



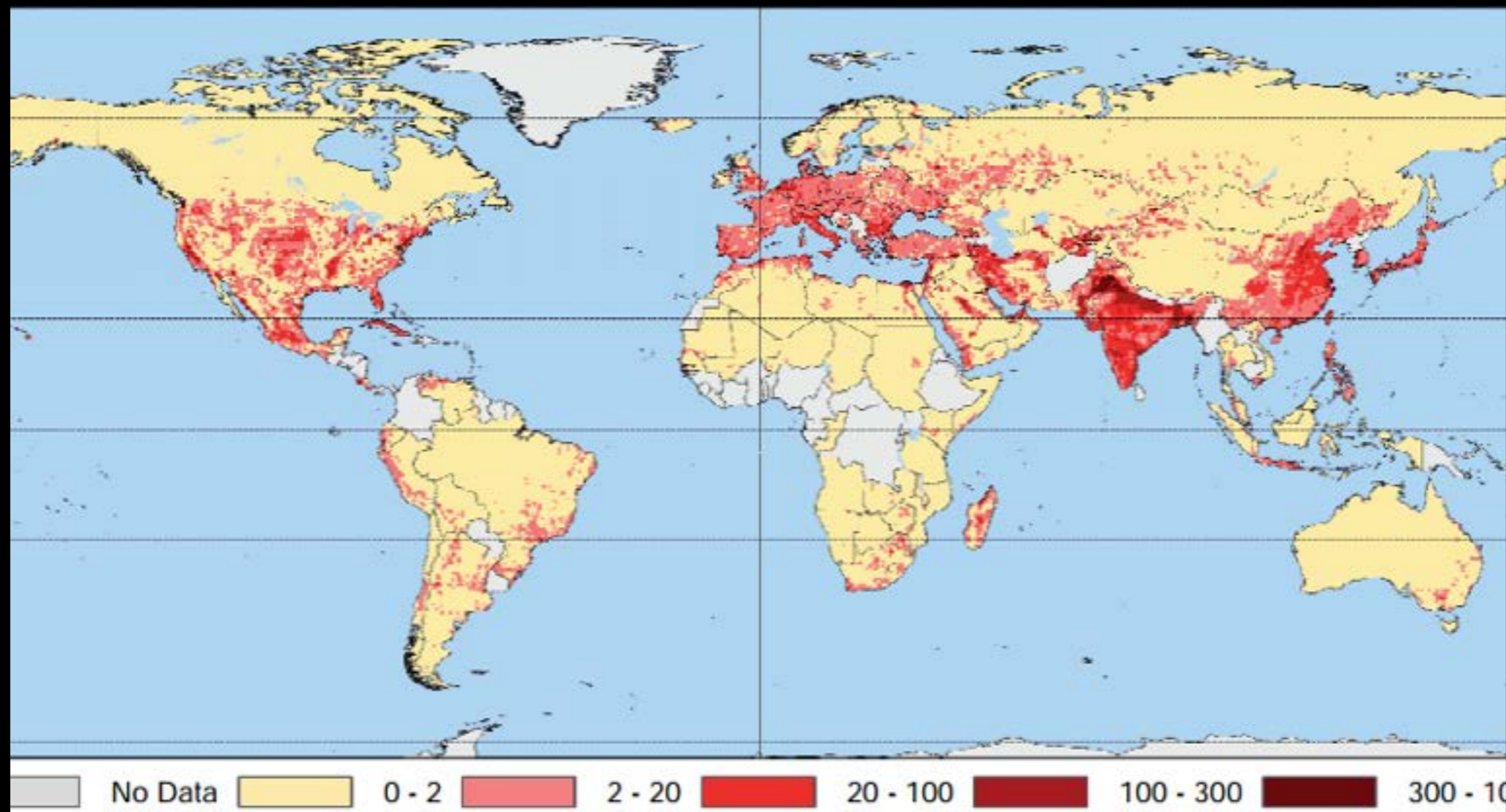
**INVISIBLE WATER,
VISIBLE CRISIS**

MANAGING INDIA'S GROUNDWATER



India is a groundwater civilisation from historical times

Today, India is the greatest abstractor of groundwater in the world



Source: Wade et al 2010, American Geophysical Union

India's Groundwater Development Conundrum





1970s onwards...

- Canal irrigation + groundwater
- New pump & drilling technology
- Energy subsidies
- Agricultural pricing policies

FOOD SECURITY

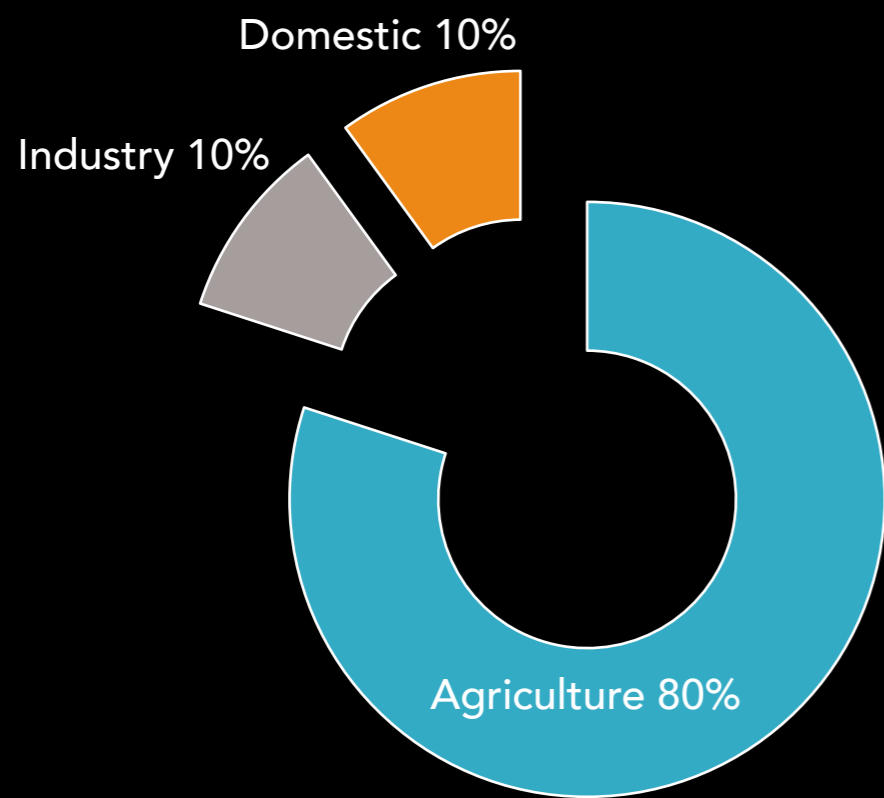
>1990s...present

- Nearly 30 million wells
- More than 0.8 million added every year
- Every fourth agriculturalist owns an irrigation well

WATER POVERTY

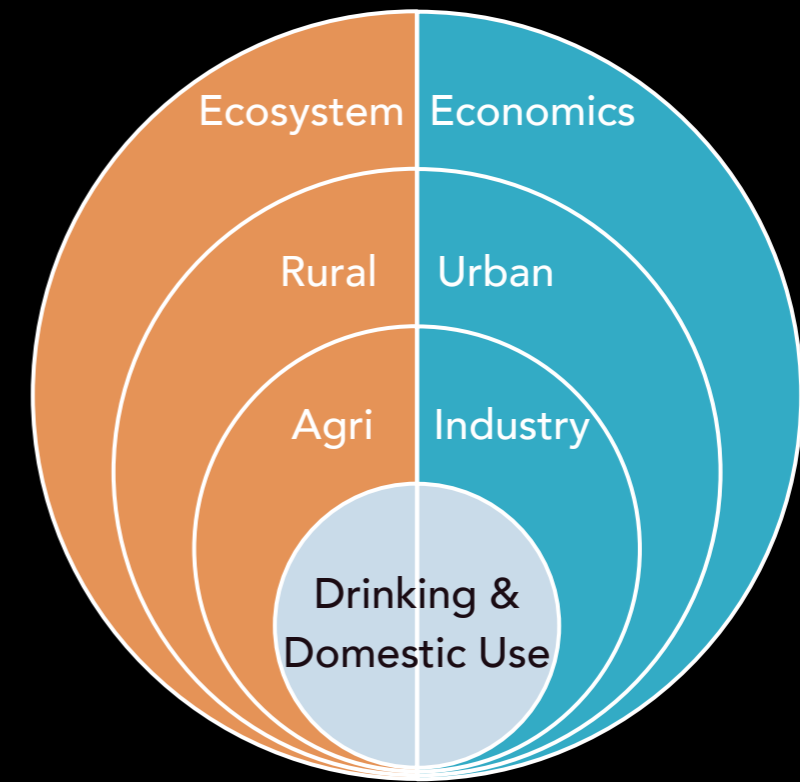
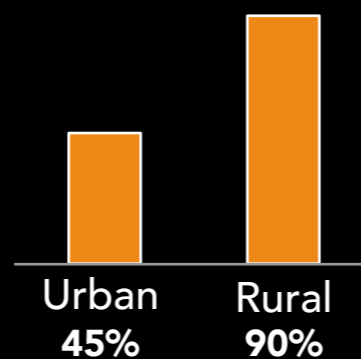


Groundwater is a finite, invisible resource, with heavy demands and dependence in India



Groundwater Uses

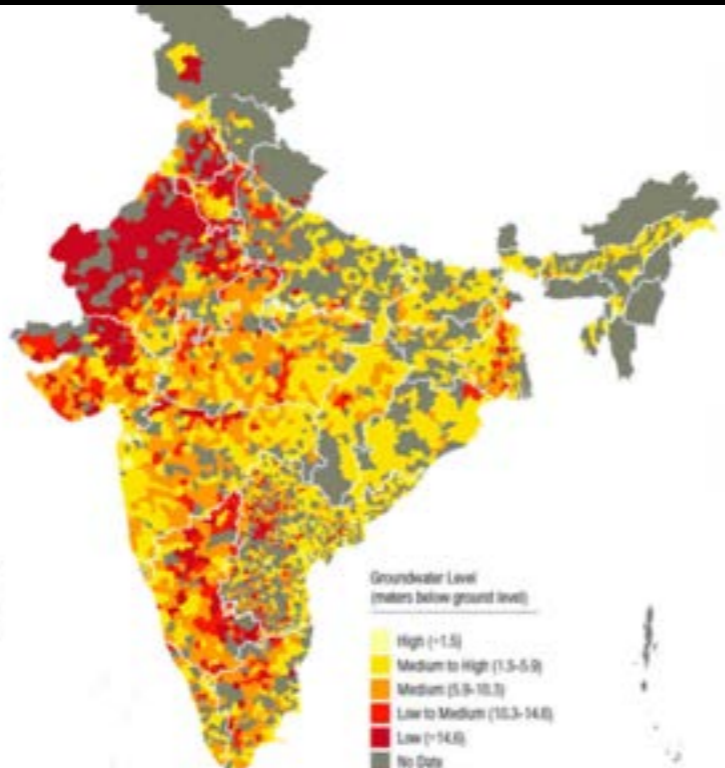
Drinking Water



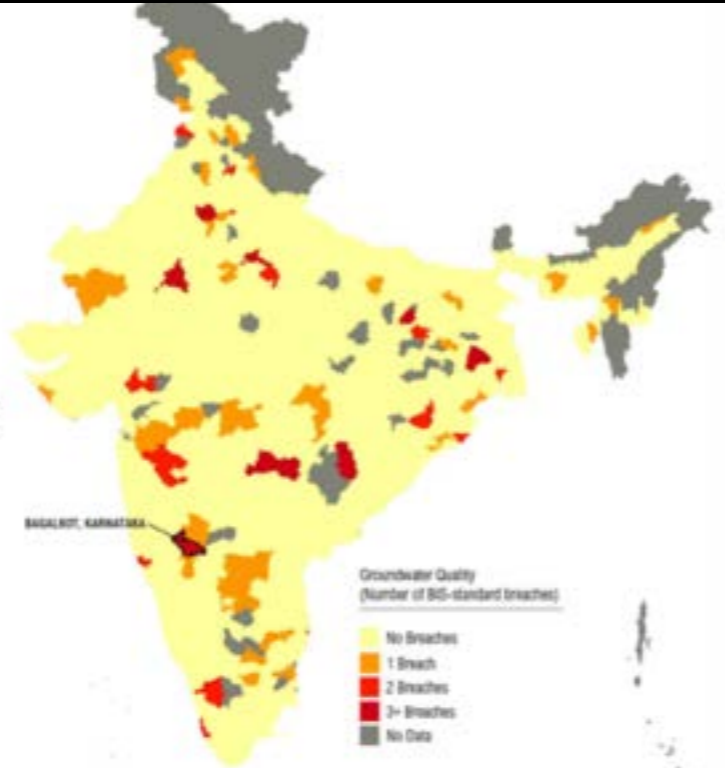
Competing Use & Users

India's Impending Water Crisis

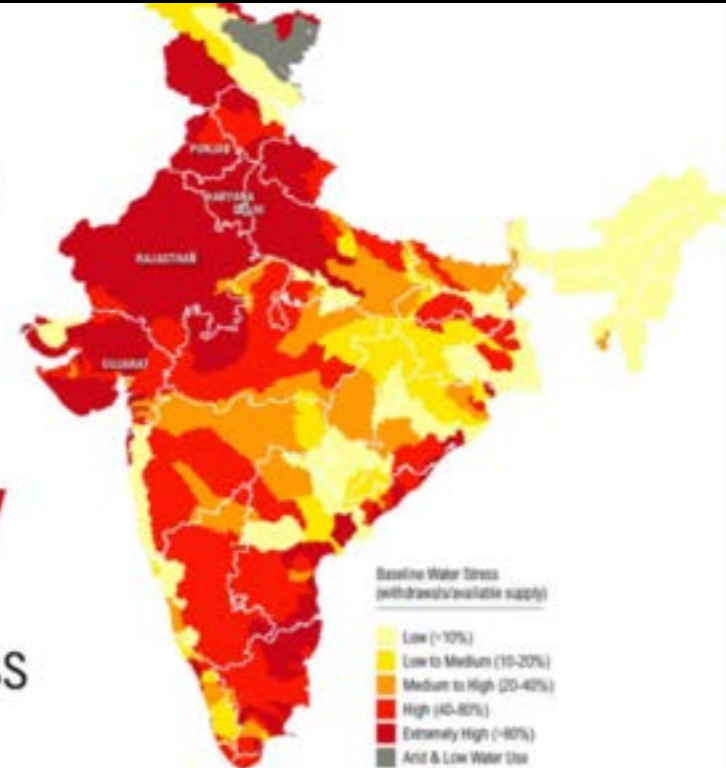
54%
of India's
Ground-
water
Wells Are
Decreasing



More than
100
MILLION
People Live
in Areas of
Poor Water
Quality



54%
of India
Faces
**High to
Extremely
High**
Water Stress



Source: www.indiawatertool.in, World Resources Institute, 2010

Paradox of Groundwater Governance in India



Policy, Legal & Institutional Framework for Groundwater Management

1882 EASEMENT ACT

Right to land = right to groundwater beneath it

1950 INDIAN CONSTITUTION

Water placed in State List - regulated and controlled by states

1998, 2012 NATIONAL WATER POLICY

No statutory status; only nudge States to develop policies. Only few States have adopted these

MODEL GW BILL
1970-2005,
2012

A template for State to adopt and devise legislation

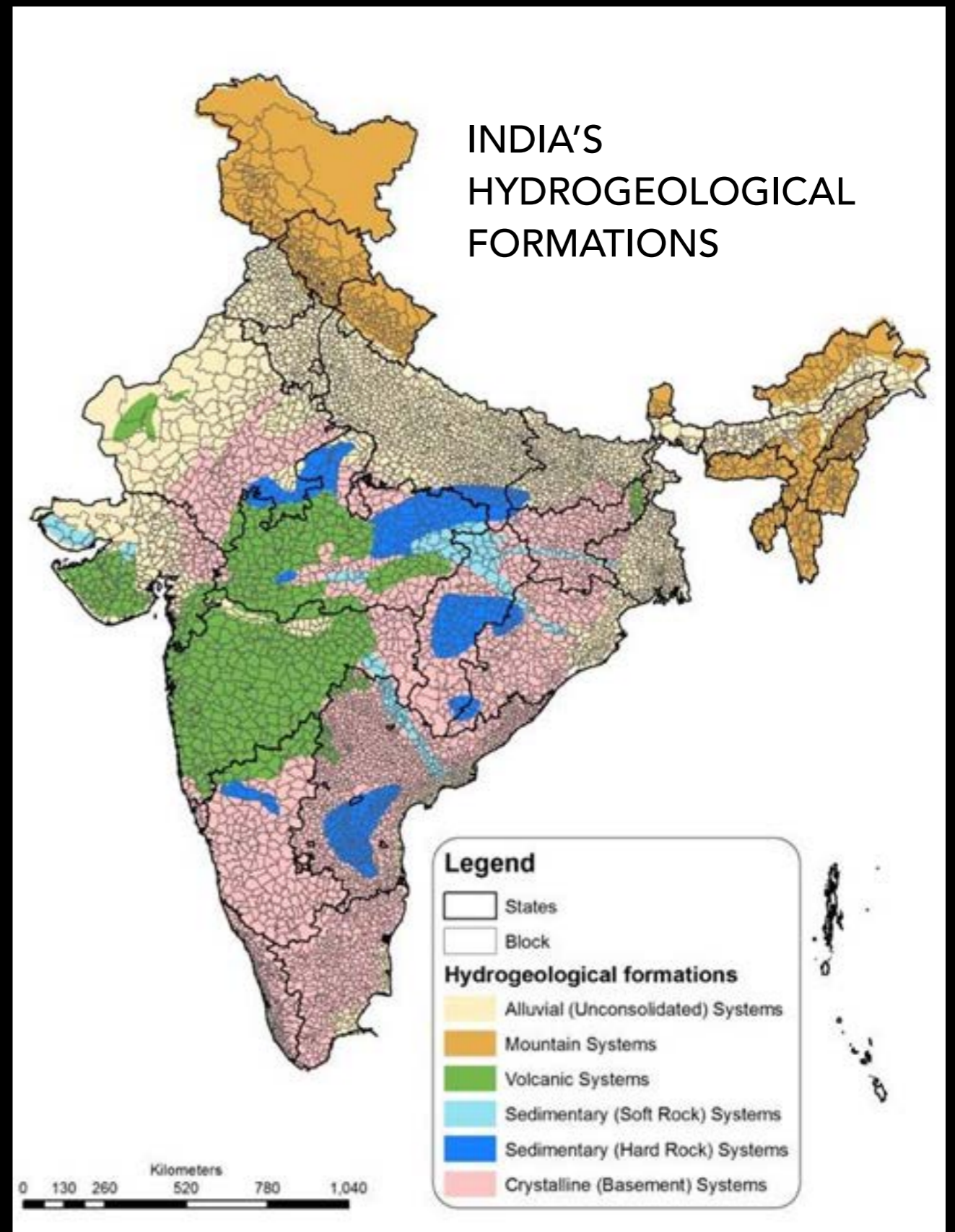
1996 CENTRAL GW AUTHORITY

Set up after Supreme Court ruling under EPA 1986



India's Diverse Hydrogeology

- Wide range & diversity in scale and setting of aquifers
- Himalayas feed the great alluvial plains of the northern river basins
- Groundwater conditions vary in space and time



Source: COMMAN 2005; GSI (various years), ACWADAM (various publ.), CGWB (2012)

**ARGHYAM IS INDIA'S FIRST
AND ONLY FOUNDATION WHOLLY
DEDICATED TO WATER
CONSERVATION AND MANAGEMENT**



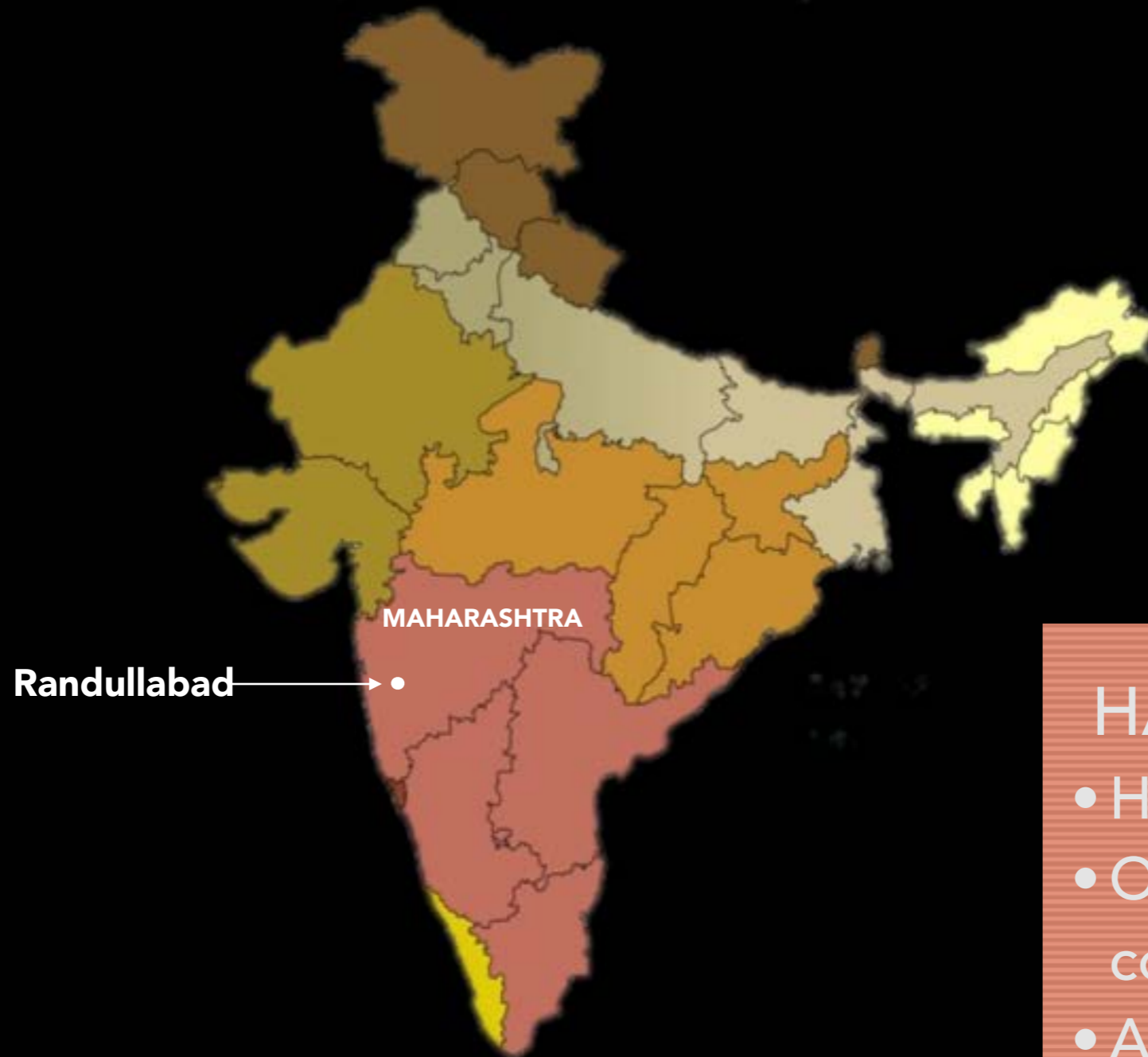
**WE FUND AND IMPLEMENT PIONEERING WORK IN
SAFE AND SUSTAINABLE GROUNDWATER AND
SANITATION, AND ARE ON A MISSION TO ENABLE
LIFELINE WATER TO THE MOST VULNERABLE**



GROUNDWATER STORIES



Randullabad, MAHARASHTRA



HARD ROCK AQUIFERS

- Heterogenous rock types
- Overexploited & fluoride contaminated groundwater
- Arid/low rainfall area

AN OASIS AMIDST DROUGHT

DROUGHT-PROOFING THROUGH COMMUNITY COOPERATION



OUR PARTNER: ACWADAM

THE CONTEXT

- Difficult geography - rain shadow region
- Rainfall 600-700mm
- ~2000 inhabitants
- High dependency on GW
- Over-exploitation of GW, reduced drought resilience





INTERVENTION

- Science-based community mapping of aquifers
- Community organisations formed
- Moratorium on new bore wells agreed
- Cropping patterns diversified
- Drinking water prioritised

IMPACT

- GW levels nearly doubled in three years
- Water used equitably
- Farming revenues rose by 90-130%
- Water balance maintained
- Drought-proof village
- Local governance enhanced

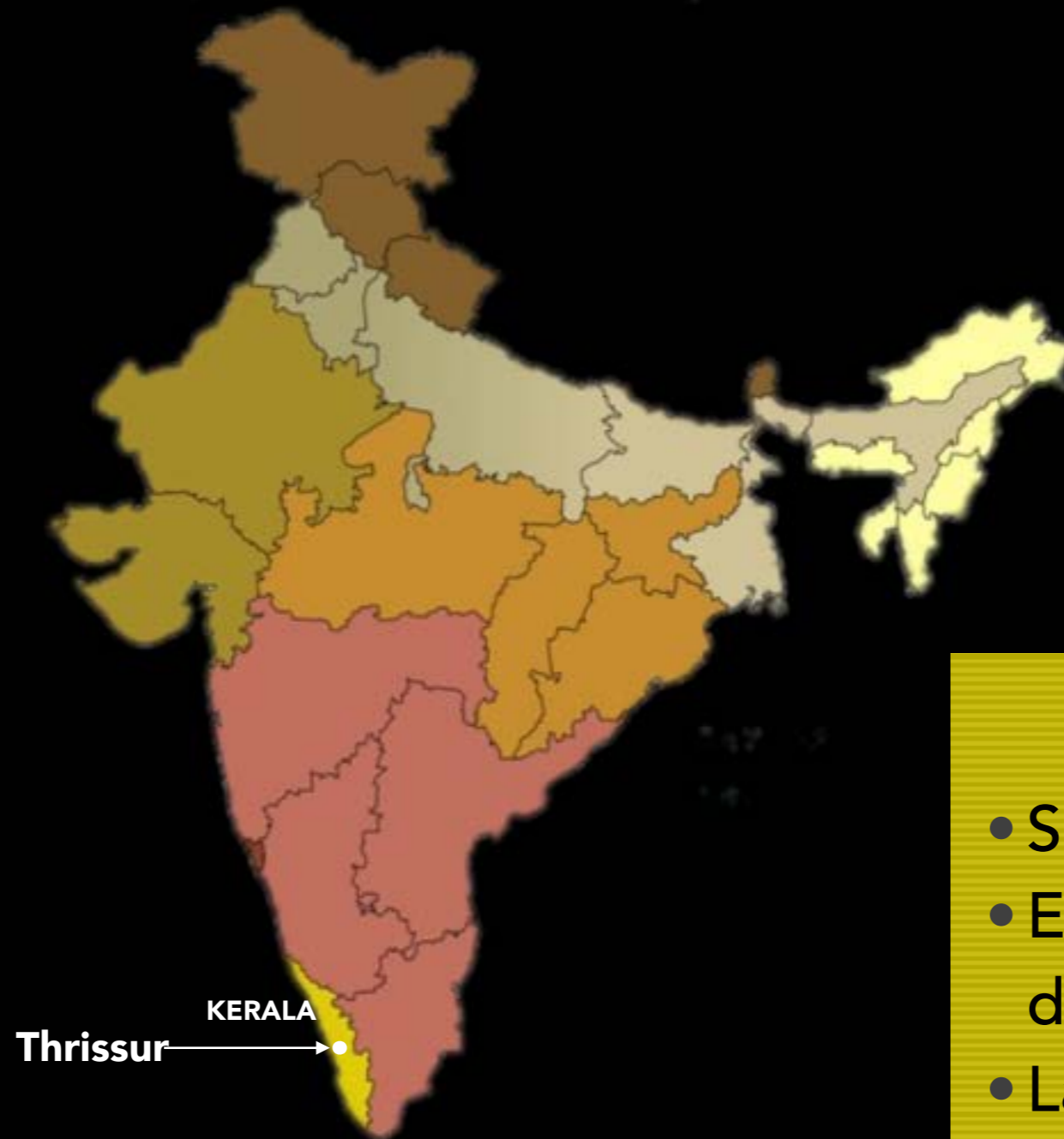




PROGRESS

- First experiment in PGWM
- Groundwater successfully managed as a resource belonging to the community, not individuals
- Communities invested long-term through an understanding of science
- Has led to 500 similar interventions

Thrissur District, KERALA



COASTAL AREA

- Salinity ingress in aquifers
- Erosion of traditional drinking water sources
- Largest concentration of dug wells

BOUNTIFUL RAIN

WHEN IT RAINS, IT STORES



OUR PARTNER: MAZHAPOLIMA

THE CONTEXT

- Rainfall 3000mm
- Falling GW levels
- 450,000 private open wells
- 70% households dependent on wells for lifeline water
- High bacteriological and nitrate contamination
- Public dependent on tankers in summers





INTERVENTION

- Piloted in 3 GPs, scaled to 53 GPs
- Captured rainfall directed from roofs to wells
- Nets or sand filters to reduce contamination
- Cost per household USD 20-80
- Arghyam investment USD 290,000 over 5 years

IMPACT

- Visible rise in well water levels
- 8500 wells recharged
- Water available even in summers
- Dependency on water tankers in summers dropped
- Water salinity down

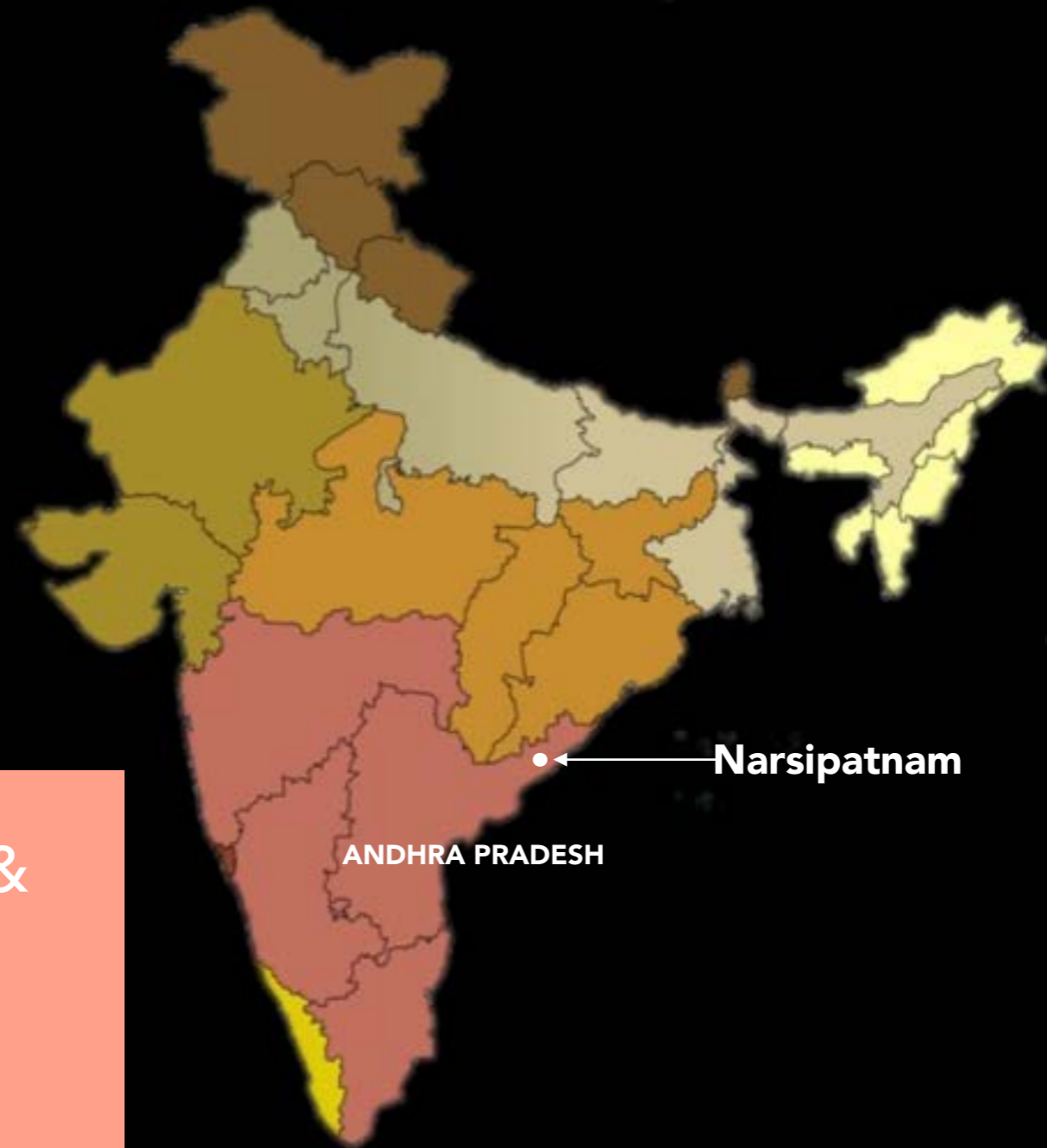




PROGRESS

- Adoption of approach by district made the solution go viral
- Recently declared a State-wide program *Jalsuraksha*
- Investment by government USD 1.5million
- Opportunity for it to become a solution for coastal areas

Narsipatnam, ANDHRA PRADESH



MOUNTAIN AQUIFERS & SPRINGS

- Forests, tribal hinterland
- Extreme poverty
- Isolated geography

NEERU AROGHYAM

BRINGING MOUNTAIN SPRINGS TO HOMESTEADS



OUR PARTNER: VJNNS

THE CONTEXT

- Rainfall 1116 mm
- Difficult terrain
- Distance to water far and elevation high
- Water collected by women and girls
- Water source unprotected
- State interventions limited





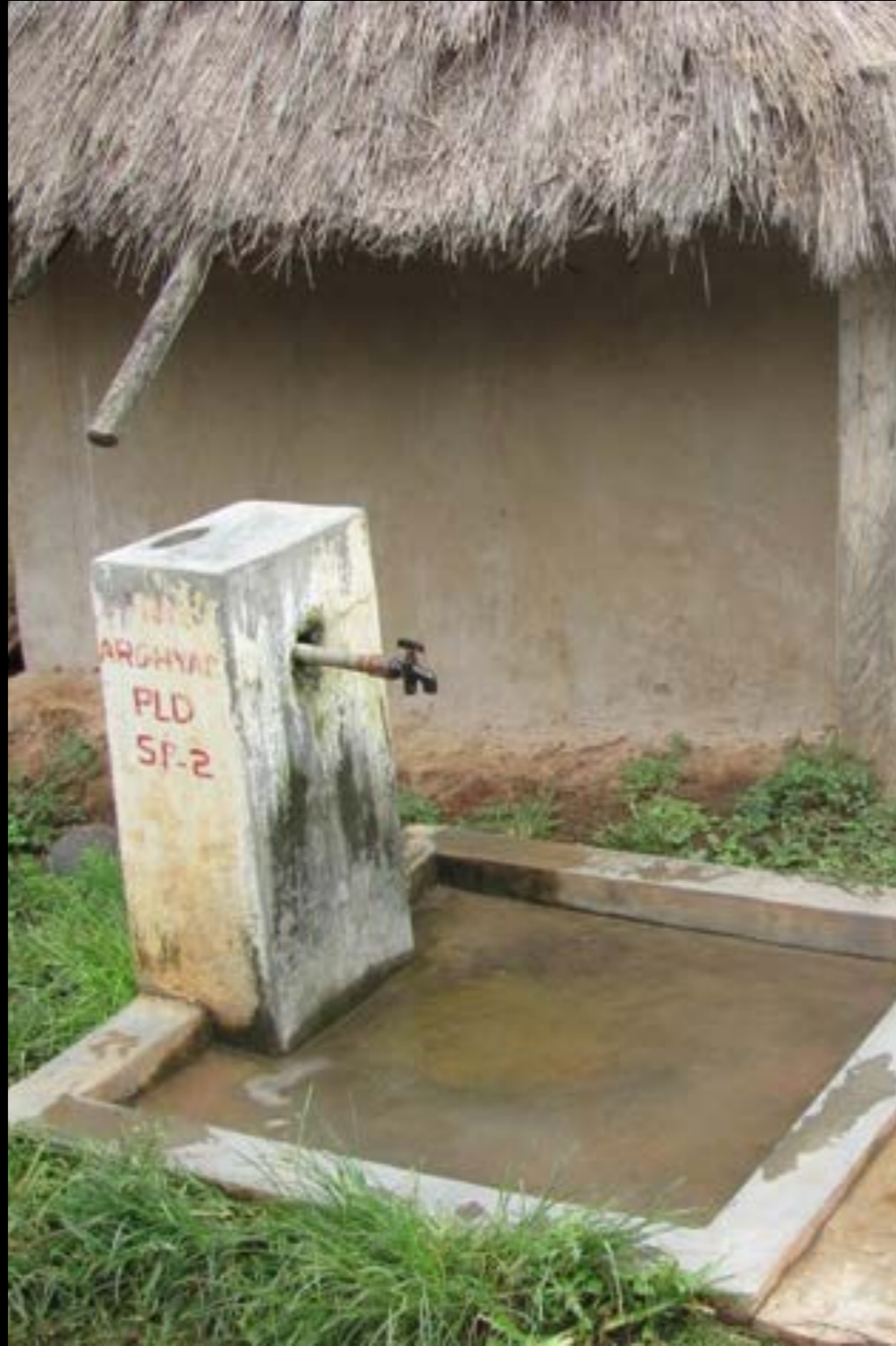
INTERVENTION

- Spring source identified
- Springs' source protected
- Sandbox constructed
- Community contributes labour
- Clean water piped to community stand posts through gravity
- Nominal O&M costs to households

IMPACT

- 70-100 habitations served
- Cost per habitation USD 10,000; cost per household USD 80
- Very low maintenance system
- Safe water delivered using zero energy
- Primary beneficiaries women and girl children
- Arghyam investment USD 250,000 over 5 years

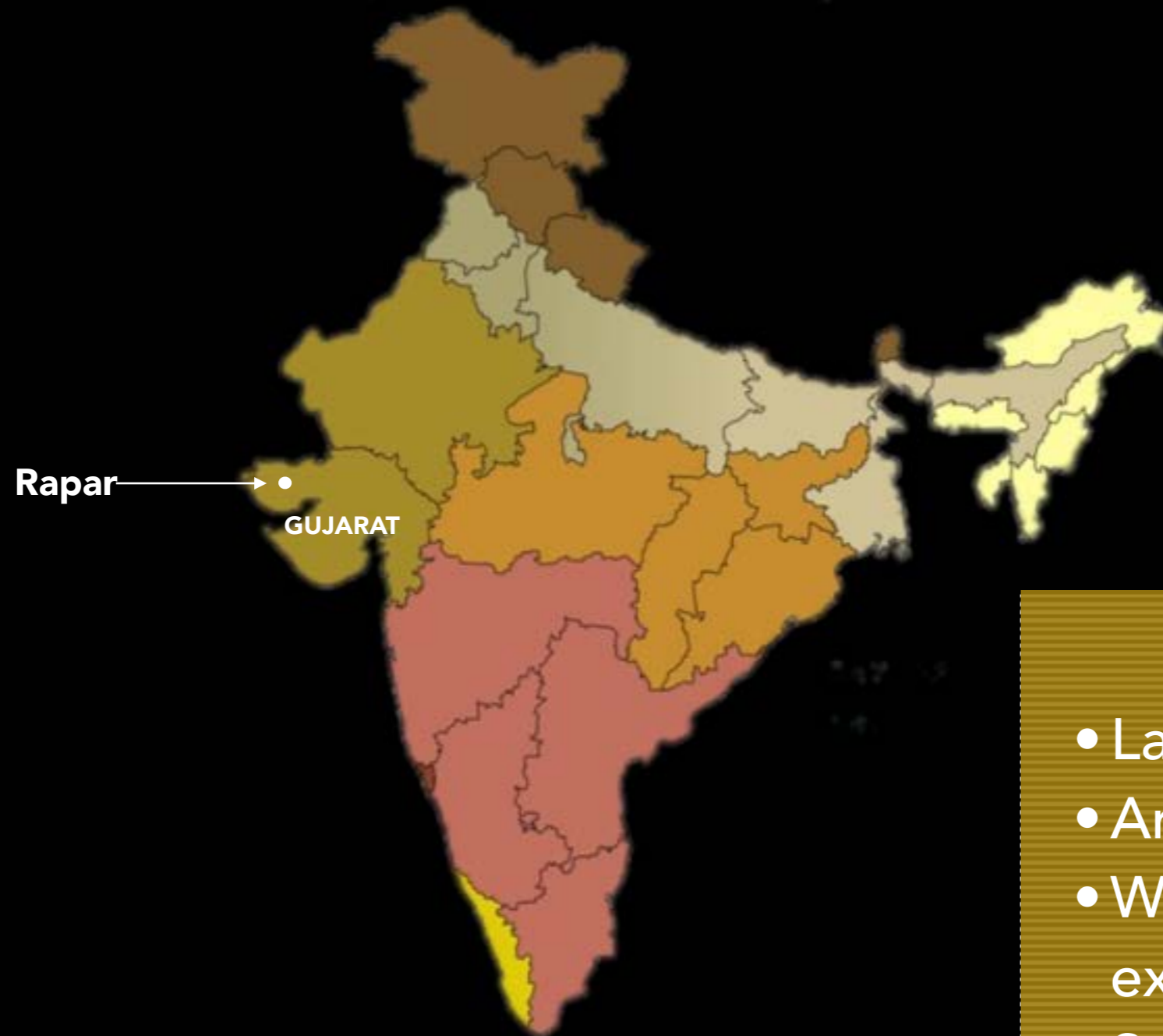




PROGRESS

- VJNNS is now a Resource Centre working with 10 field partners
- 150 micro-level plans ready for implementation
- Opportunity for all mountain/springs areas
- Renewed interest in springs - Meghalaya, Sikkim

Rapar, Kutch District, GUJARAT



MIXED TYPES

- Largest district in the country
- Arid zone
- Water use intensive and extensive
- Salinity

WATER IS THE LIFELINE

NO WATER DISTRESS, NO MIGRATION



OUR PARTNER: SAMERTH

THE CONTEXT

- Low rainfall area
230mm
- Endemic water
shortages
- Marginalised tribal
communities
- Low literacy
- Access to government
safety net limited





INTERVENTION

- Communities empowered to understand aquifers
- 24 community institutions formed and functioning
- Integrated water security plans developed
- Government schemes accessed to implement plans
- Ponds de-silted, earthen check dams built
- O&M by communities

IMPACT

- 20 villages, 65 hamlets water secure
- GW levels up by 28 cubic km
- Lifeline water for people and cattle secured
- 30% increase in agriculture yield
- Distress migration minimal reduced by 60%
- Arghyam investment USD 83,000

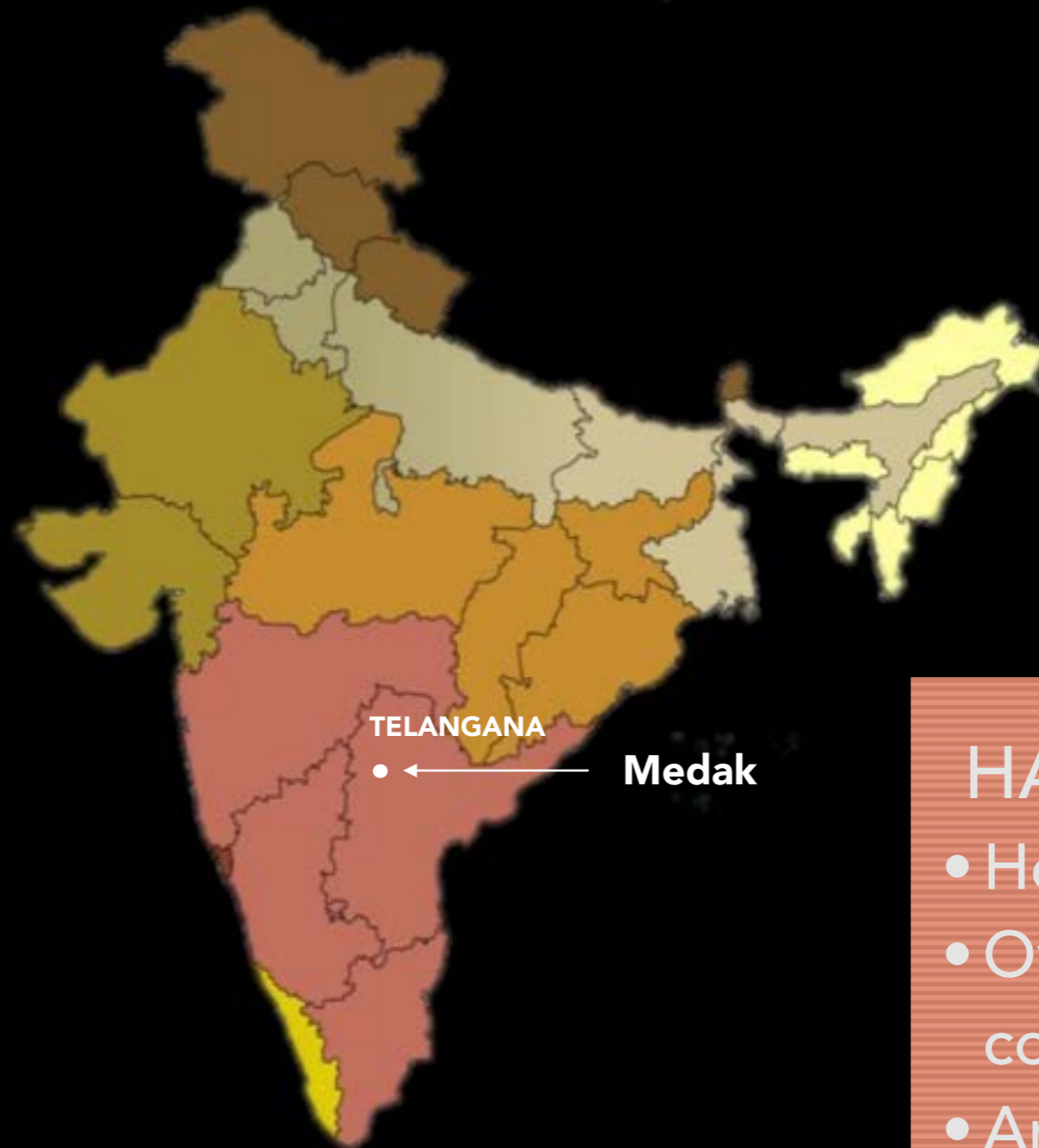




PROGRESS

- Local government enabling scale for other parts of the district
- Similar interventions now being piloted among tribal communities in Chattisgarh
- Opportunity for replication among marginalised communities to access government safety net schemes

Medak District, TELANGANA



HARD ROCK AQUIFERS

- Heterogenous rock types
- Overexploited & fluoride contaminated groundwater
- Arid, semi-arid area

WHAT'S MINE IS OURS

POOLING & SHARING GROUNDWATER FOR AGRICULTURE



OUR PARTNER: WASSAN

THE CONTEXT

- Poor rainfall area
600-1000mm
- Farmers entirely
dependent on GW
- Perverse incentives
enabling water intense
crops
- Water table dropping
- Extraction costs rising





INTERVENTION

- Farmers on a grid with or without bore wells form collective
- Trained in hydrogeology and aquifer mapping
- Water sharing norms agreed
- Entire grid connected by pipe network
- Borewell pooling implemented

IMPACT

- GW increased by 2m in three years
- Pumping time reduced, energy costs saved
- Irrigated area doubled and productivity increased upto 240%
- Water intense cultivation decreased by 20%

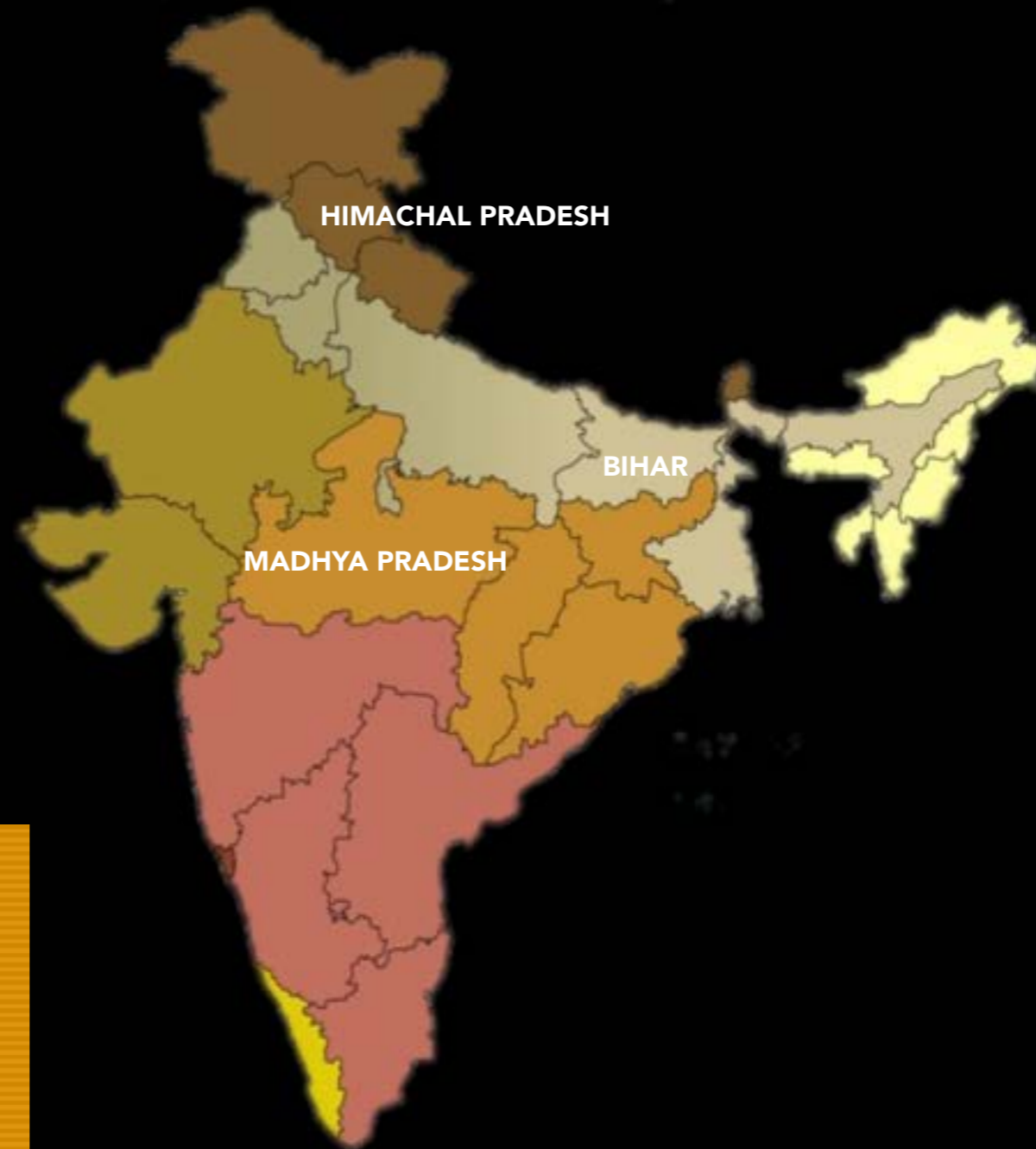




PROGRESS

- Borewell pooling recognised as best practice by *Indira Jala Pradha* scheme
- Funds leveraged from State for expansion of integrated watershed/ groundwater management
- Opportunity for borewell pooling as a solution in agriculture

HIMACHAL PRADESH, MADHYA PRADESH, BIHAR



WATER QUALITY
(Pan India)
Bacteriological
Nitrates, Iron, Fluoride,
Arsenic

QUALITY MATTERS

FROM MOUNTAIN SPRINGS TO FLOOD PLAINS



OUR PARTNERS: PSI & MPA; WQ NETWORKS

MOUNTAIN SPRINGS

PSI

- High risk of bacteriological contamination
- Sanitation protocols agreed through community participation
- Self regulation of social fencing achieved
- Water quality assured through social fencing and botanic filtration





DHAR, MP

PSI

- High fluoride contamination in wells due to geogenic causes
- Mitigation measures by government unsuccessful
- Community understanding of the problem enhanced through hydrogeology
- Contaminated wells marked
- Water storage tanks set up
- Stored water earmarked for drinking purposes and managed by community

NORTH BIHAR

MPA

- GW in most parts of Bihar contaminated by arsenic and/or iron
- Revived, flood resilient dug wells show lower prevalence of arsenic compared to borewells
- Iron and bacteriological contamination mitigated by *matka* filters

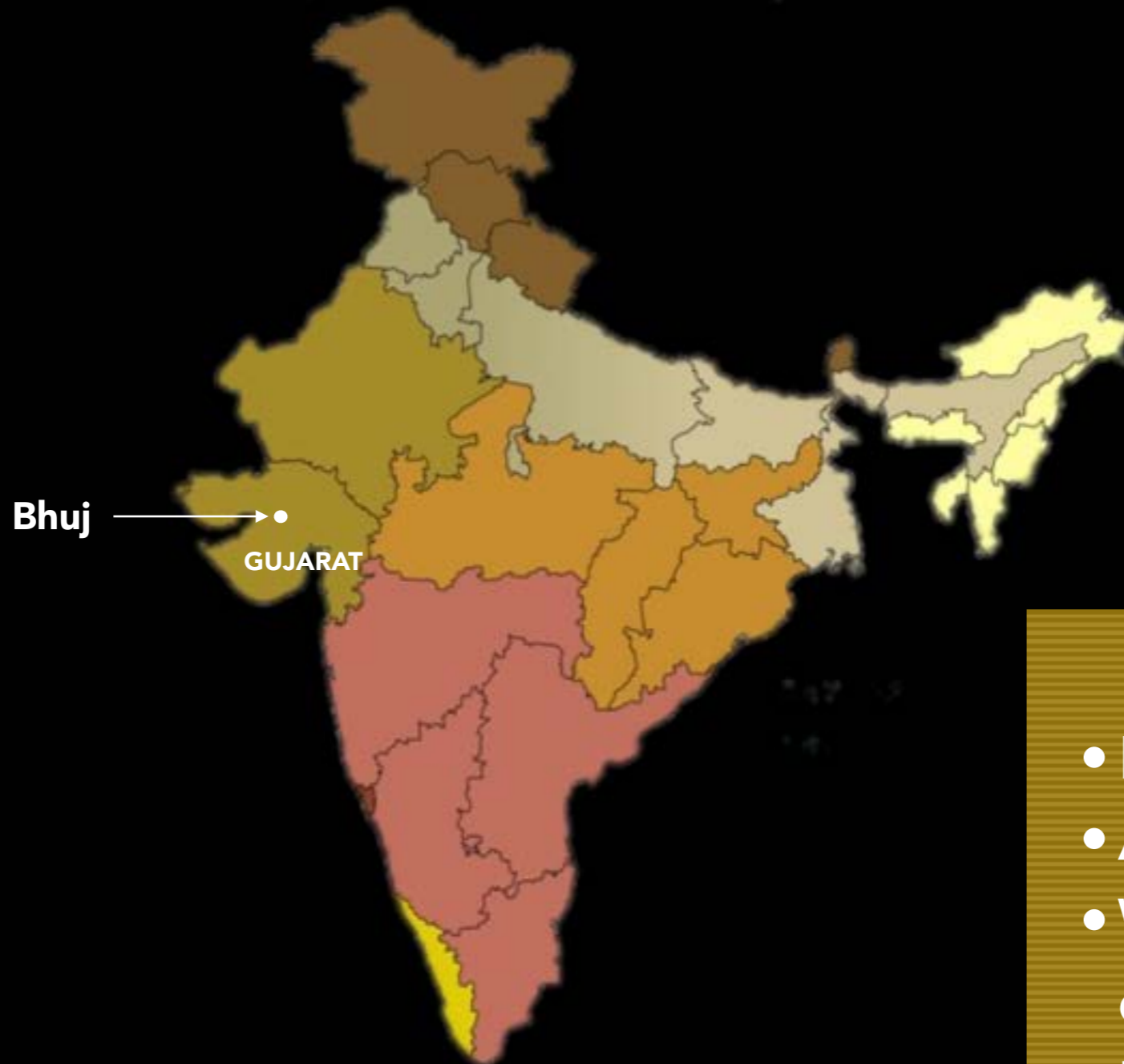




WATER QUALITY THROUGH NETWORKS

- Chronic, widespread and immediate problem
- Context specific solutions imperative to mitigate poor water quality
- Transfer of knowledge, best practices and capacities is central
- Networks to enable greater reach in a shorter timeframe
- First of its kind in India set up by Arghyam for Fluoride and Arsenic

Bhuj, Kutch District, GUJARAT



MIXED TYPES

- HQ of Kutch district
- Arid zone
- Water use intensive and extensive
- Unplanned urban growth

CITIZENS UNITED

WATER WARRIORS IN THE CITY



OUR PARTNER: ACT

THE CONTEXT

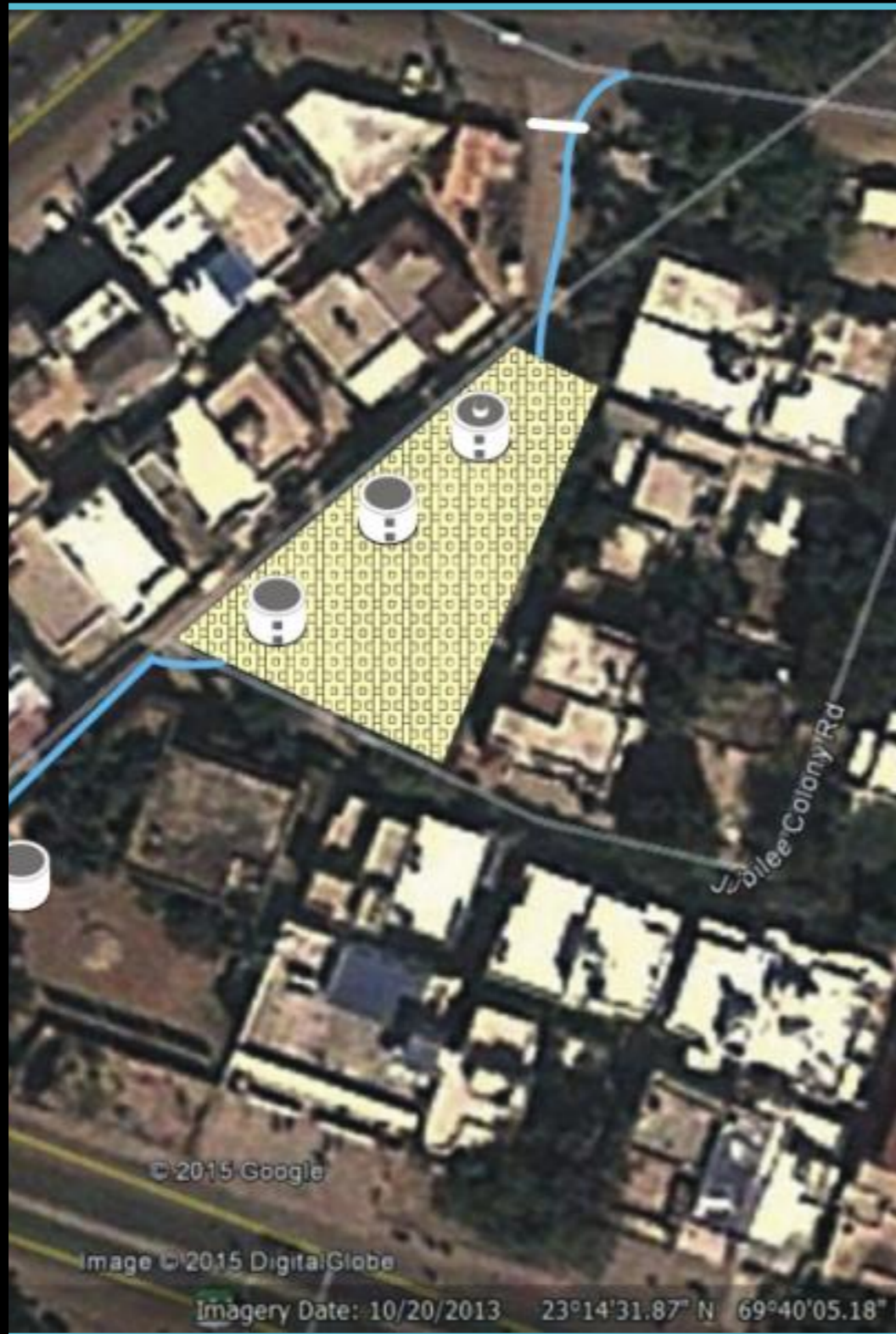
- One of the fastest growing cities
- Population 170,000 from 100,000 in a decade
- Rainy season short within a span of three weeks - 320mm
- 75,000 cubic metre of water lost of run-off per year
- GW supplies 60% of city's needs
- Interventions for two social strata being piloted.



URBAN SLUM

- Decentralised water supply to the slum functional
- Lake rejuvenation increased GW levels
- Water storage and distribution network established
- Water piped to community standposts





URBAN MIDDLE CLASS COLONY

- Stormwater drainage an issue at its low lying
- RWA participated in intervention
- GW recharge wells and drainage put in within colony
- Community contributed 10% of costs

CITIZENS ENGAGEMENT IN URBAN SPACES

- New types of community structures in urban centres
- Citizen/local bodies unite for a cause
- District administration incorporating participatory urban watershed into new schemes





THE COMMON THREAD

- GROUNDWATER IS A COMMON POOL RESOURCE
- MANAGED AS A FINITE RESOURCE - AQUIFER BASED
- BY COMMUNITIES FOR COMMUNITIES
- ONE SIZE DOES NOT FIT ALL - PRINCIPLES SCALABLE, SOLUTIONS REPLICABLE

THE ROLE OF THE STATE

- PROVIDE REGULATORY FRAMEWORK TO ENSURE EQUITY AND ACCESS
- INVEST AND ENSURE ALLOCATED FUNDS REACH COMMUNITIES
- INSTITUTIONS AND CAPACITY DEVELOPMENT
- ENABLE FLEXIBLE, CONTEXTUAL SOLUTIONS



QUESTIONS TO PONDER

**What lessons can we draw for our groundwater security
in the 21st century?**

**Can community-driven, science-based solutions that are contextual,
flexible and responsive, make invisible groundwater visible?**

How can the State steer this paradigm shift?



OUR CONTINUING STRATEGY

- DISCOVER LOCAL SOLUTIONS
- DEEPEN UNDERSTANDING THROUGH SCIENCE AND SUSTAINED PRACTICE
- SEED AND NURTURE NETWORKS, PLATFORMS AND PARTNERSHIPS TO EXTEND REACH
- ADVOCATE FOR EQUITABLE ACCESS TO SAFE WATER & SANITATION FOR ALL, WITH GOVERNMENT AND OTHER DONORS



ARGHYAM

AN OFFERING





SAFE SUSTAINABLE WATER FOR ALL

ARGHYAM

Thank you