THE USE OF ARTIFICIAL INTELLIGENCE AND INNOVATIVE SOLUTIONS TO SUPPORT ETHICAL AND GOOD GOVERNANCE

Thursday, 20th May 2021

Water: New Strategies and Technologies for its Management and Use

Professor Rob Hope,
School of Geography and the Environment
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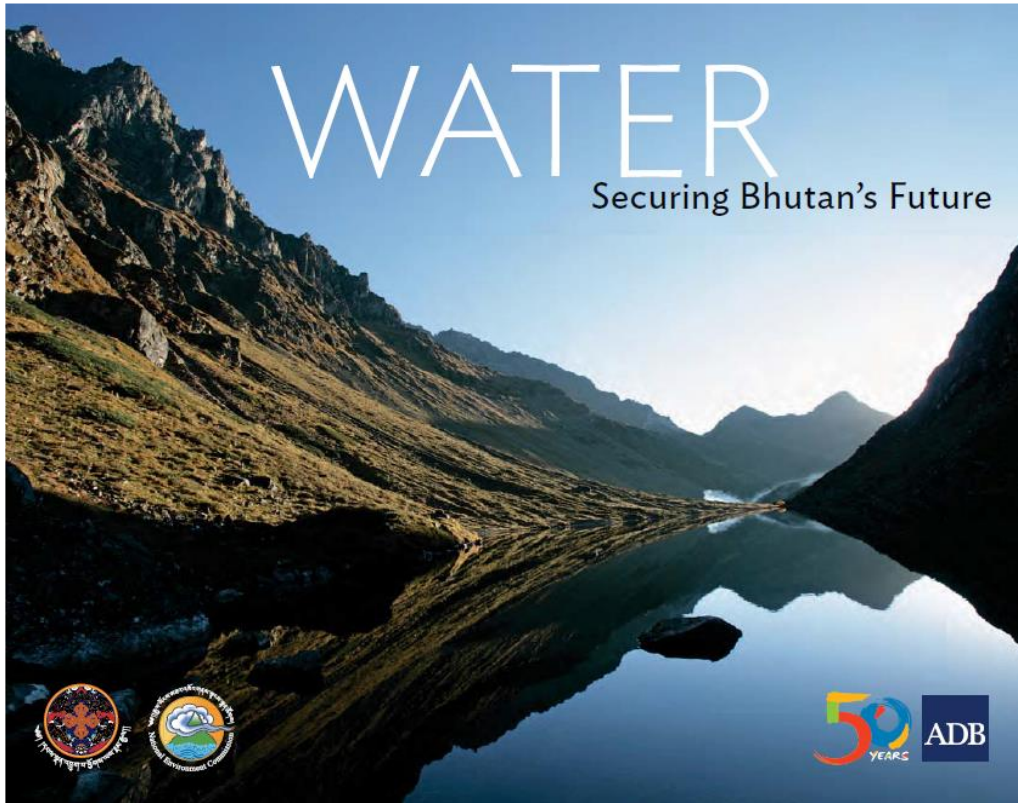
Outline

- Water security – a defining global challenge
  - Bhutan – water security
  - REACH – improving water security for the poor
  - India – irrigation infrastructure
- Can AI improve water governance?
  - Global progress in AI and Earth Observation
- Water security outcomes
  - Climate resilient schools
  - Financing water services
- Concluding comments & discussion



https://www.adb.org/publications/water-securing-bhutans-future#:~:text=Integrated%20water%20resource%20management%20serves,is%20being%20pursued%20in%20Bhutan.

Bhutan Water Security
- water security risks and trade-offs

Wangchu Water Security Index:

1. Rural drinking water supply and sanitation
2. Economic water security
3. Urban water security
4. Environmental water security
5. Disaster and climate change resilience

http://wwsi.nec.gov.bt/

In Bhutan, fewer schools had sufficient water for cleaning toilets and for bathing in 2018

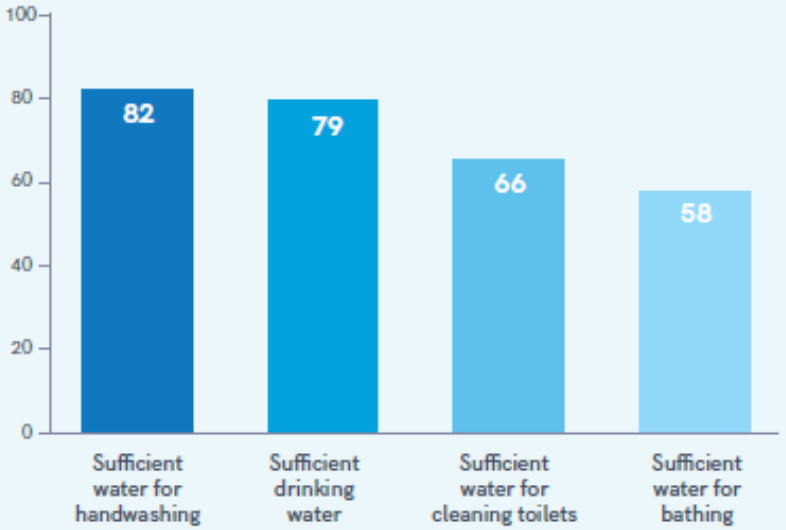
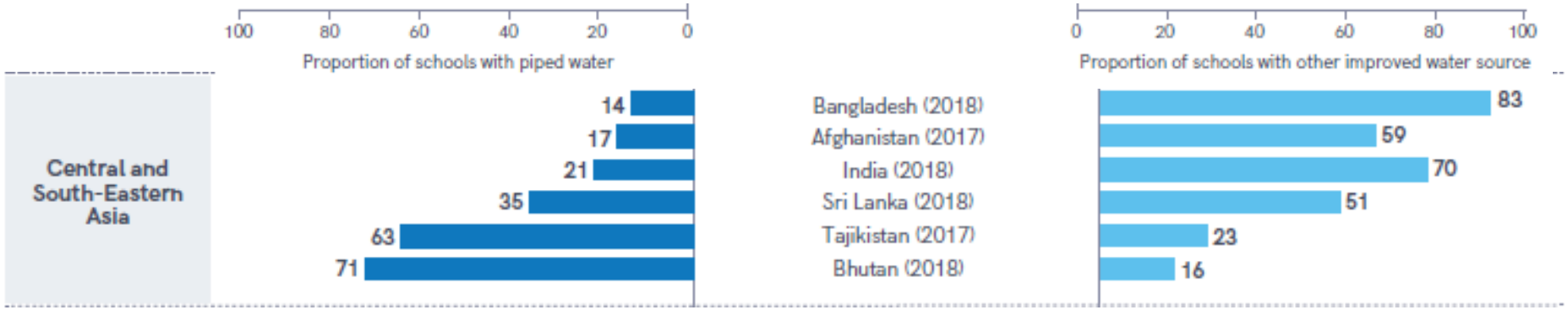


FIGURE 27 Proportion of schools with sufficient water available for different purposes in Bhutan, 2018 (%)

Source: Annual Education Statistics, Ministry of Education Policy and Planning Division, Bhutan (2018)



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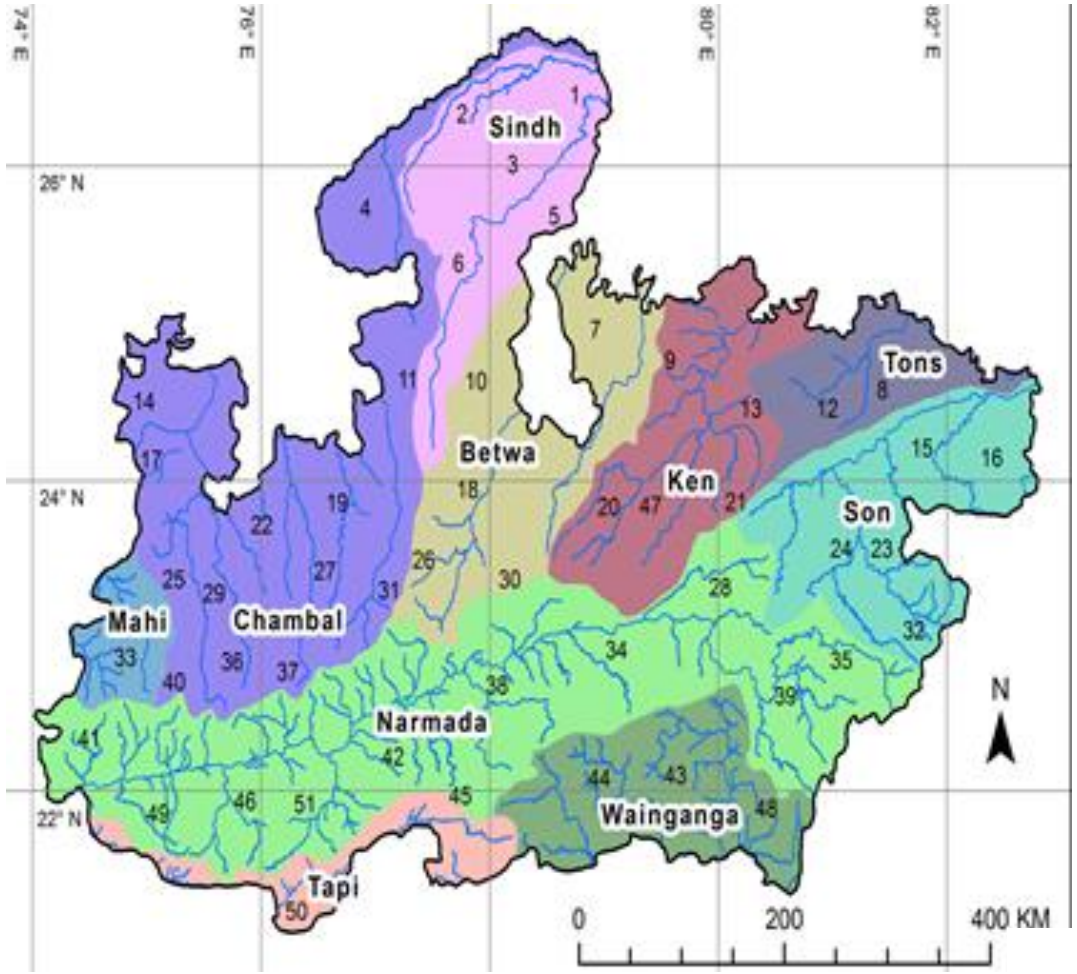
Water Security – a defining global challenge



Madhya Pradesh Water Sector Restructuring Project

- World Bank/GoMP – USD443m, 2005-2015
- Maximise irrigation potential in 495,000ha in six river basins in 31 out of 51 Districts
- Modernize and rehabilitate irrigation infrastructure

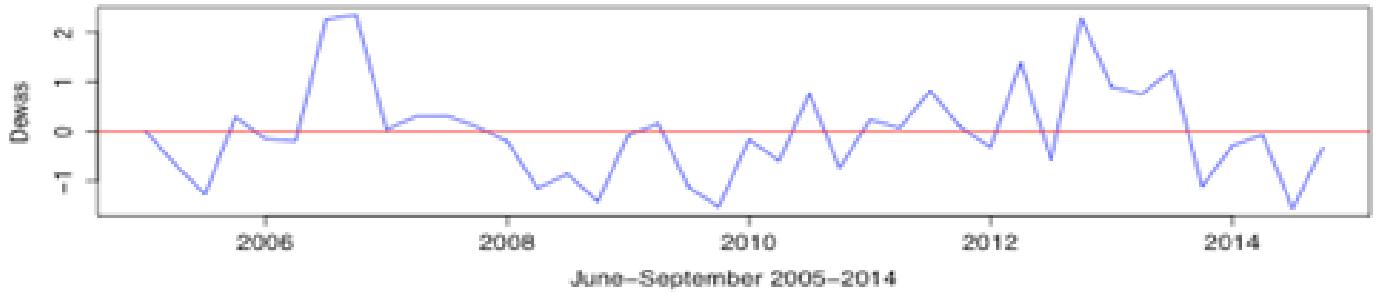
INTERNATIONAL JOURNAL OF WATER RESOURCES DEVELOPMENT
https://doi.org/10.1080/07900627.2018.1480357

Routledge
Taylor & Francis Group

Check for updates

Understanding the effectiveness of investments in irrigation system modernization: evidence from Madhya Pradesh, India

Ranu Sinha[a], Michael Gilmont[b], Robert Hope[c] and Simon Dadson[d]



Water Security – a defining global challenge

FINANCIAL TIMES

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Images of Earth taken to inform lending decisions to farmers are being used to prove environmental good deeds © AFP/Getty Images

Leo Lewis 16 HOURS AGO

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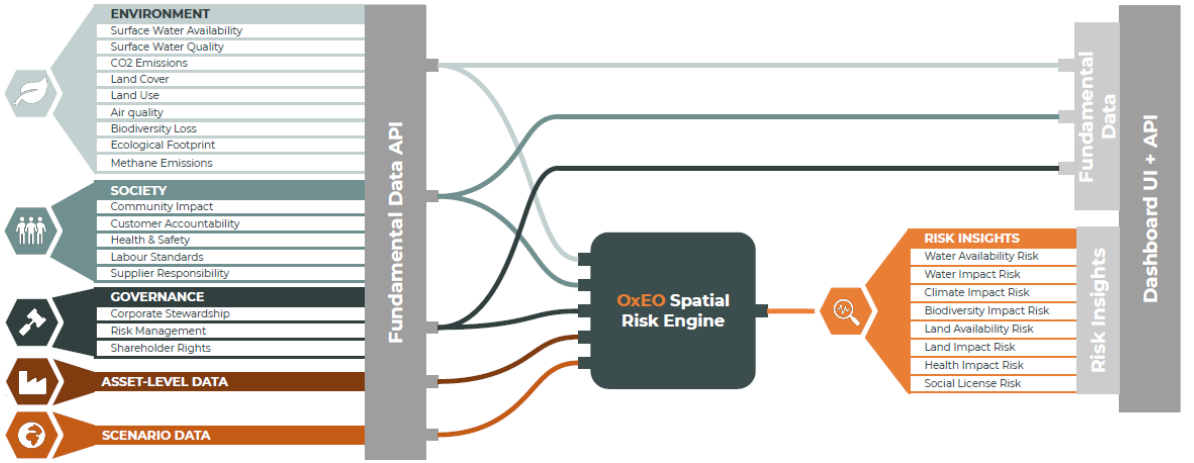
Product: API Services for data and risk insight



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Global Affordable Connectivity

Low-cost, two-way global satellite connectivity for IoT devices

Can AI improve water governance?

npj | Clean Water

www.nature.com/npjcleanwater

ARTICLE OPEN

Check for updates

Detection of untreated sewage discharges to watercourses using machine learning

Peter Hammond[1], Michael Suttie[2], Vaughan T. Lewis[3], Ashley P. Smith[4] and Andrew C. Singer[1]

Hundreds of sewage leaks detected thanks to AI

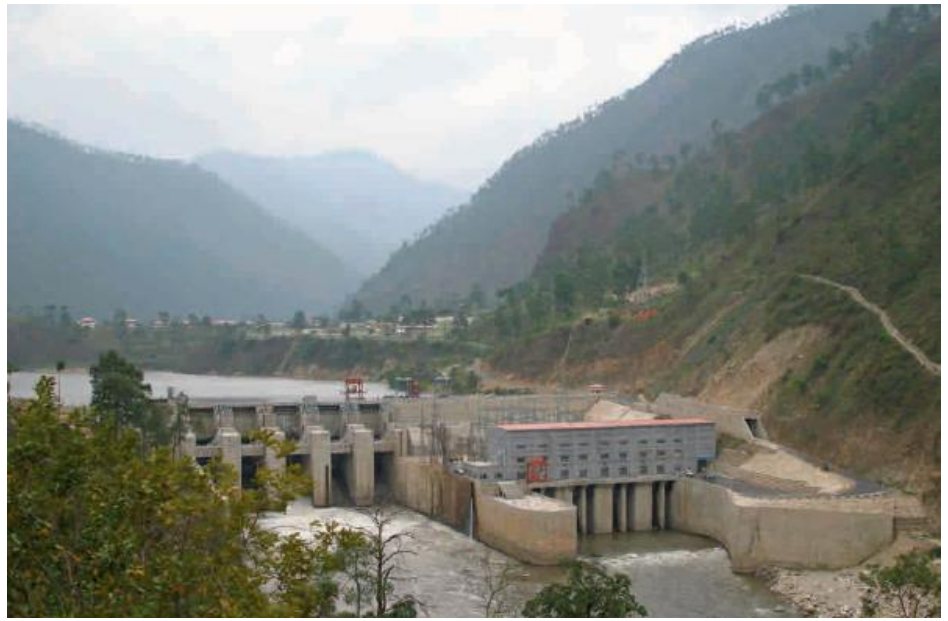
By Victoria Gill
Science correspondent, BBC News

11 March

P. Hammond et al.

Fig. 1 WWTP1: example effluent flow pattern for 10 days annotated with EDM confirmed spilling intervals. A 2

Can AI improve water governance?



The Economist

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Europe

May 15th 2021 edition ›

Green steel

Plentiful renewable energy is opening up a new industrial frontier

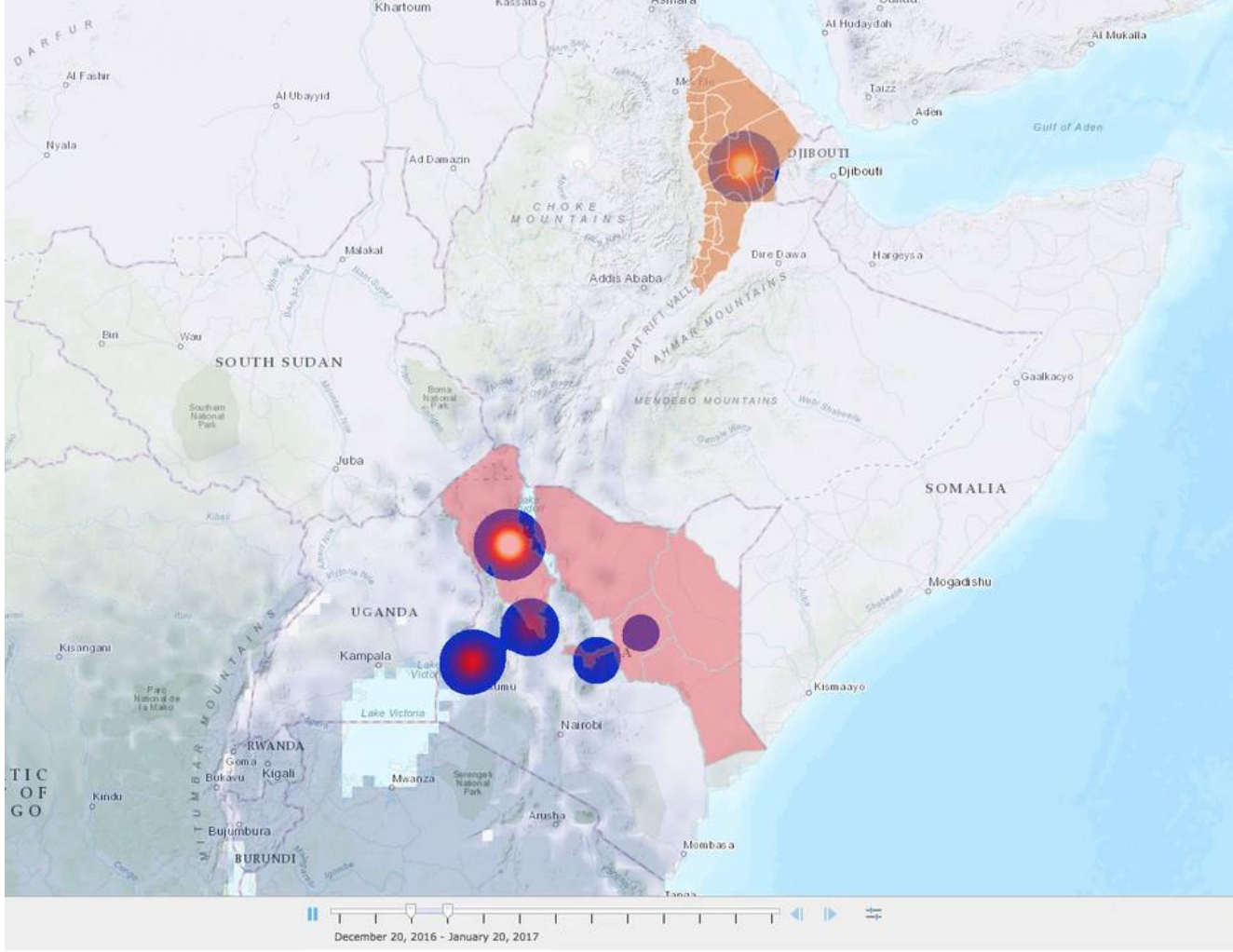
Competitors are alarmed

Top: Diversion tunnel for the Punatsangchhu Hydropower Project-I, Wangduephodrang.

Bottom: High-voltage power cable transmitting power to India.

Right: Kurichhu Hydropower Project in eastern Bhutan.

SweetSense



This video shows a visualization of NASA satellite estimated rainfall data with SweetSense measured water use for 2017. Sensors are installed on electrical boreholes in Afar, Ethiopia with USAID Lowland WASH and northern Kenya with USAID Kenya RAPID each serving up to 10,000 people. Hand water pump sensors are installed in western Kenya with The Water Project and in Uganda with The Water Trust each serving up to 500 people.

Can AI improve water governance?

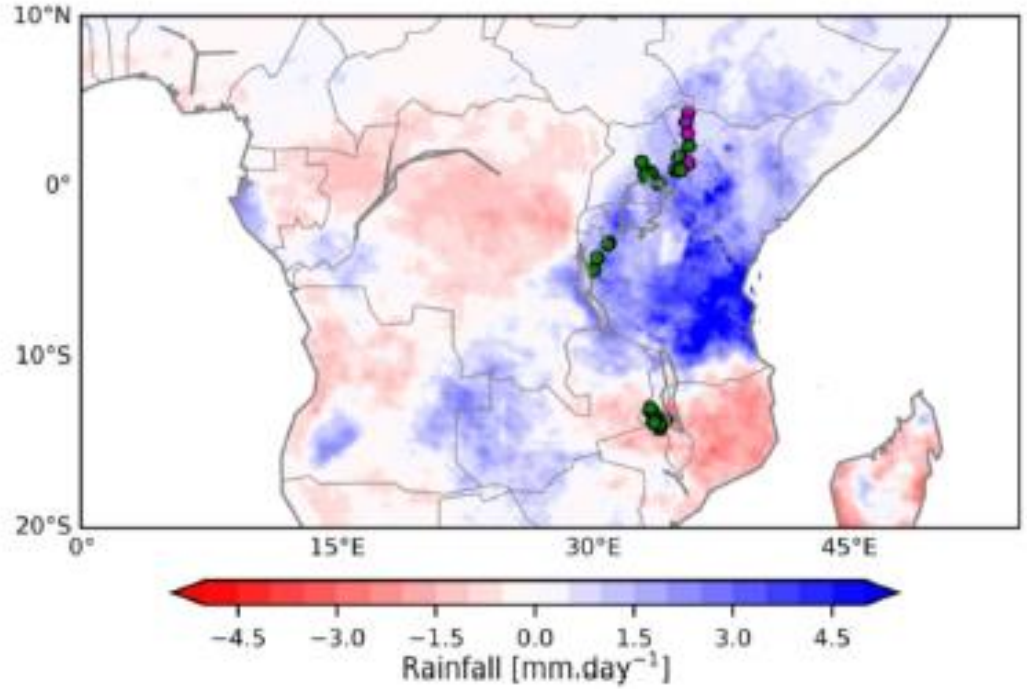


Fig. 1 Analysis of rainfall anomalies during the period from January to April 2020 against 1983–2012 climatology indicates unusually high rainfall in Kenya, Uganda, and Tanzania and low levels of rainfall in Malawi. Green dots indicate locations of piped schemes where the PAYF payment modality is employed. Magenta dots indicate locations of piped schemes where the monthly fee payment modality is employed.

npj | Clean Water

www.nature.com/npjcleanwater

BRIEF COMMUNICATION OPEN

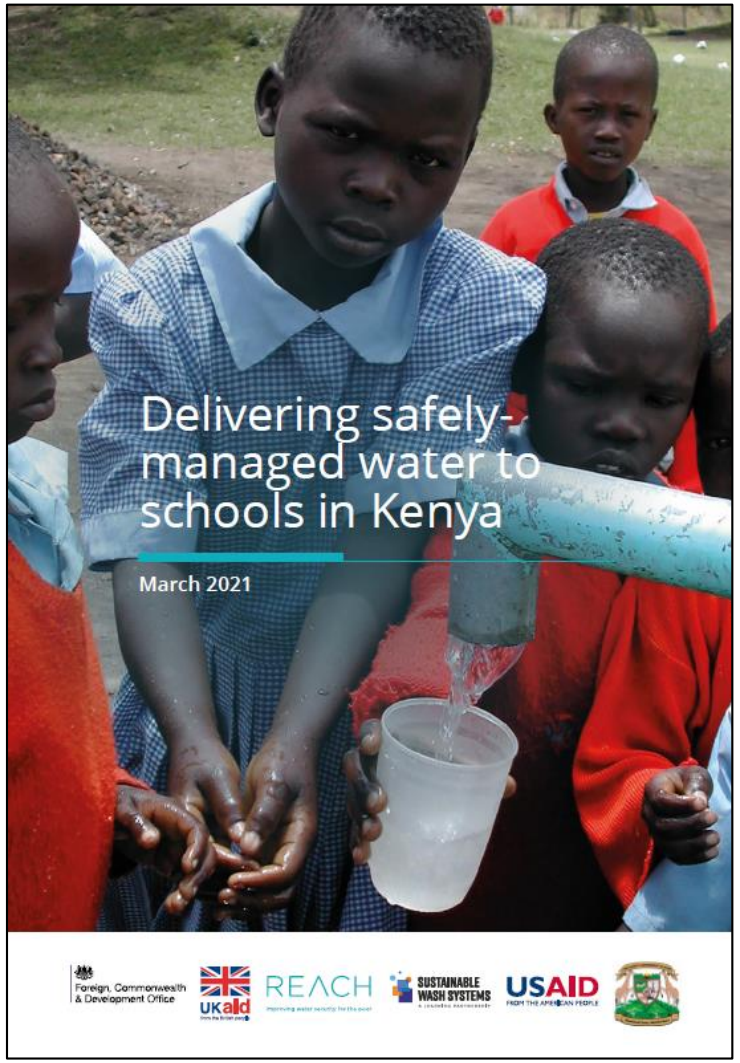
Check for updates

Monitoring socio-climatic interactions to prioritise drinking water interventions in rural Africa

Andrew Armstrong[1,2,3]✉, Robert Hope[1,2] and Callum Munday[1]

Figure 1: Survival curve for handpumps and piped schemes in Kitui county, Kenya

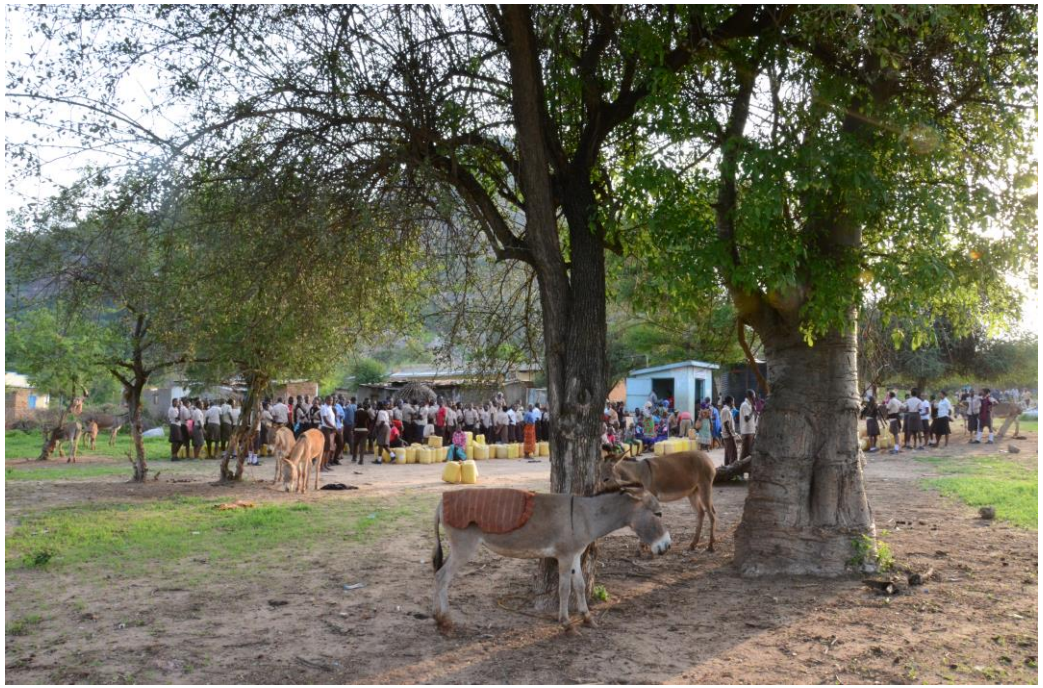
Can AI improve water governance?



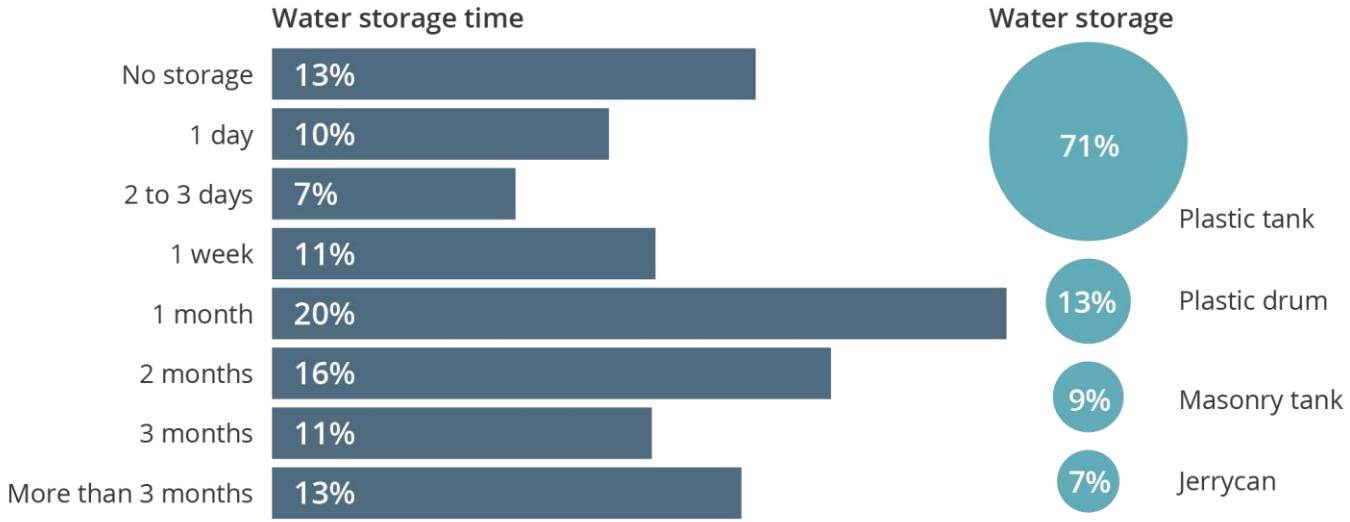
Water secure schools

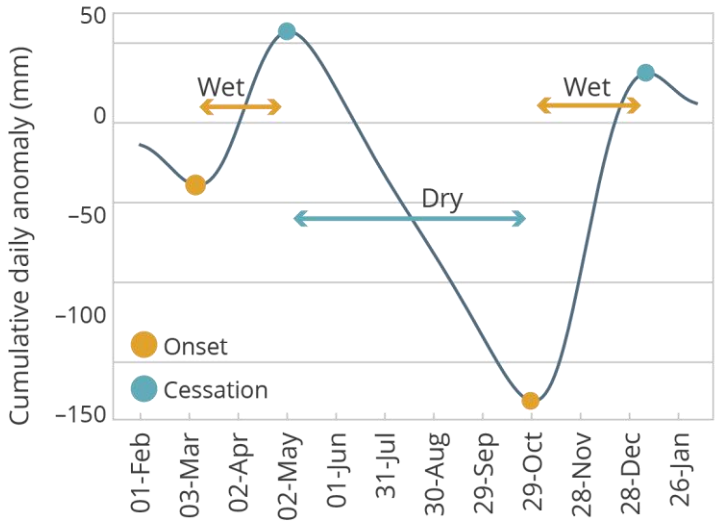
Water risks: Over 1 in 2 schools have no handwashing facilities

- Only 1 in 4 schools have a handwashing facility with soap

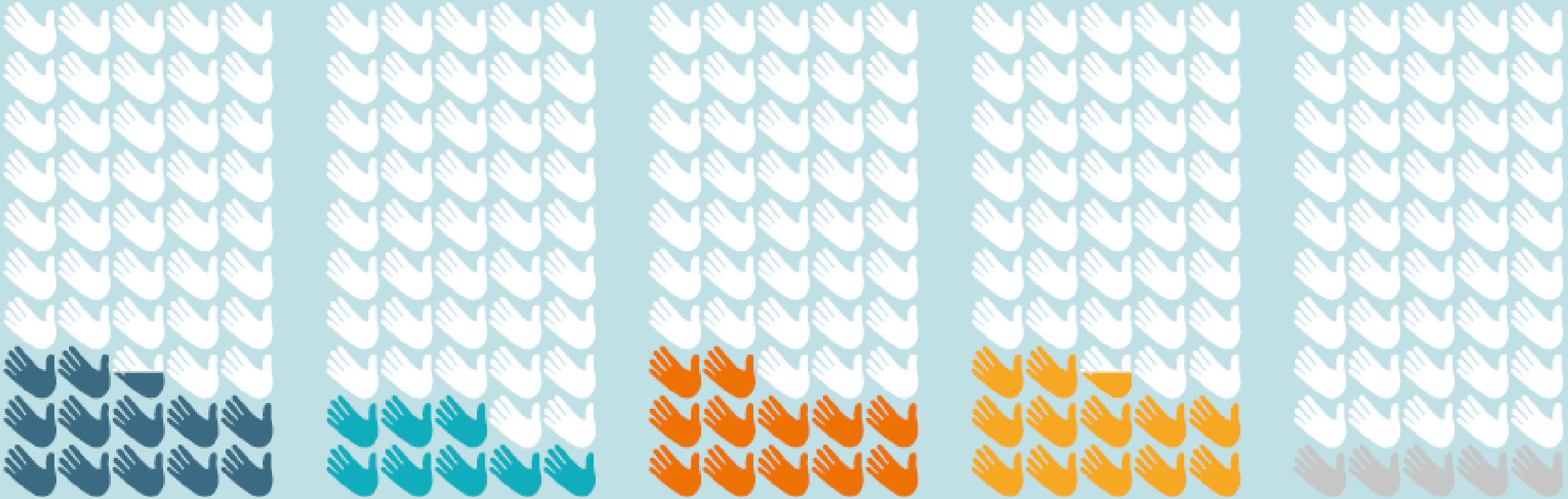


Water risks: Over 8 in 10 schools have rainwater harvesting tanks, though 41% have storage for a week or less



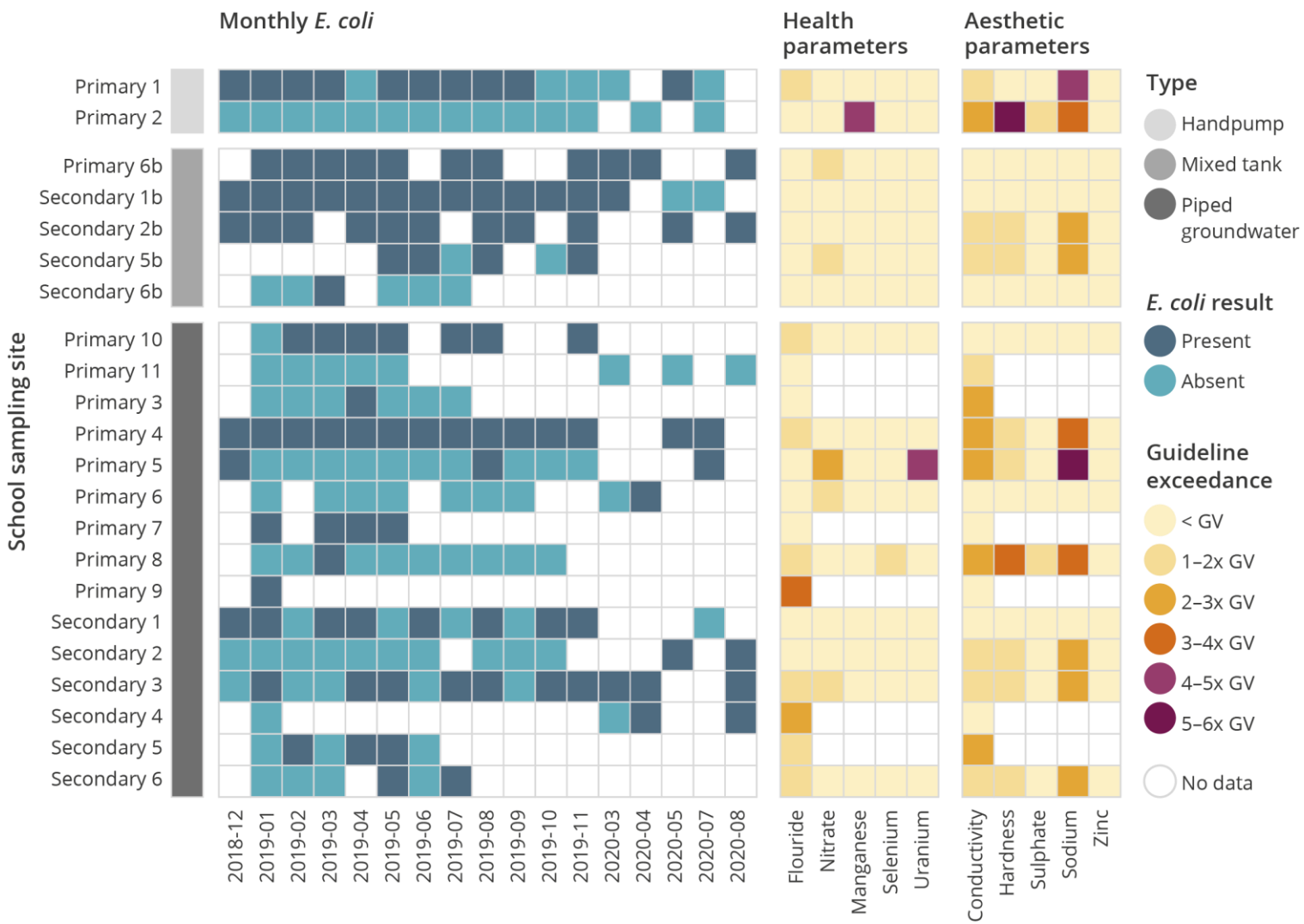


Reported frequency of daily handwashing by main school water supply



25%	16%	24%	25%	10%
Piped on-site	Rainwater	Unimproved	Vending	Basic

Water quality risks: multiple hazards affect by seasons and climate variability

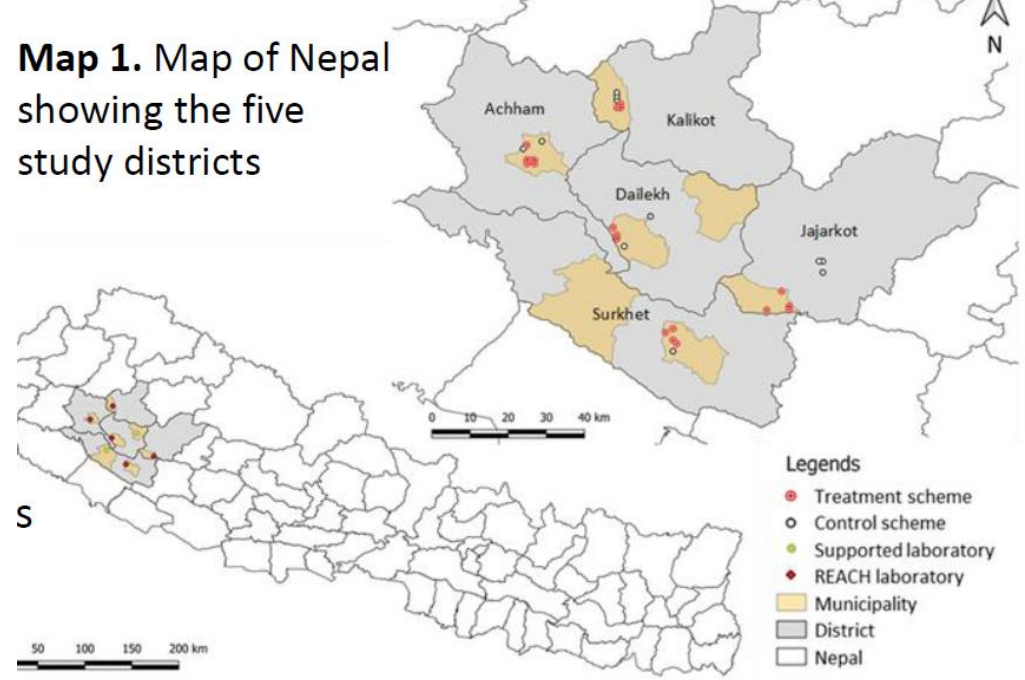


Monthly monitoring programme in 2019 (88 waterpoints, including 17 schools)

Water safety interventions

Decentralized laboratories	Adapted water safety planning	Scheme upgrades	Centralized data management
Solar powered incubator Membrane filtration Trained technicians	Monthly sanitary monitoring Adapted sanitary forms (Source, RVT, tap, household) Trained staff	Source protection Roughing filter at intake System level disinfection (chlorine)	Mobile data tool: Akvo flow Water quality and sanitary inspection results Data available online in real-time

Map 1. Map of Nepal showing the five study districts



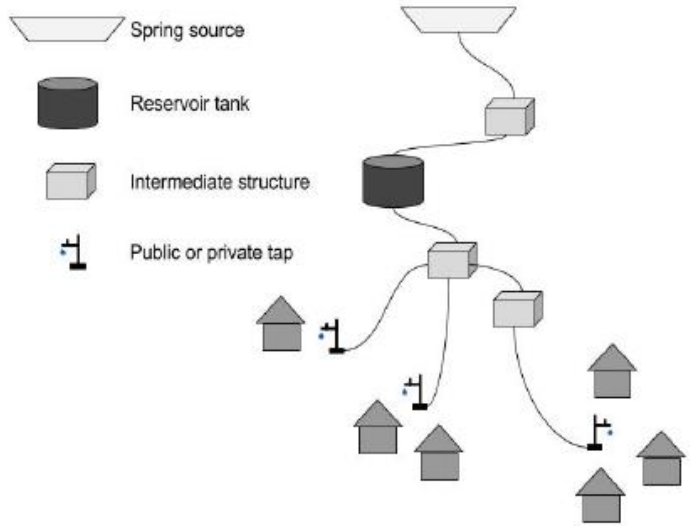


Figure 1. Typical gravity-fed piped scheme in the study area

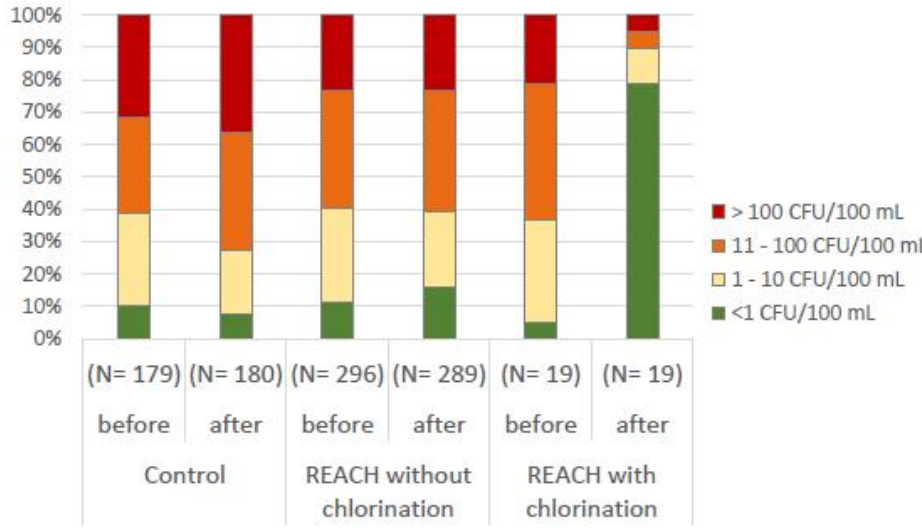


Figure 2. Microbial risk categories for stored water samples in control communities and intervention communities with and without chlorination

eawag aquatic research

HELVETAS Swiss Intercooperation NEPAL

2019 Performance

Scale

2800 Waterpoints

790 Piped Waterpoints

73 Schemes

2100 Handpumps

Estimated Population Served

1.2 million

Uptime

Infrastructure was functional **94%** of the time

User Payments

USD 329,000

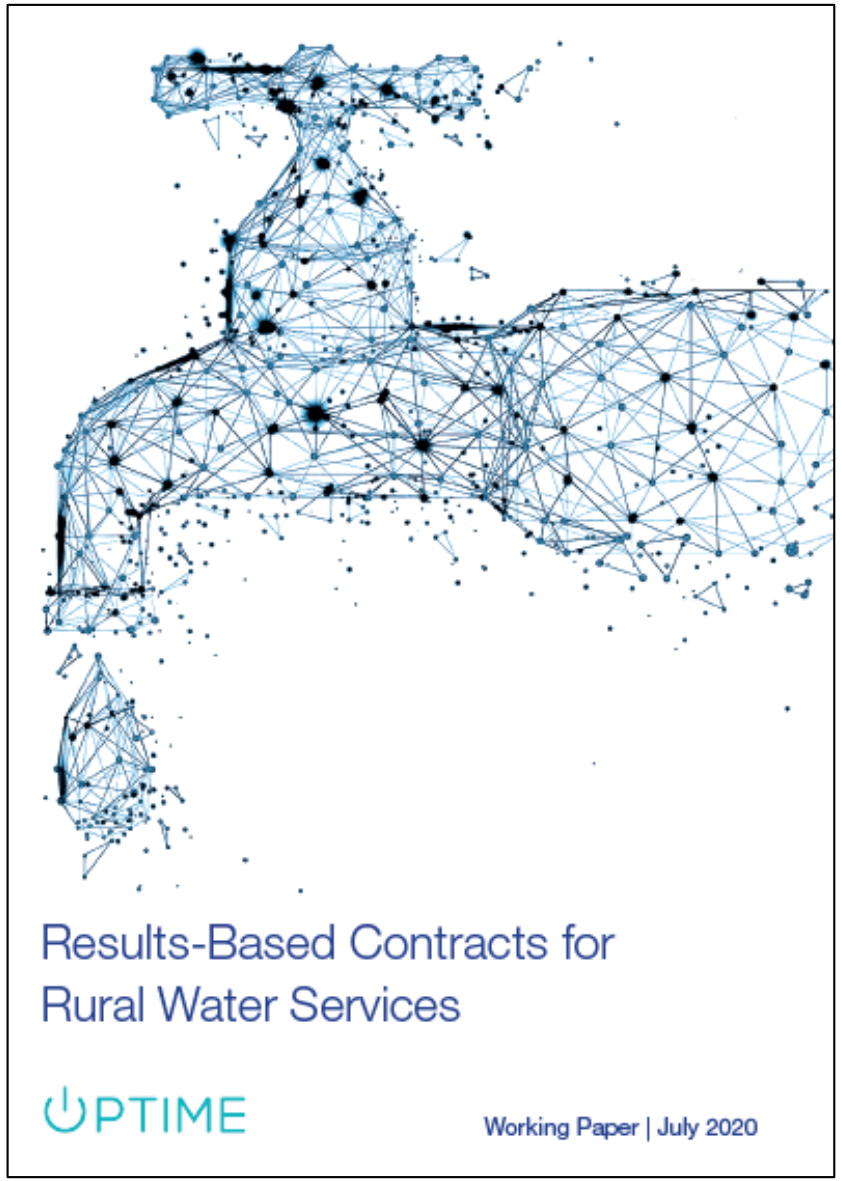
30% of total cost

Modelled results-based funding

Total results-based payments	Estimated payment per person served
USD 875,621	**USD 0.69**

UPTIME

The Uptime framework



RWSN

REACH
Improving water security for the poor

Foreign, Commonwealth & Development Office

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THE REACH-RWSN 100M INITIATIVE

A Global Diagnostic of rural water service providers to inform results-based funding.

Concluding comments & discussion

- Climate crisis presents water security risks and green growth opportunities
- COVID-19 makes us rethink the quality of water services in the home, school, work and healthcare facilities
- Water security requires making trade-offs and understanding risks (biophysical, financial, institutional, ecological and socio-cultural)
- Infrastructure, institutions and investment interact to determine water security outcomes for society, the economy and the environment