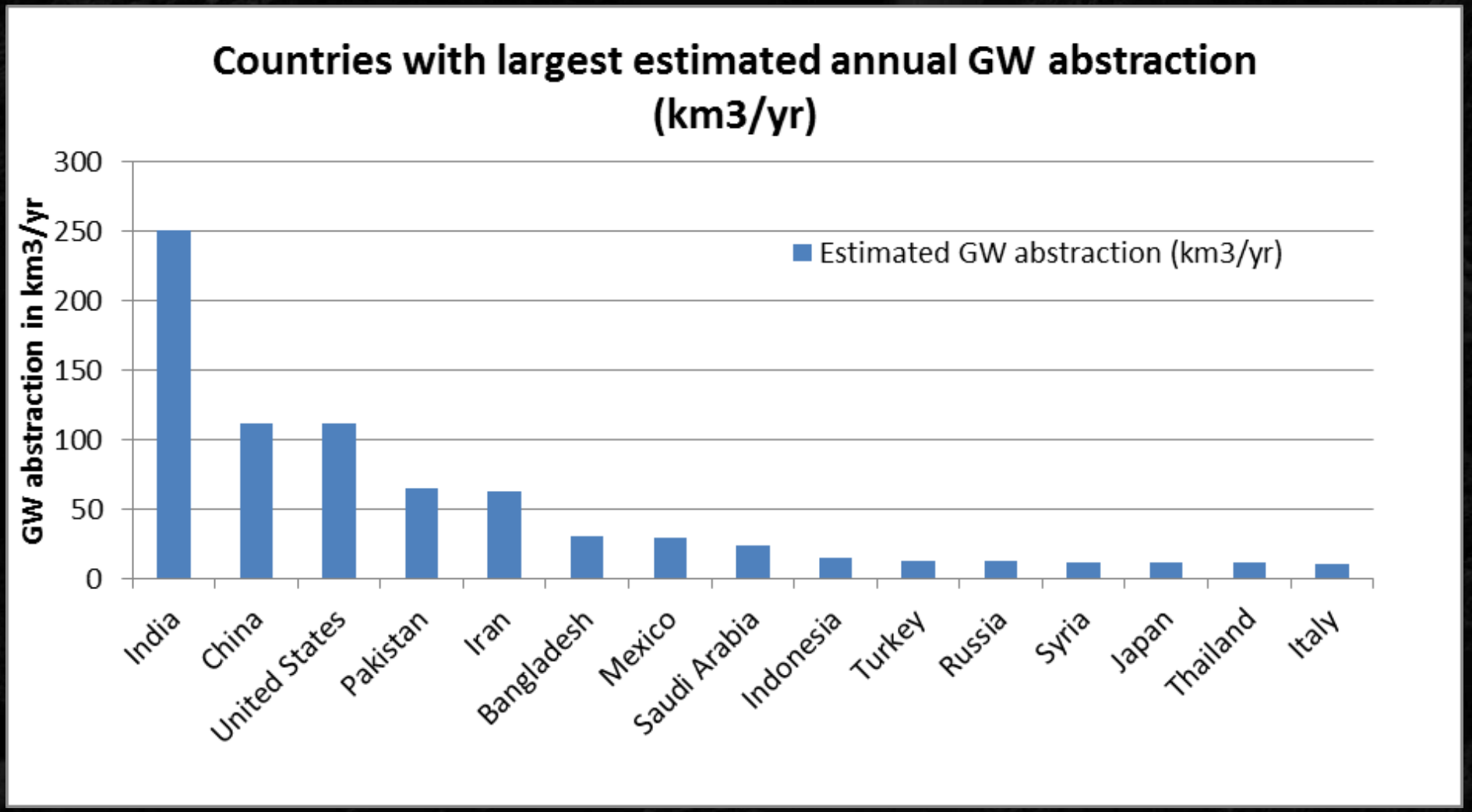
Groundwater is the world's most extracted raw material with withdrawal rates currently in the estimated range of 982 km^3 /year



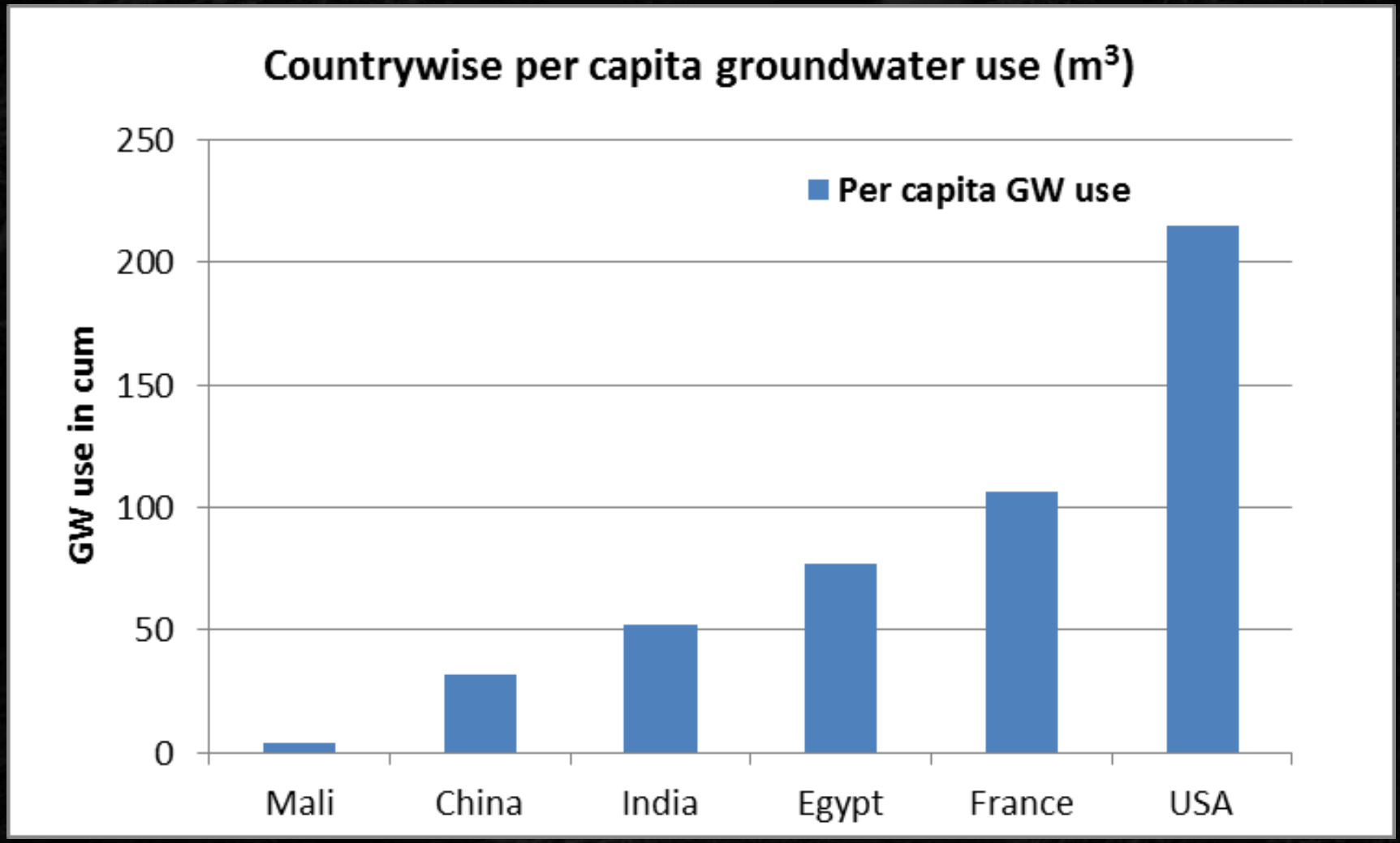


www.unesco.org

Global groundwater abstraction



Country wise per capita GW use



Source AQUASTAT – FAO, 2002-03

Importance of groundwater

- 90% of the rural water supply is sourced from groundwater.
- About 61% irrigation in the country is from groundwater.
- Largest accessible source of freshwater .
- Long history of groundwater use.
- One of the oldest well in India is 5000 years old.
- Last century has seen unprecedented use of groundwater.

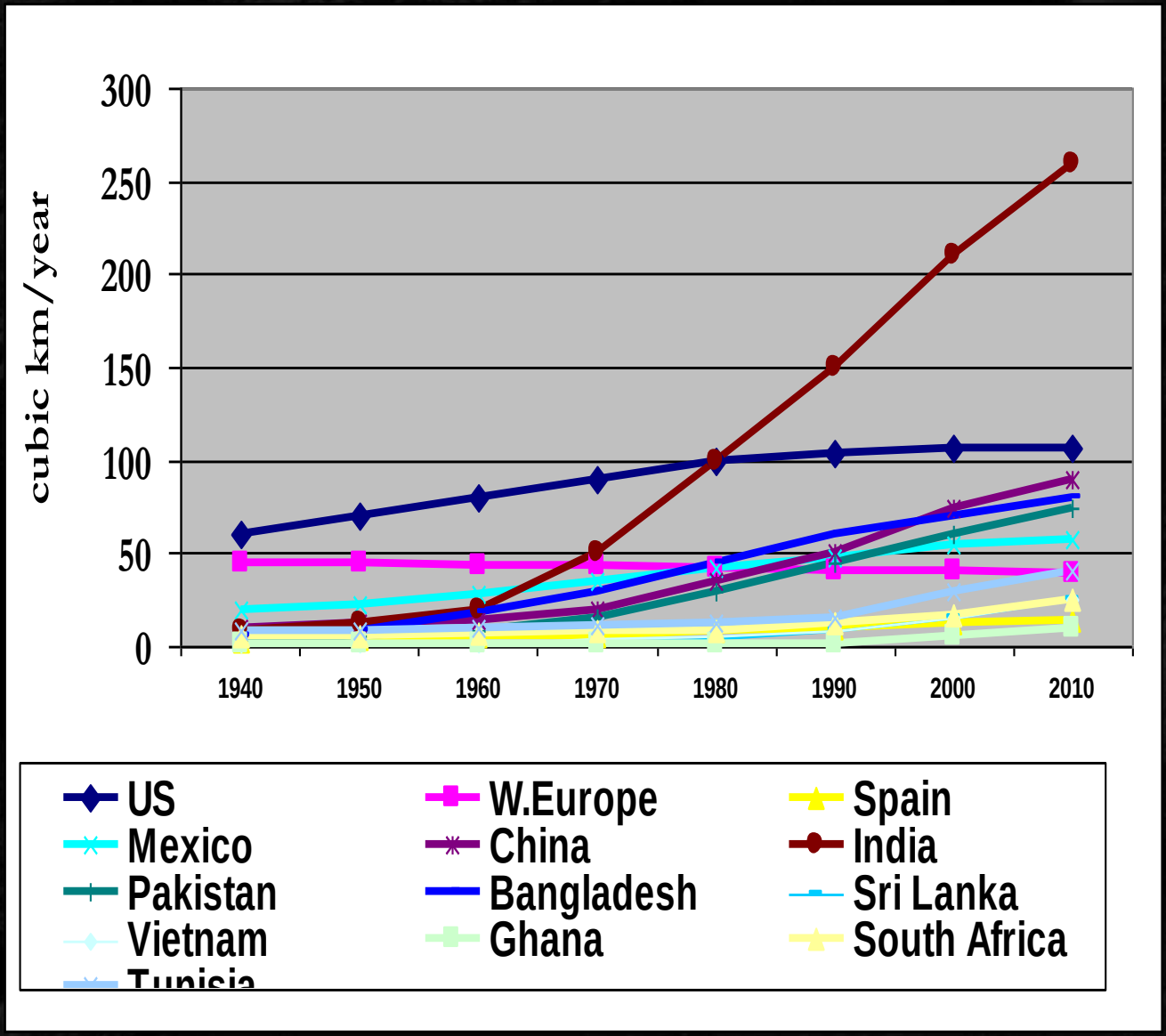
70% of South Asia's irrigated land is serviced by groundwater, with or without conjunctive use of surface water

Shah, 2009

Uses of groundwater

- Drinking and domestic purposes
- Agriculture
- Livestock
- Industry
- Maintaining the ecological balance

India is the world's largest user of groundwater for agriculture…

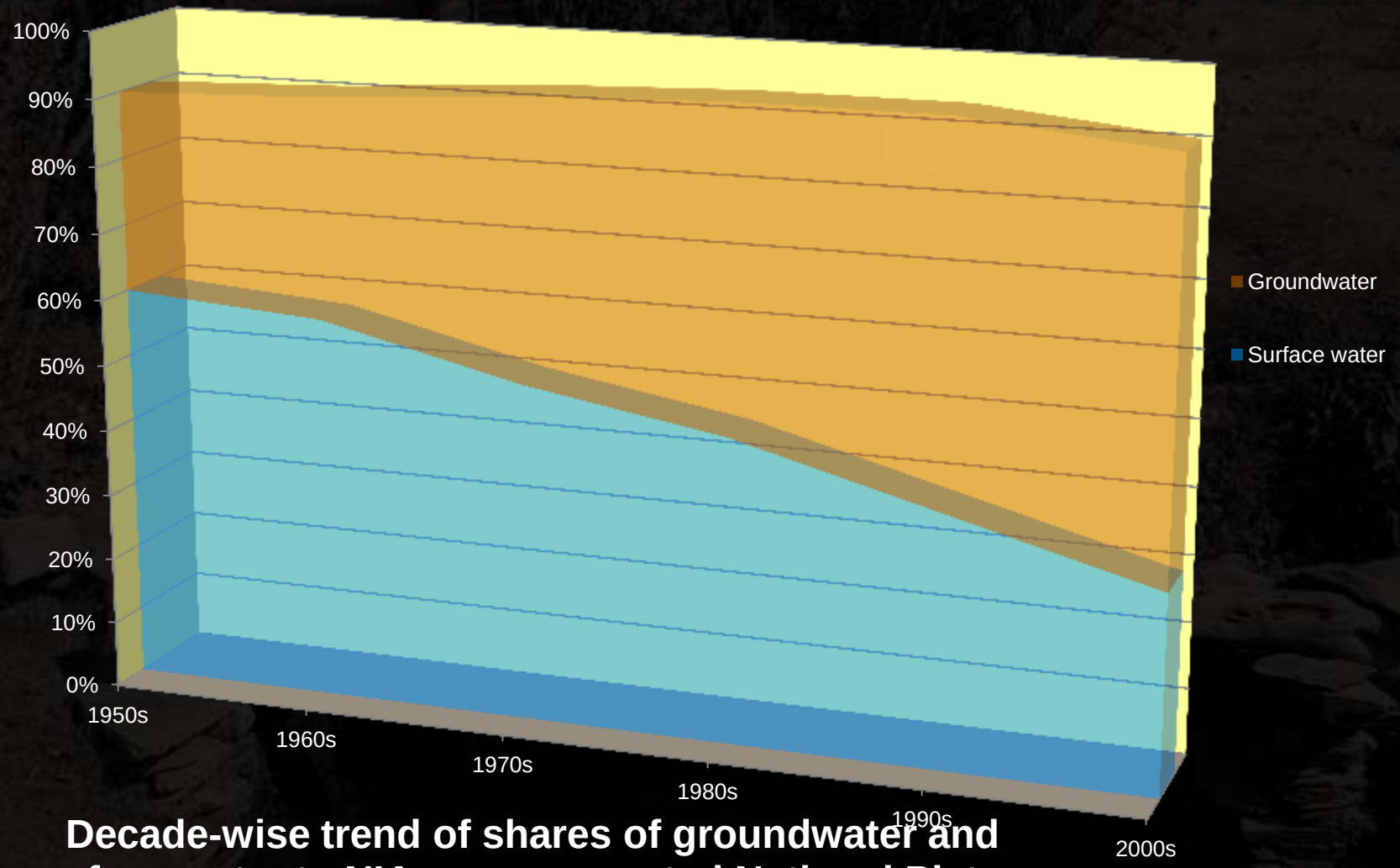


India has over 30 million irrigation wells. We add 0.8 million/year.

Every fourth cultivator owns an irrigation well; non-owners depend on groundwater markets.

After *T. Shah, 2009*

NIA, surface water & groundwater



Decade-wise trend of shares of groundwater and surface water to NIA - an aggregated National Picture

Source: Indian Agricultural Statistics, 2008


Canal irrigation
2008 10 15

Groundwater irrigation: India's unique story

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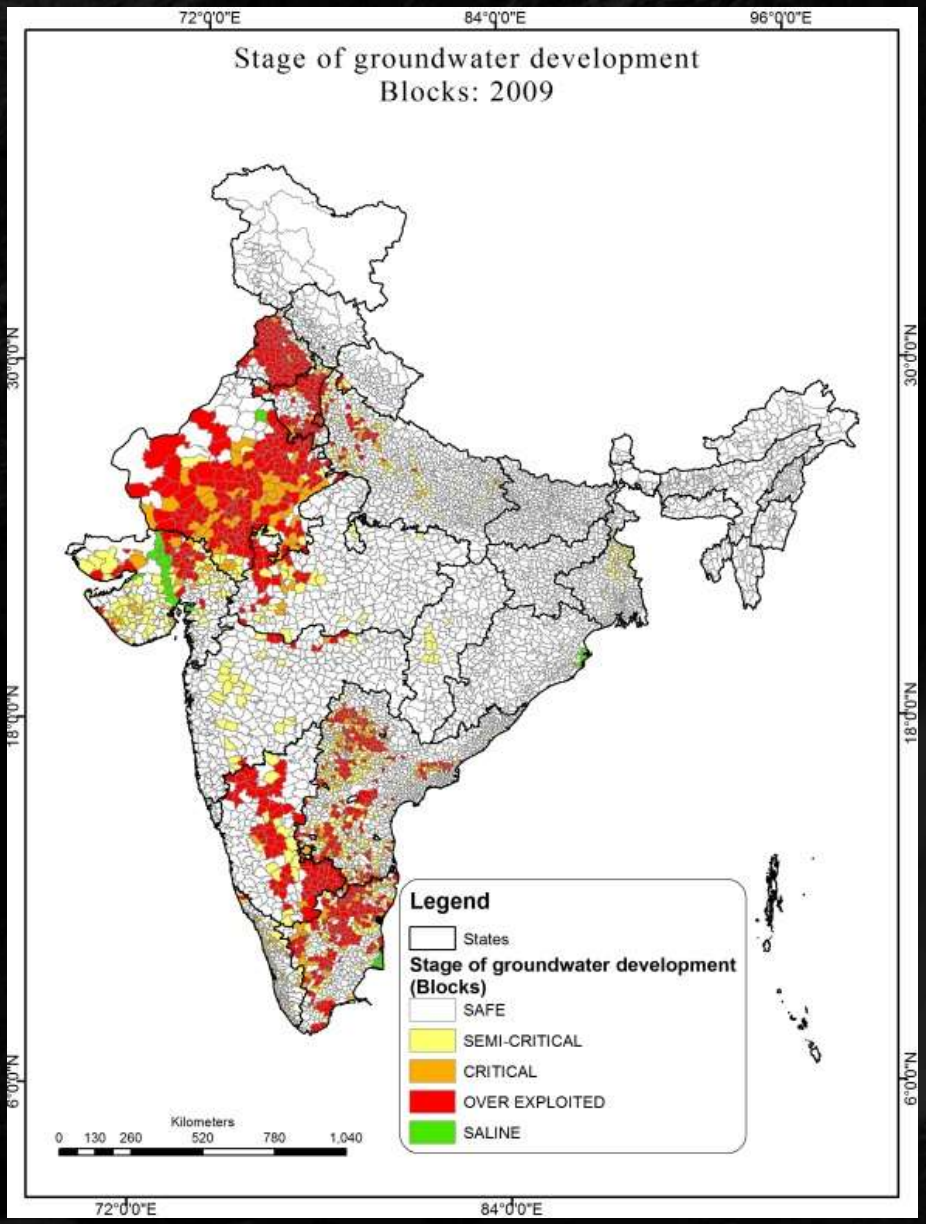
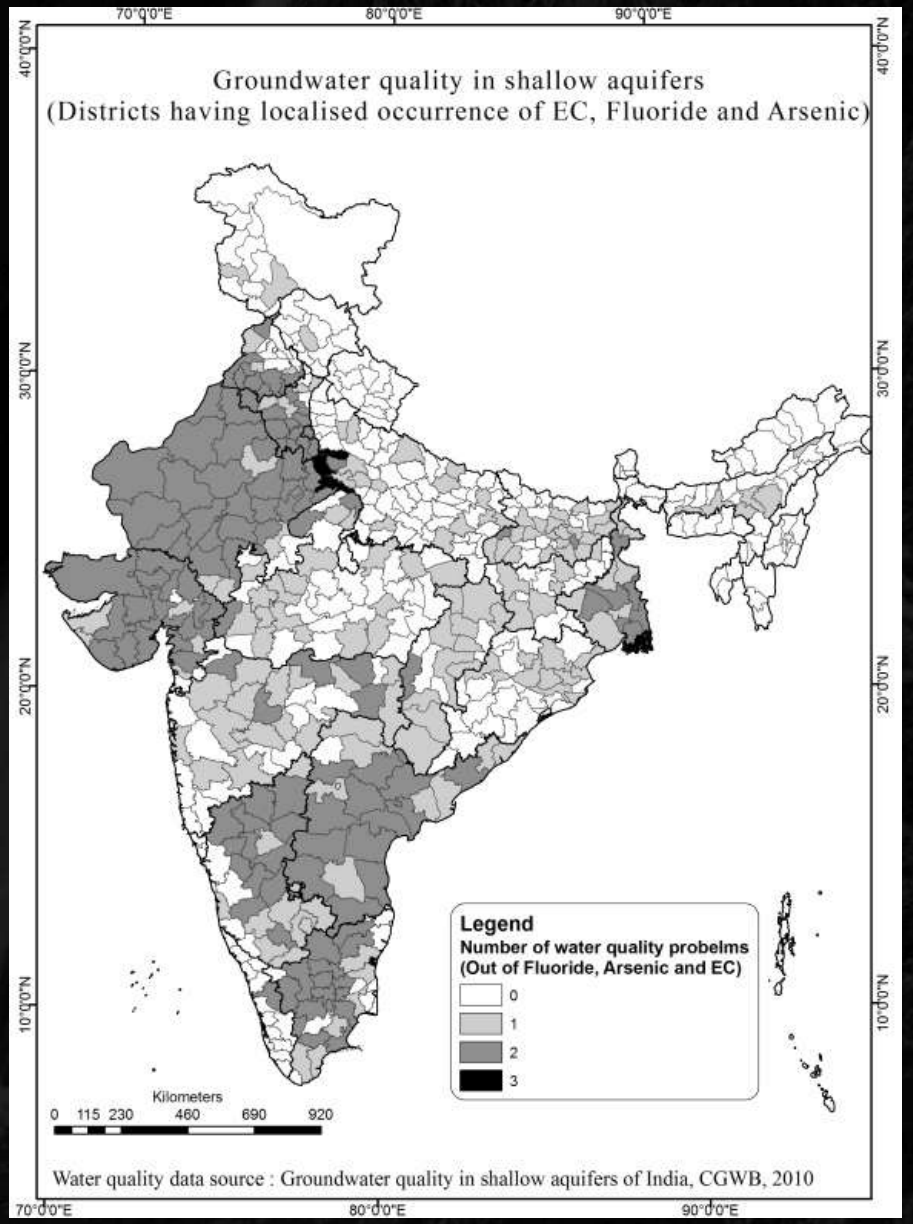
Groundwater vulnerability

Description	Number of Districts	% to Total Districts	States
Districts with High Level of Groundwater Development (GD>70%) ("Unsafe" districts)	173	30%	Punjab, Haryana, Rajasthan, UP, Gujarat, Tamil Nadu
Districts with at least one of the 3 most serious quality problems (Arsenic or Fluoride or Salinity)	169	29%	Assam, Gujarat, Haryana, Karnataka, Maharashtra, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh, West Bengal
TOTAL	**342**	**59%**	

Nearly 60% districts with groundwater vulnerability

Kulkarni, Shankar & Krishnan, 2009


Stage of groundwater development
Blocks: 2009
72°0'0"E
84°0'0"E
96°0'0"E
30°0'0"N
18°0'0"N
6°0'0"N
Legend
States
Stage of groundwater development (Blocks)
SAFE
SEMI-CRITICAL
CRITICAL
OVER EXPLOITED
SALINE
Kilometers
0 130 260 520 780 1,040


Groundwater quality in shallow aquifers
(Districts having localised occurrence of EC, Fluoride and Arsenic)
70°0'0"E
80°0'0"E
90°0'0"E
40°0'0"N
30°0'0"N
20°0'0"N
10°0'0"N
Legend
Number of water quality probelms (Out of Fluoride, Arsenic and EC)
0
1
2
3
Kilometers
0 115 230 460 690 920
Water quality data source : Groundwater quality in shallow aquifers of India, CGWB, 2010

Understanding groundwater…*interpreting the unseen underground!*


Where is the water coming from; where is it going??


What are these?
What is happening
to water here?


What is this?
Surface water
or groundwater?
2008 11 8


What will happen to this water?

Percolation tank
or
Irrigation pond?

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What is the connection between the two photographs?

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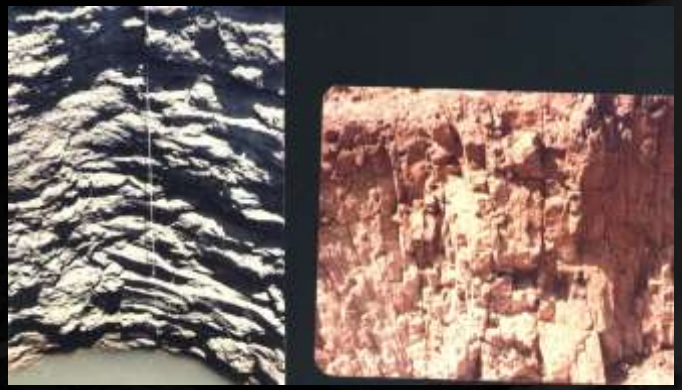
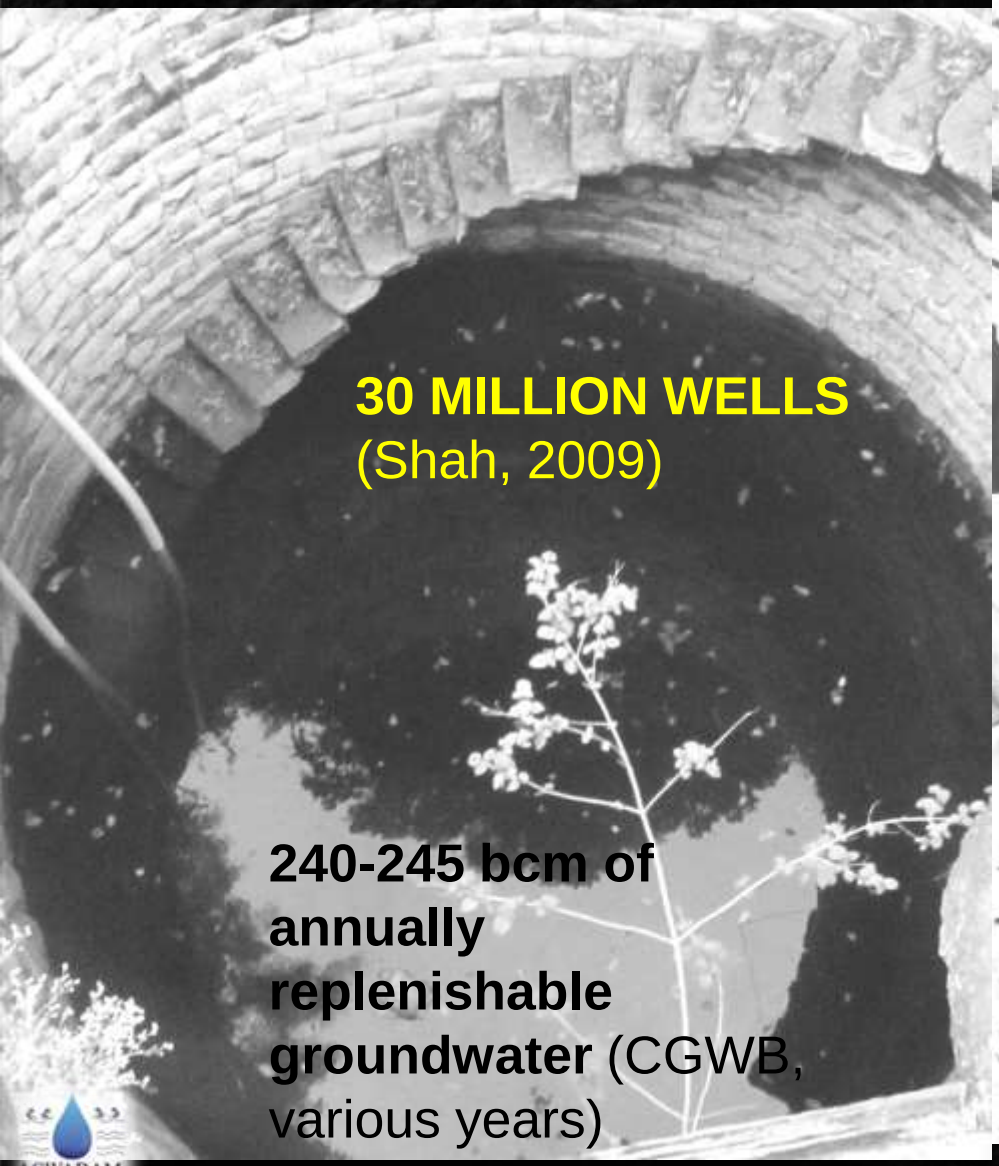
GEOLOGY plays a very important role in the formation of aquifers, and consequently, on the accumulation and movement of groundwater..



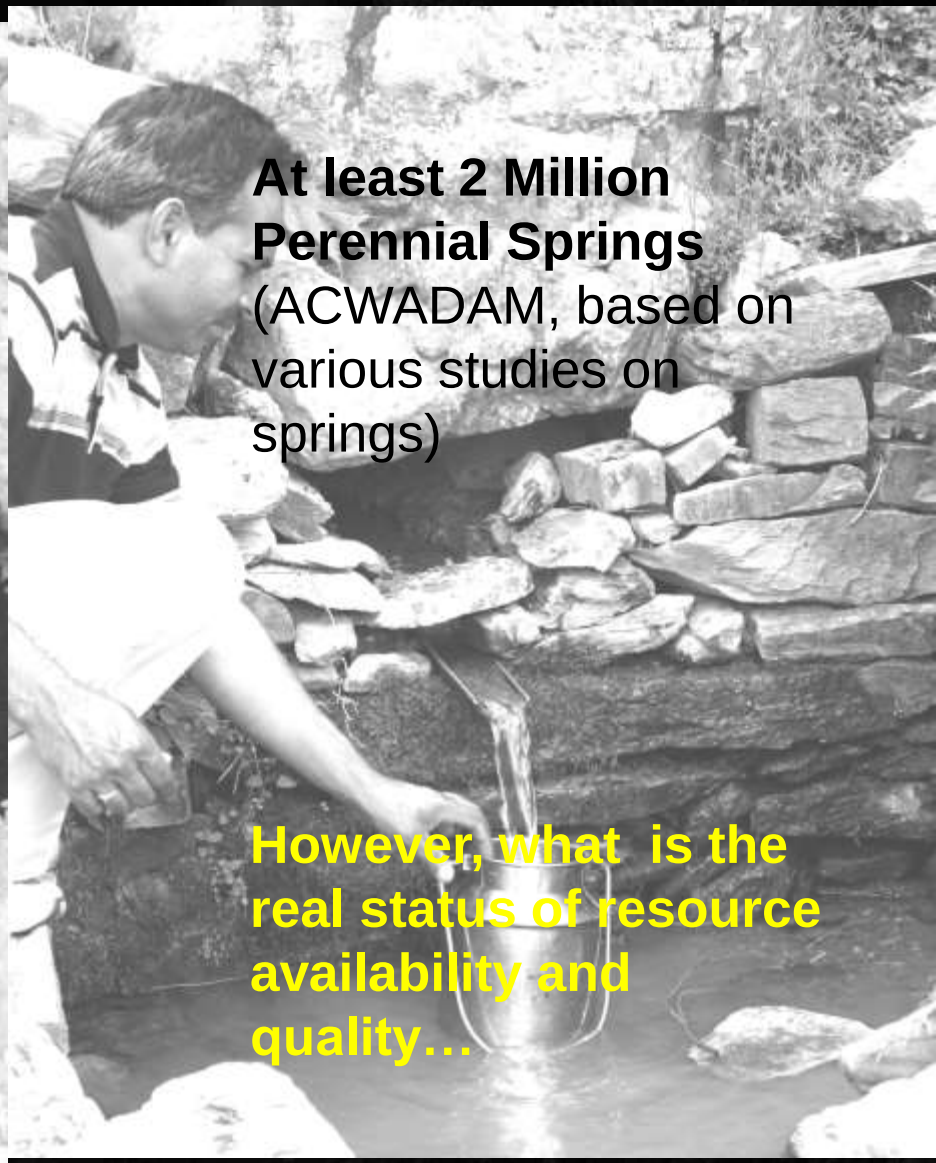
Geological conditions tend to vary, both laterally and vertically…

Supply: wells, springs…



30 MILLION WELLS (Shah, 2009)

240-245 bcm of annually replenishable groundwater (CGWB, various years)

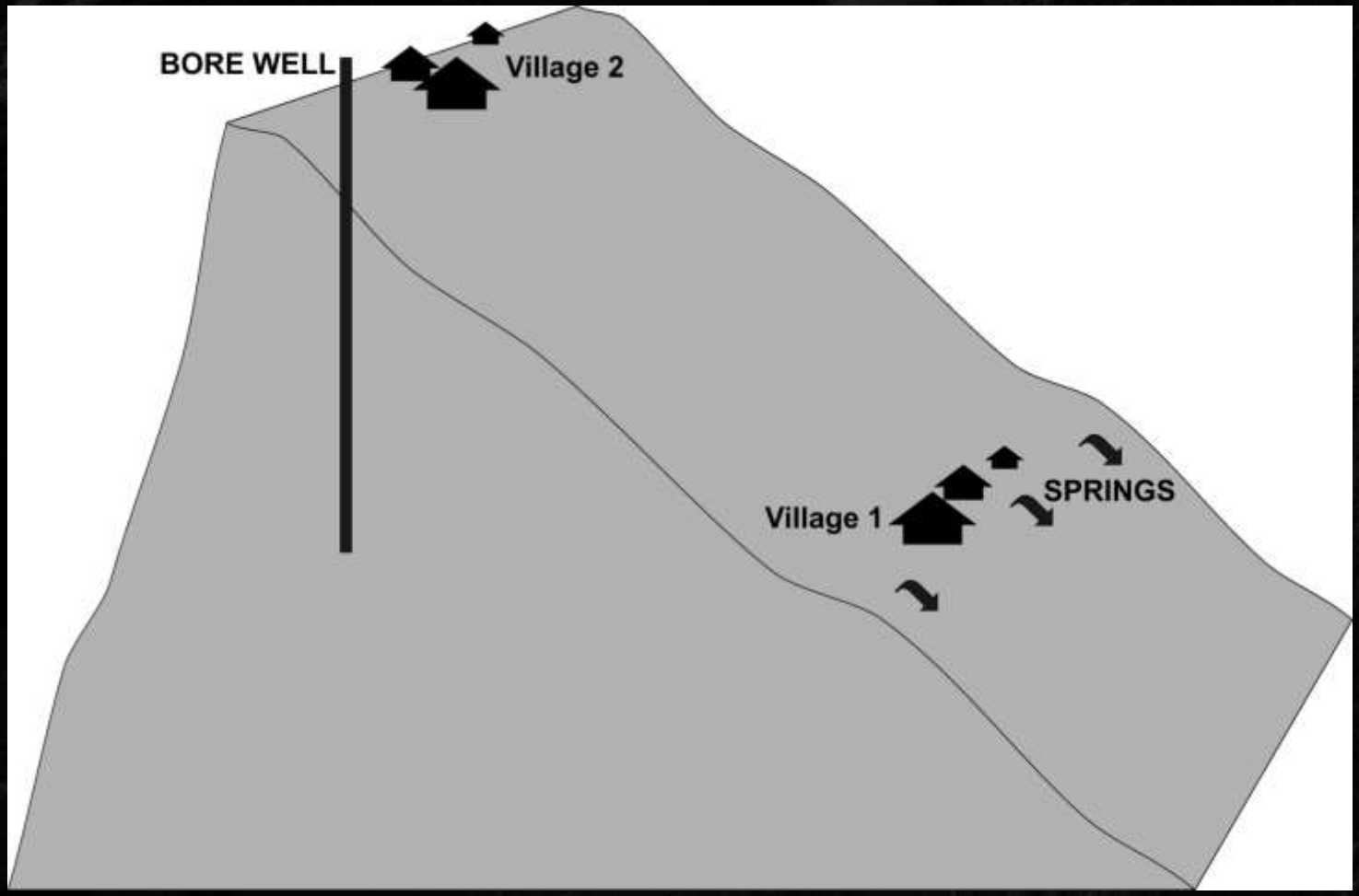


At least 2 Million Perennial Springs (ACWADAM, based on various studies on springs)

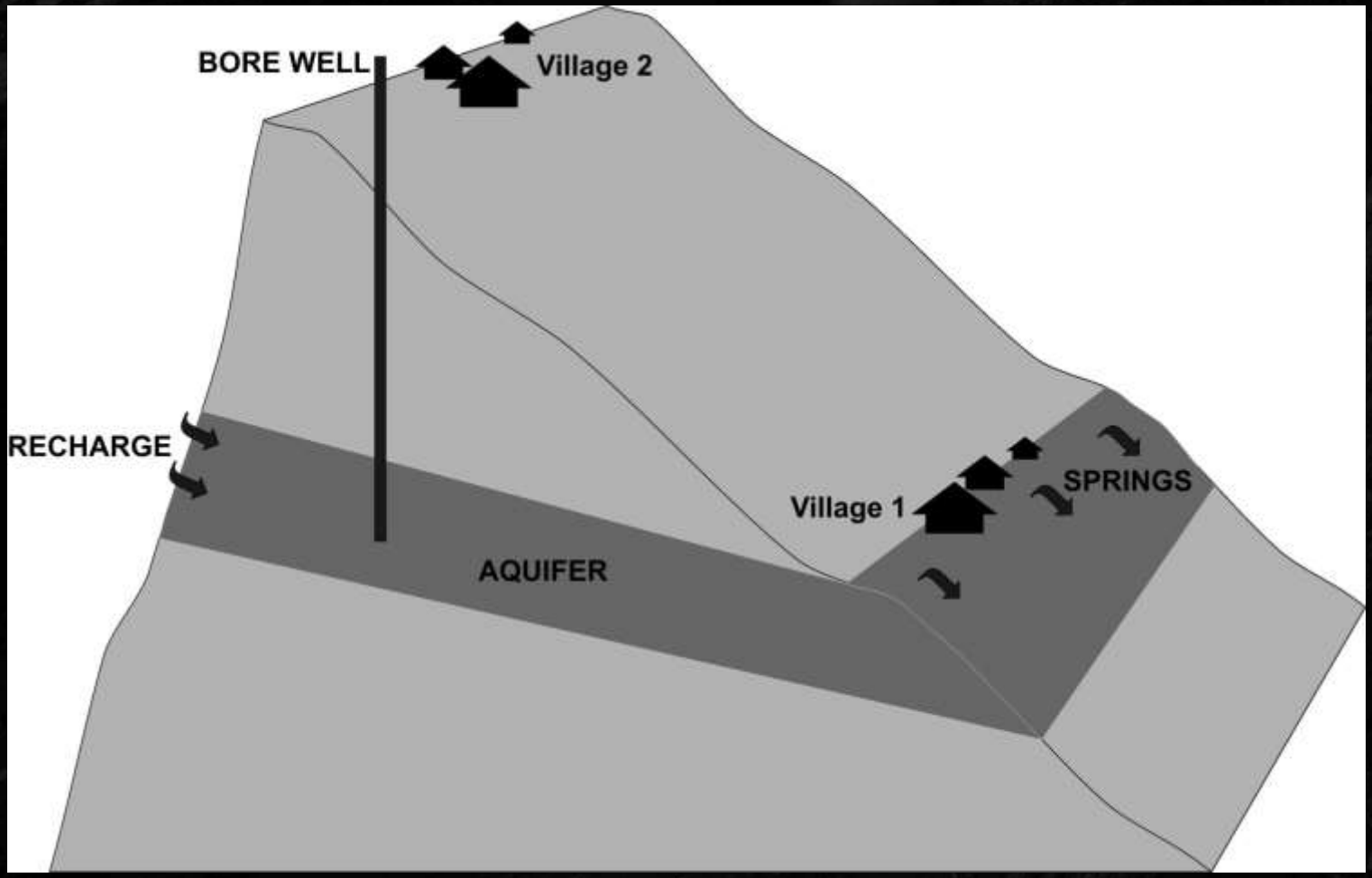
However, what is the real status of resource availability and quality…


AQUIFER

Mountain sources – water in two villages: beyond topography, watersheds and admin boundaries…



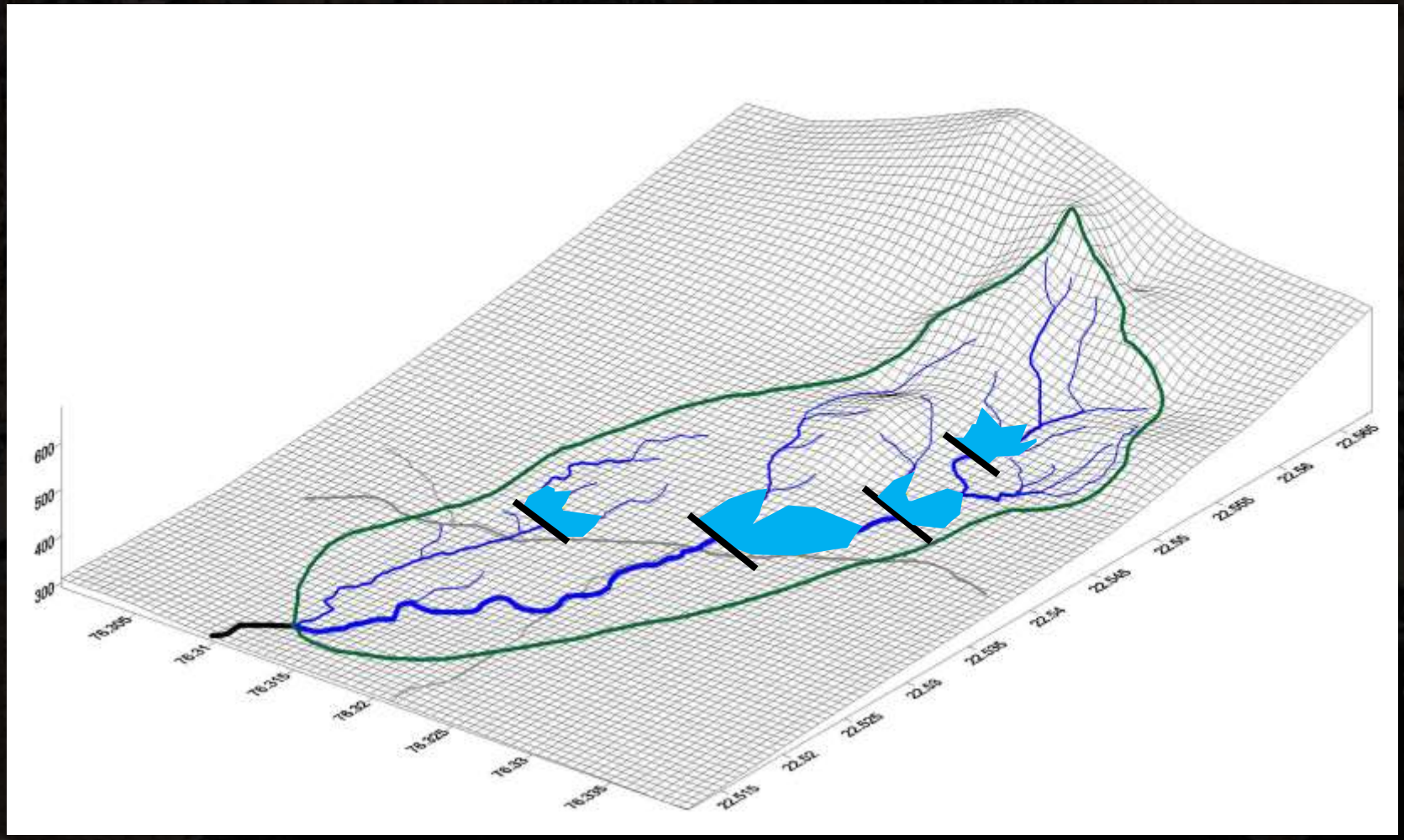
Aquifers: providing a complete picture...



Hydrological processes…

Hydrological processes…

Watersheds…*creating structures*



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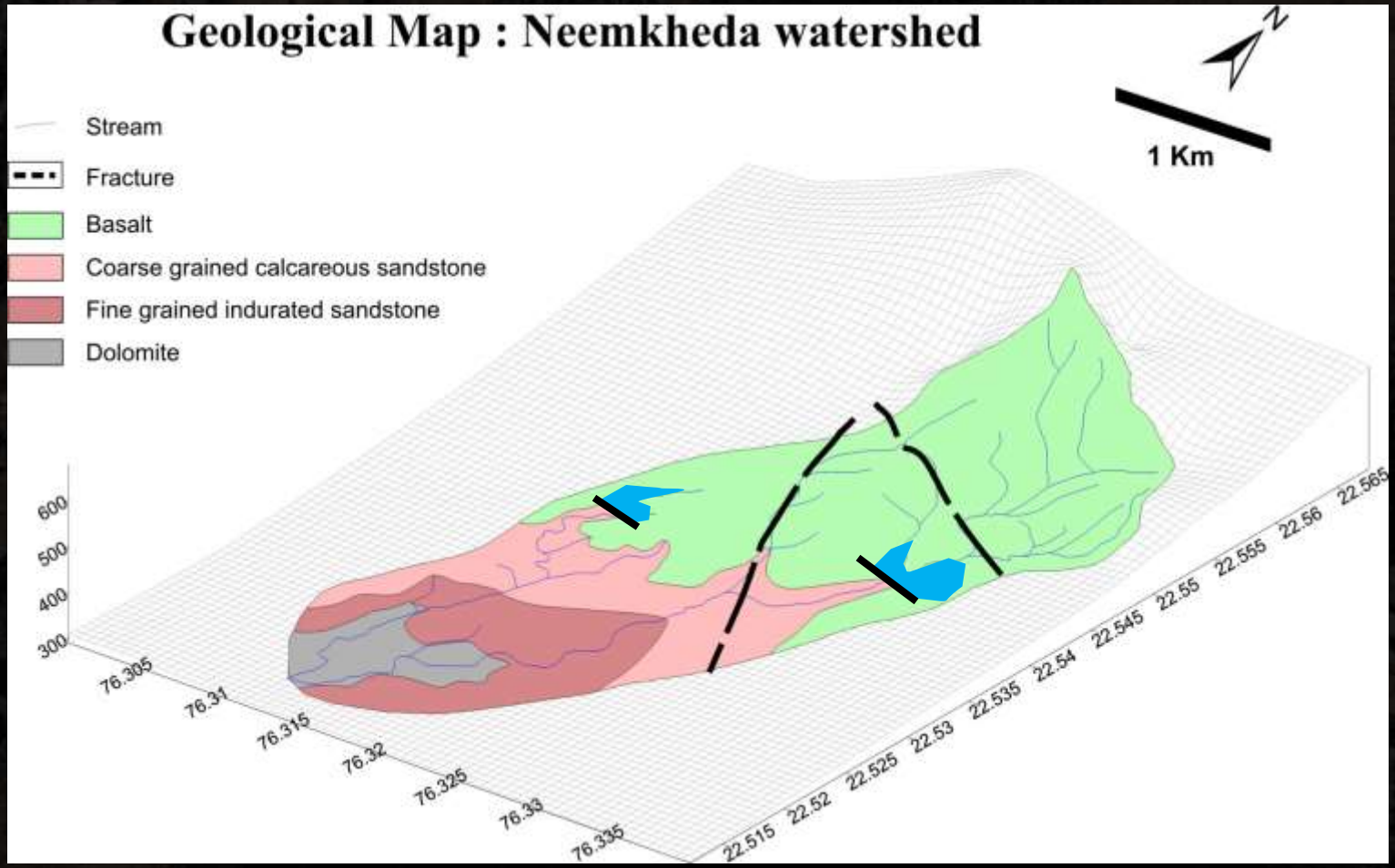
Watersheds and groundwater

creating structures…smartly!



For recharge

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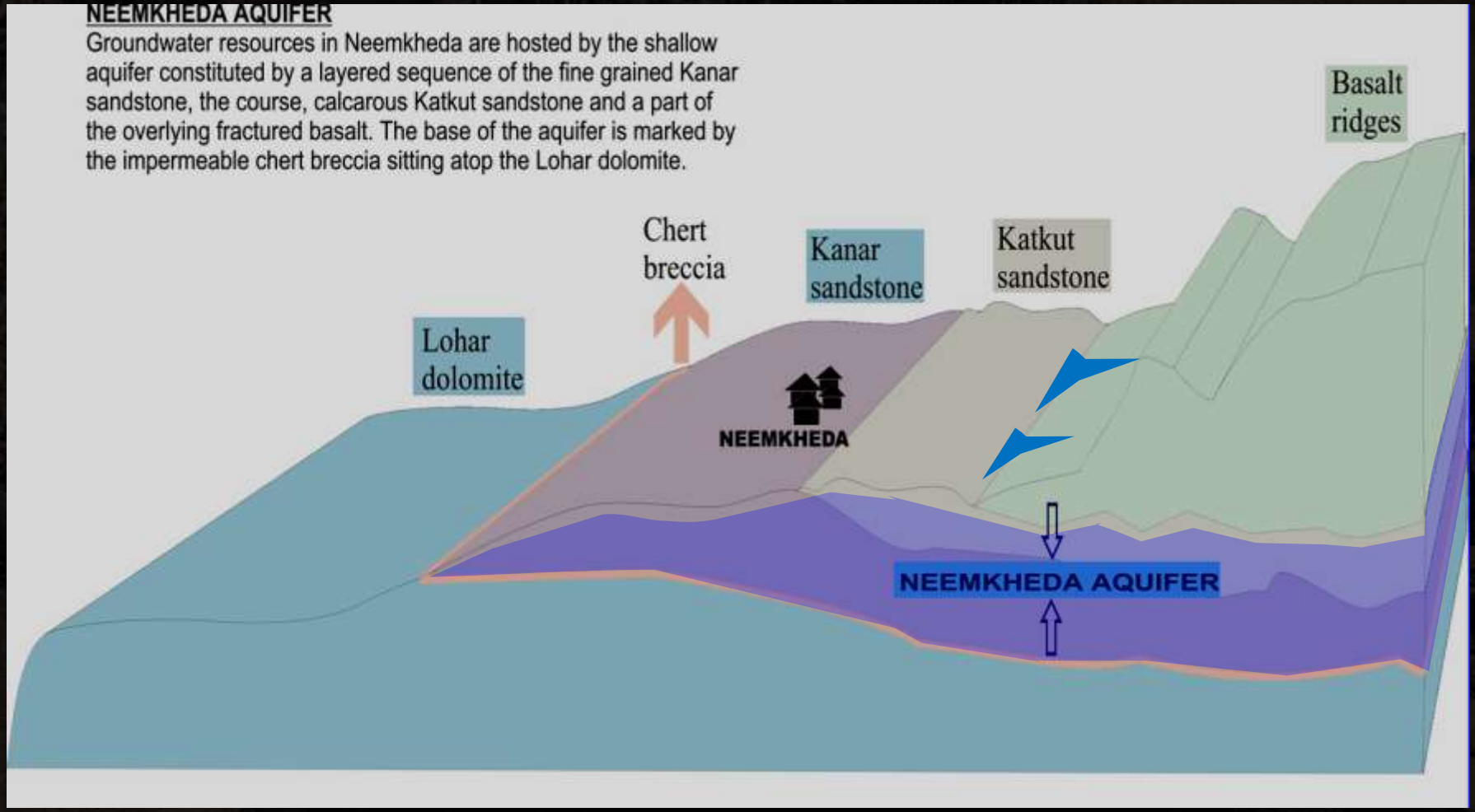
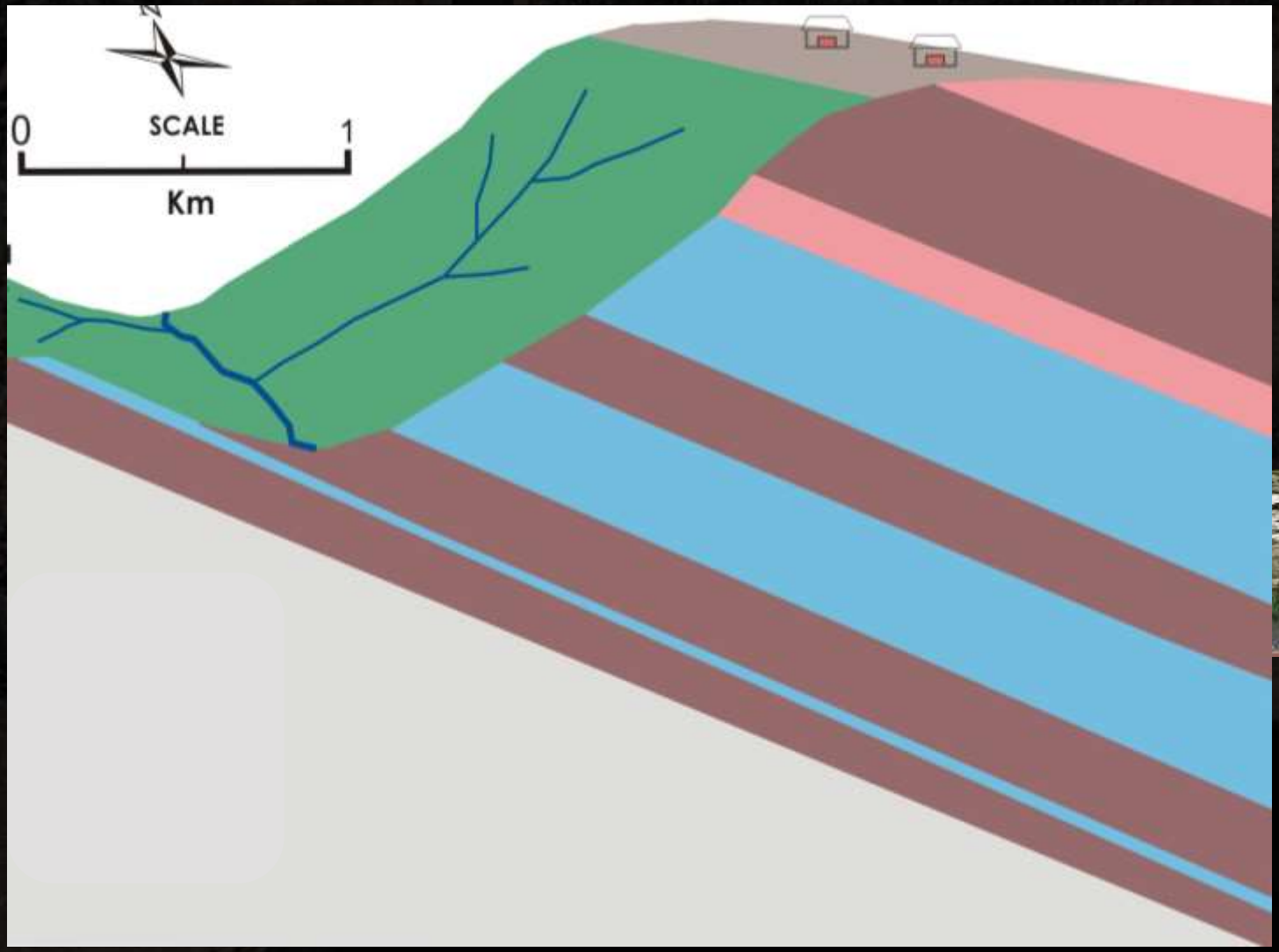
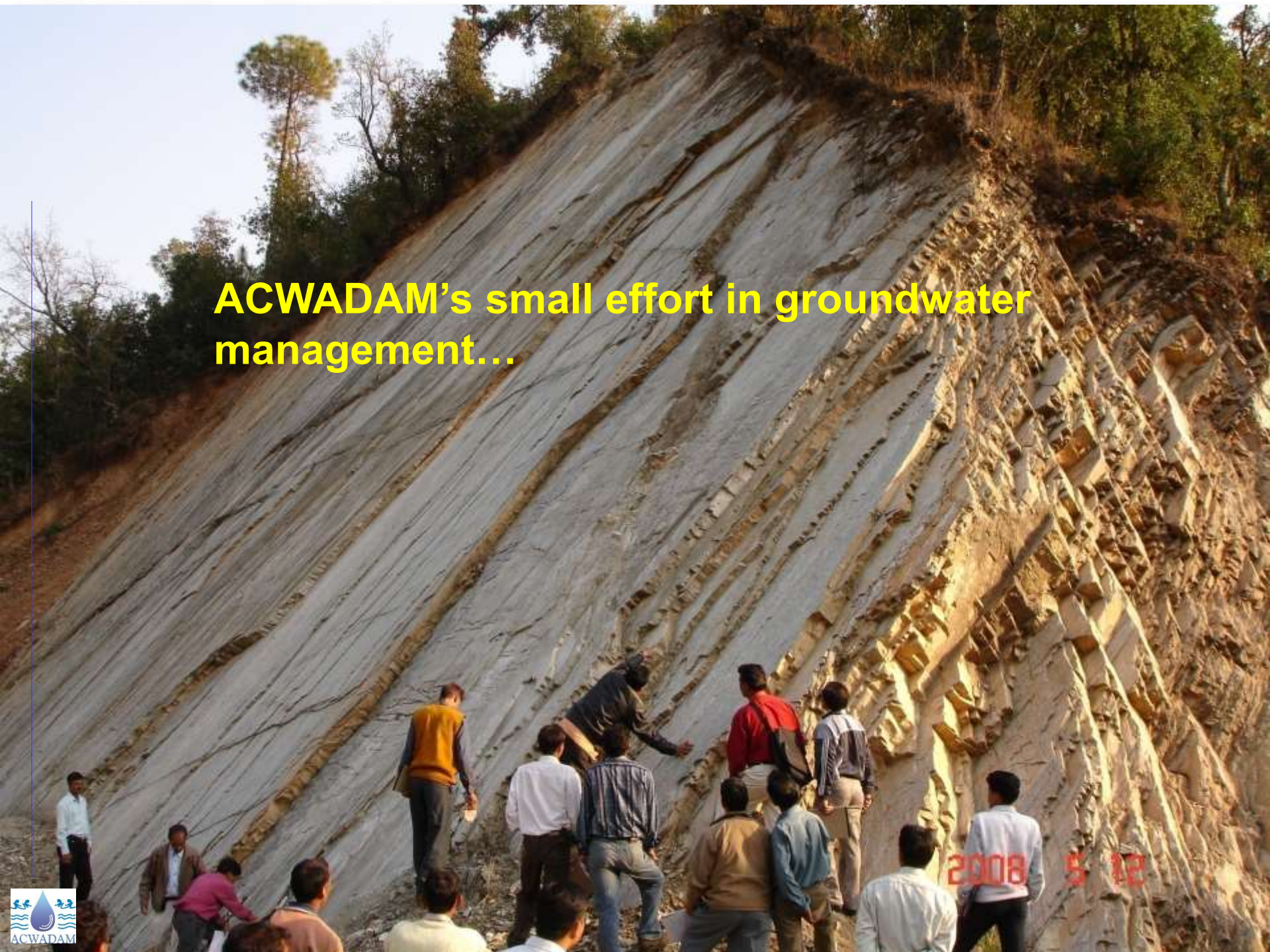
Hydrogeology & aquifer(s)…



What is *behind* a spring?

…a system of rocks and groundwater!




ACWADAM's small effort in groundwater management…
2008 5 12

ACWADAM's goal

To help achieve scientifically based, sustainable management of water resources, <u>especially groundwater</u>, in different settings –

- *Geographically diverse locations.*
- *Rural & urban*
- *Domestic, agricultural & industrial*

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Our approach

- Action research
- Education, training & facilitation
- Customisation

Partnerships and collaborations based on mutual strengths

e.g. ACWADAM's scientific capabilities often combined with social skills or engineering capacities of partner organisations..

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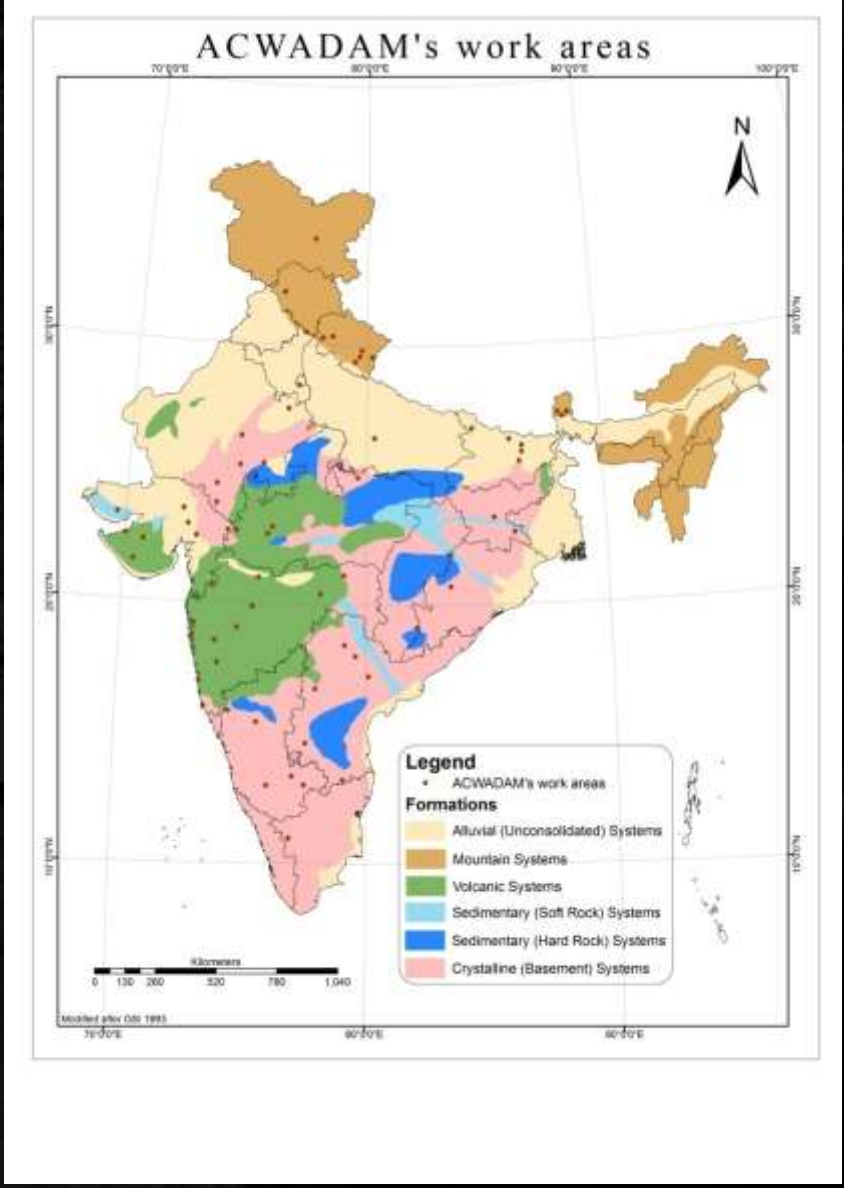
Our interventions



- Trainings
- Action research and piloting
- Implementation
- Facilitation
- Advice
- Advocacy – policy and regulation

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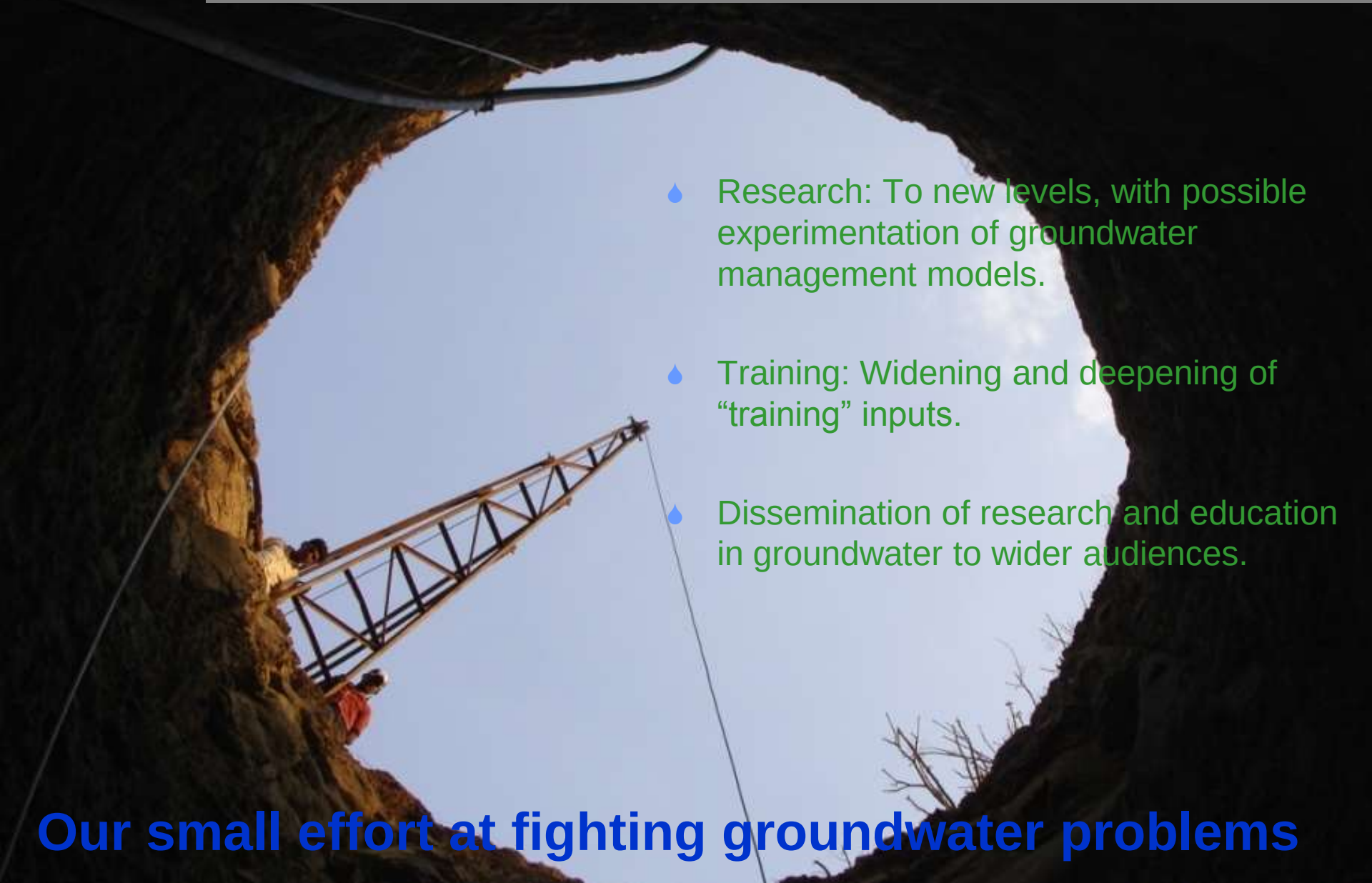

- Research: To new levels, with possible experimentation of groundwater management models.
- Training: Widening and deepening of “training” inputs.
- Dissemination of research and education in groundwater to wider audiences.

Our small effort at fighting groundwater problems