Groundwater Risk Management for Growth & Development *(GRo for GooD)*

UPGro Consortium Kick-off Workshop, London

Oxford University with UPC (Hydrogeology Group), University of Nairobi, Jomo Kenyatta University of Agriculture and Technology, Rural Focus Ltd., Government of Kenya (WRMA, WASREB)

22nd April, 2014

NERC SCIENCE OF THE ENVIRONMENT

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

UKaid from the British people

Research jointly supported by the ESRC and DFID

UP Gro Unlocking the Potential of Groundwater for the Poor

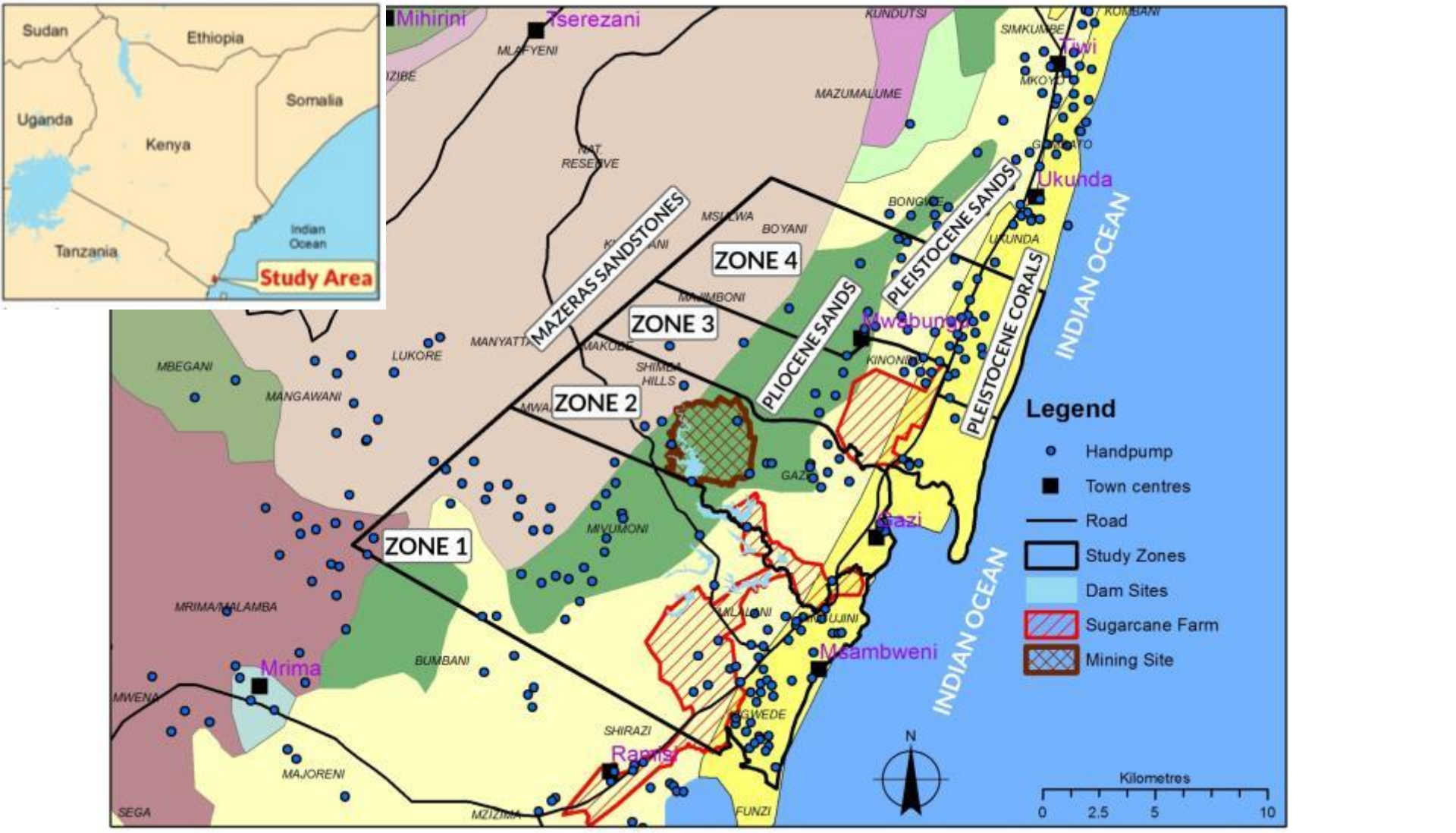
GRo for GooD

The project will make contributions to support interdisciplinary science and governance of managing groundwater risks for growth and development in Africa:

1. A new Groundwater Risk Management Tool integrated into government regulation and management in Kenya.
2. An automated, daily monitoring network for shallow groundwater levels.
3. Improved theory and evidence linking groundwater governance to poverty and health dynamics and outcomes.

Why Kwale?

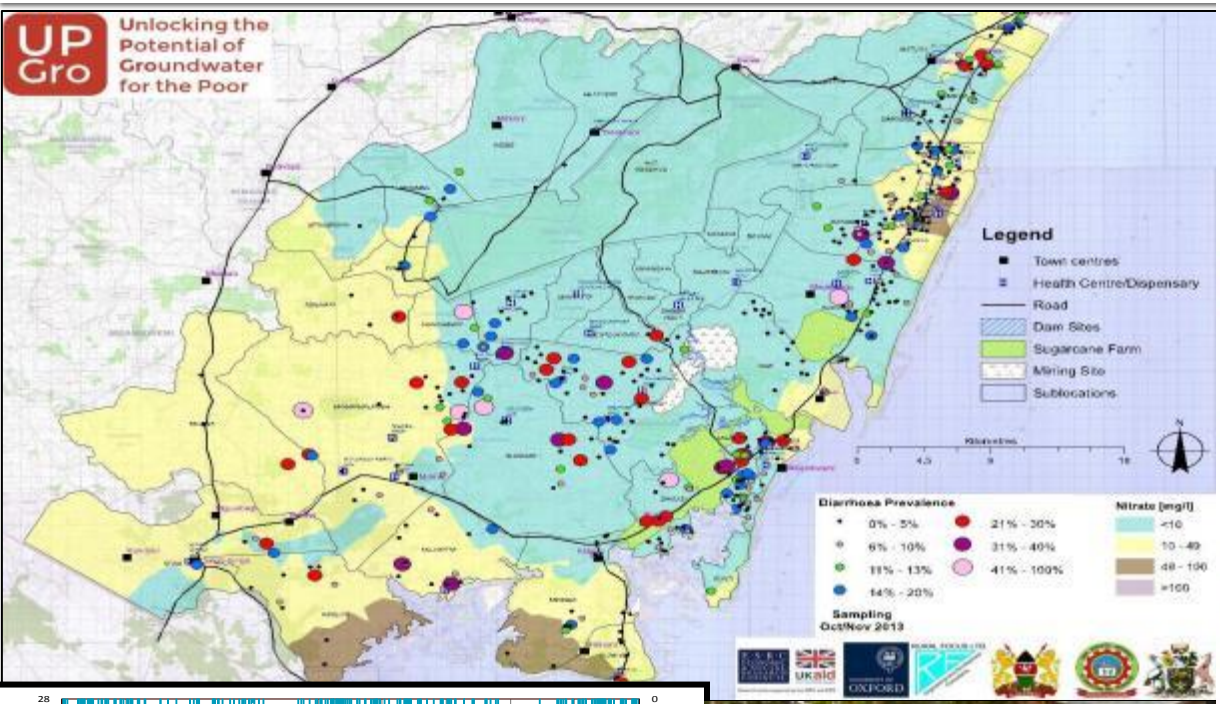
- *future and unknown trends can be evaluated from a 'natural' baseline*
- *replicable methodology applicable to similar challenges across Africa*

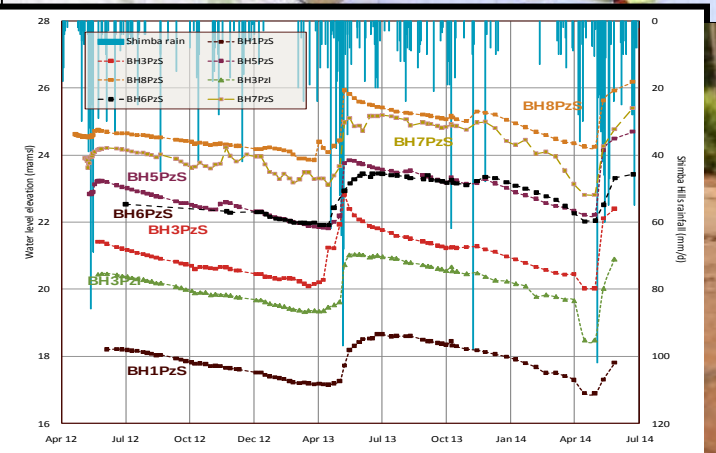


Natural baseline to track change and future trends

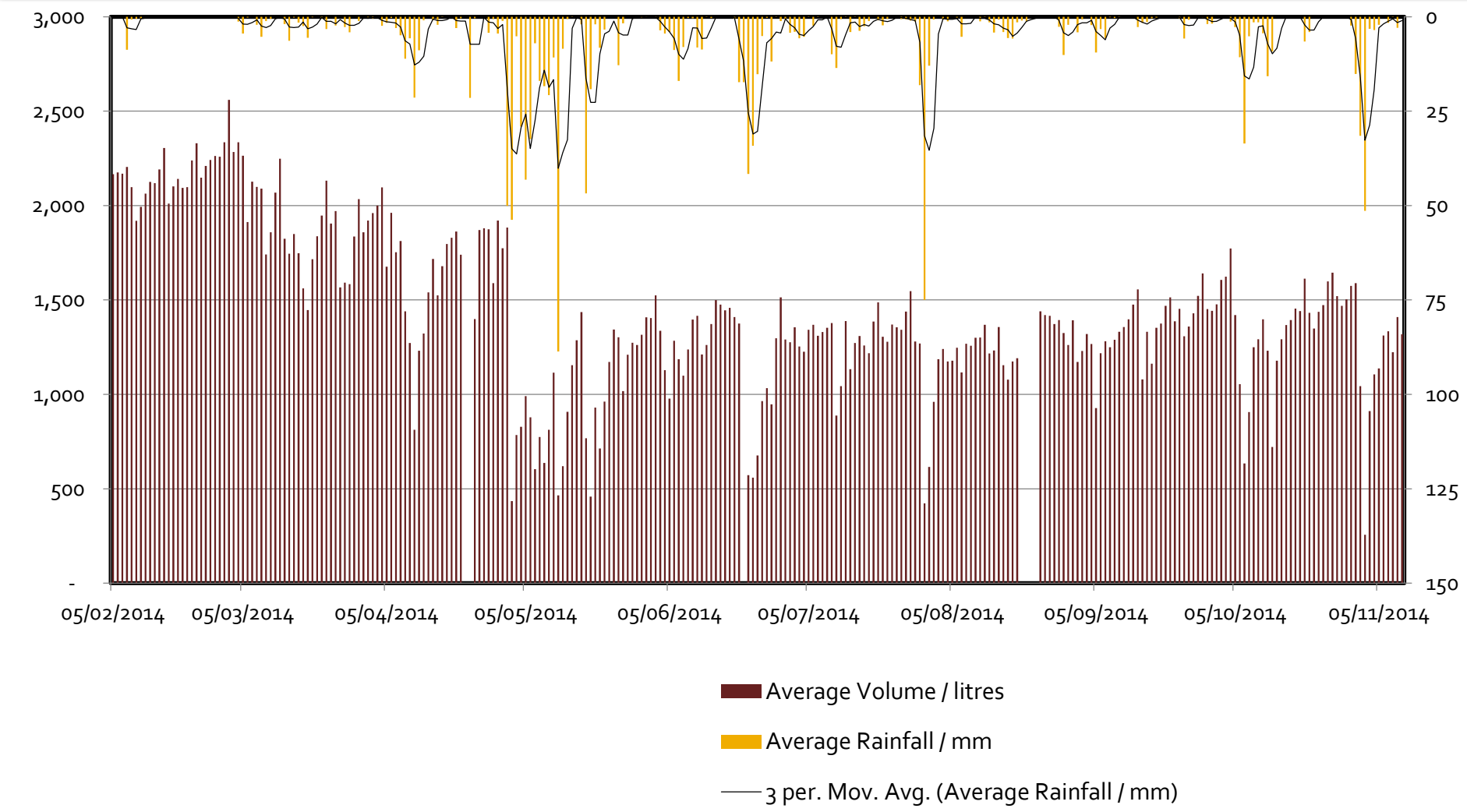
- Surface water and groundwater monitoring network

- historical, high quality data (Base), plus Government commitment



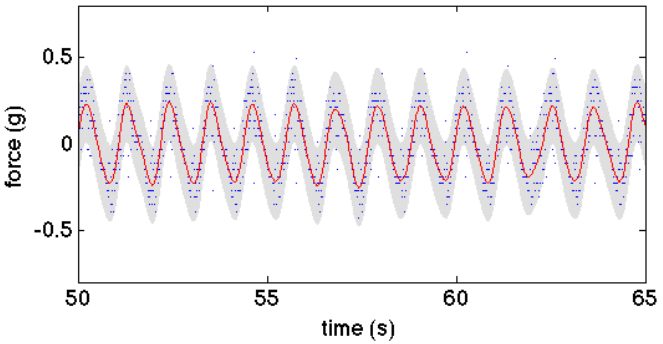


Smart Handpumps
- observed daily data to inform science, policy and practice

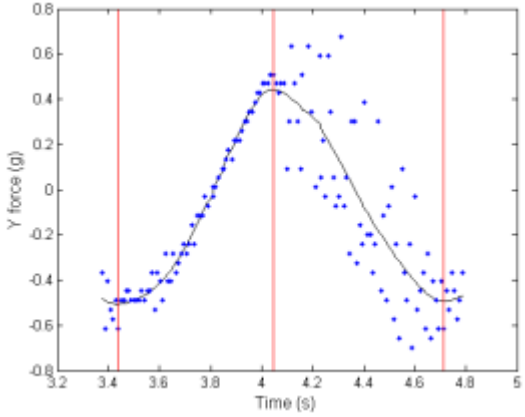


Shallow aquifer monitoring system

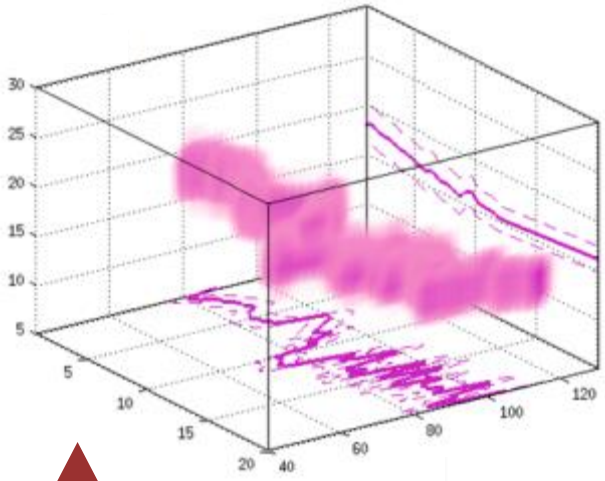
- *Bayesian machine learning for real-time prediction*



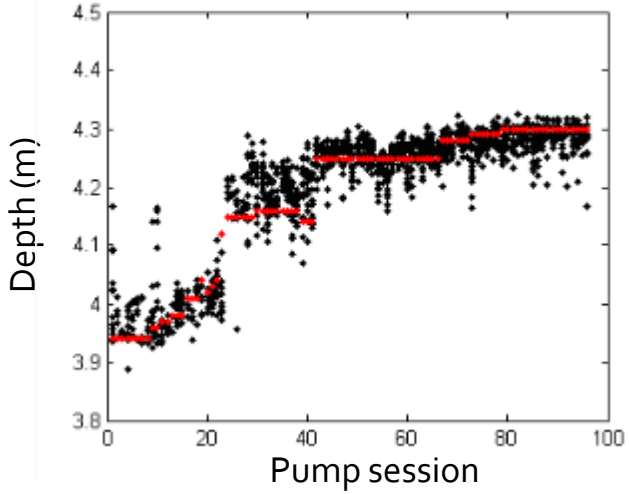
(i) Time-series data are acquired from the pump via telemetry



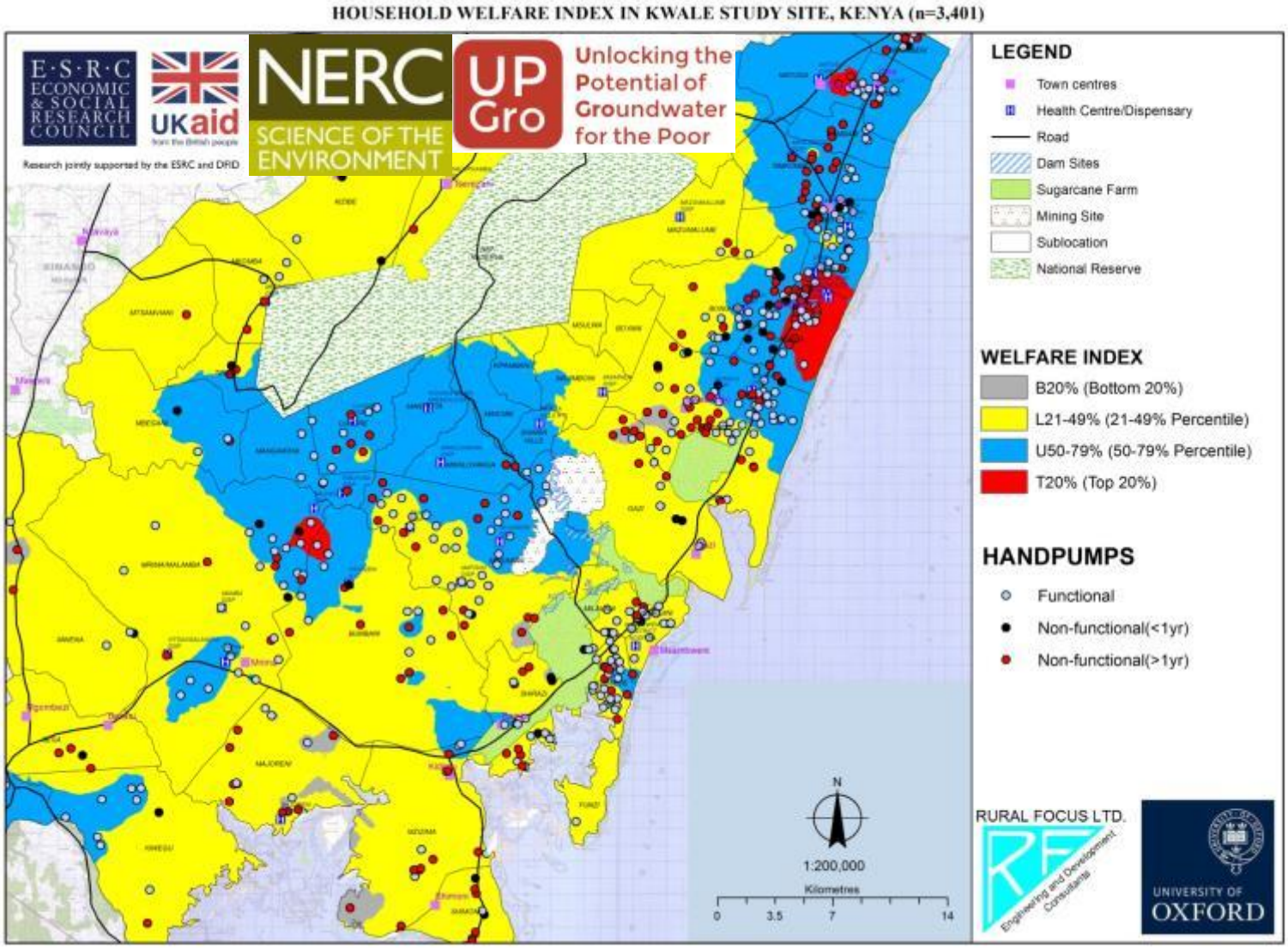
(ii) Features are extracted from the time-series



(iii) A Bayesian Gaussian process learns the relationship between input features and aquifer depth

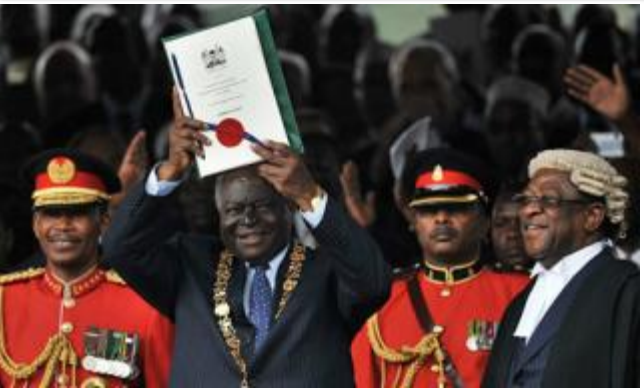


Multidimensional poverty



Governance transformations

- Decentralisation; Corporate; Community



Role and impacts of decentralisation for groundwater governance

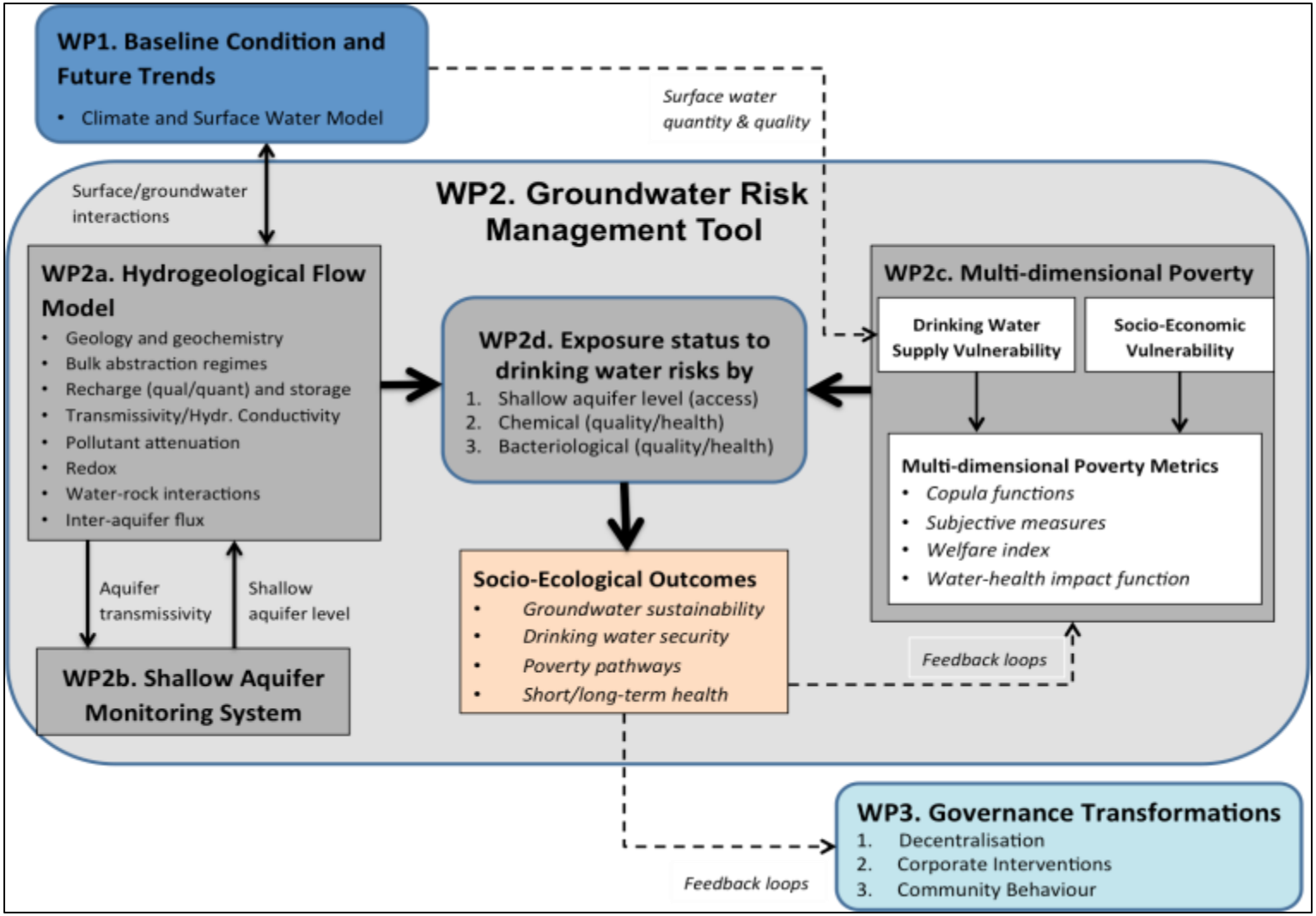
Emergence of local Water Resources User Associations to manage groundwater

How does the "social license to operate" affect the behavioural responses of corporate water users?

How will rural water users respond to alternative water service arrangements?

Conceptual framework

- monitoring system using Bayesian Gaussian processes
- multi-dimensional risk indices to inform governance responses



UPGRo - Programme Integration

- **Identify areas for PIG beyond UPGRo Knowledge Broker for**
  - Coordination and logistics
  - Knowledge exchange (added value beyond RWSN/SKAT?)
  - Data management
  - Drawing the programme together scientifically
- **But, what are the desired outcomes?**
  - Programme legacy – integration into global programmes (SDG, WSP, other?), institutional capacity in Africa
  - Uptake and funding in non-UPGRo Africa and South Asia context
  - Advances in science translates into new policy and investment decisions
- **Initial thoughts**
  - Recharge from extreme events
  - Ground-truth shallow aquifer monitoring system in other UPGRo study sites
  - Wider applicability of a Groundwater Risk Management Tool
  - UPGRo product suite of major scientific advances for policy uptake through KB activities (web, event, country, etc.)

Thank you and questions

Research jointly supported by the ESRC and DFID