UNC WATER INSTITUTE

Community-Managed Water Supplies

JAMIE BARTRAM AND MEGHAN MILLER

WATER NEW ZEALAND

20–22 SEPTEMBER 2017, HAMILTON

Water System Types

Private systems (self-supply)

Community-managed

Utility-managed (public or private)

"The precise definition of a 'community water supply' will vary. … it is often administration and management that set community supplies apart … . The increased involvement of ordinary, often untrained and sometimes unpaid community members in the administration and operation of water supply systems is characteristic …"

World Health Organization Guidelines for Drinking-water Quality Volume 3, 1997

Water System Types

Private systems
(self-supply)

Community-managed

Utility-managed
(public or private)

Water System Types

Private systems (self-supply)

Community-managed

Utility-managed (public or private)

WHO/UNICEF JMP (ie global) Rural (self-defined by countries)

WHO/UNICEF JMP (ie global) Urban (self-defined by countries)

Water System Types

Private systems
(self-supply)

Community-managed

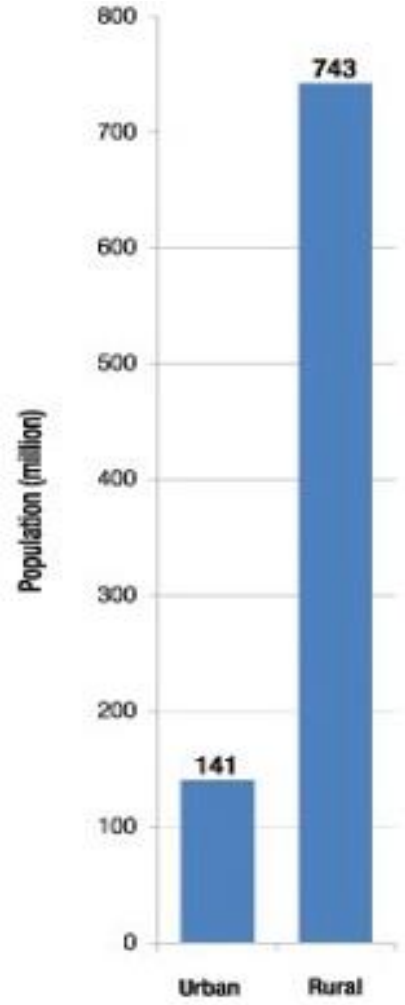
Utility-managed
(public or private)

WHO/UNICEF JMP (ie global)
Rural (self-defined by countries)
3.3billion

WHO/UNICEF JMP (ie global)
Urban (self-defined by countries)
3.6billion

Water System Types

Private syst
(self-supp



84% of the world population without an improved drinking-water source lives in rural areas

Utility-managed
ublic or private)

WHO/U
Ru

MP (ie global)
efined by
es)
on

Rural:urban Inequalities in post-2015 Targets and Indicators for Drinking Water (Scientific Commentary). Bain R, Wright J, Christenson E and Bartram J. Science of the Total Environment 490 (2014) 509–513.

Water System Types

Private systems
(self-supply)

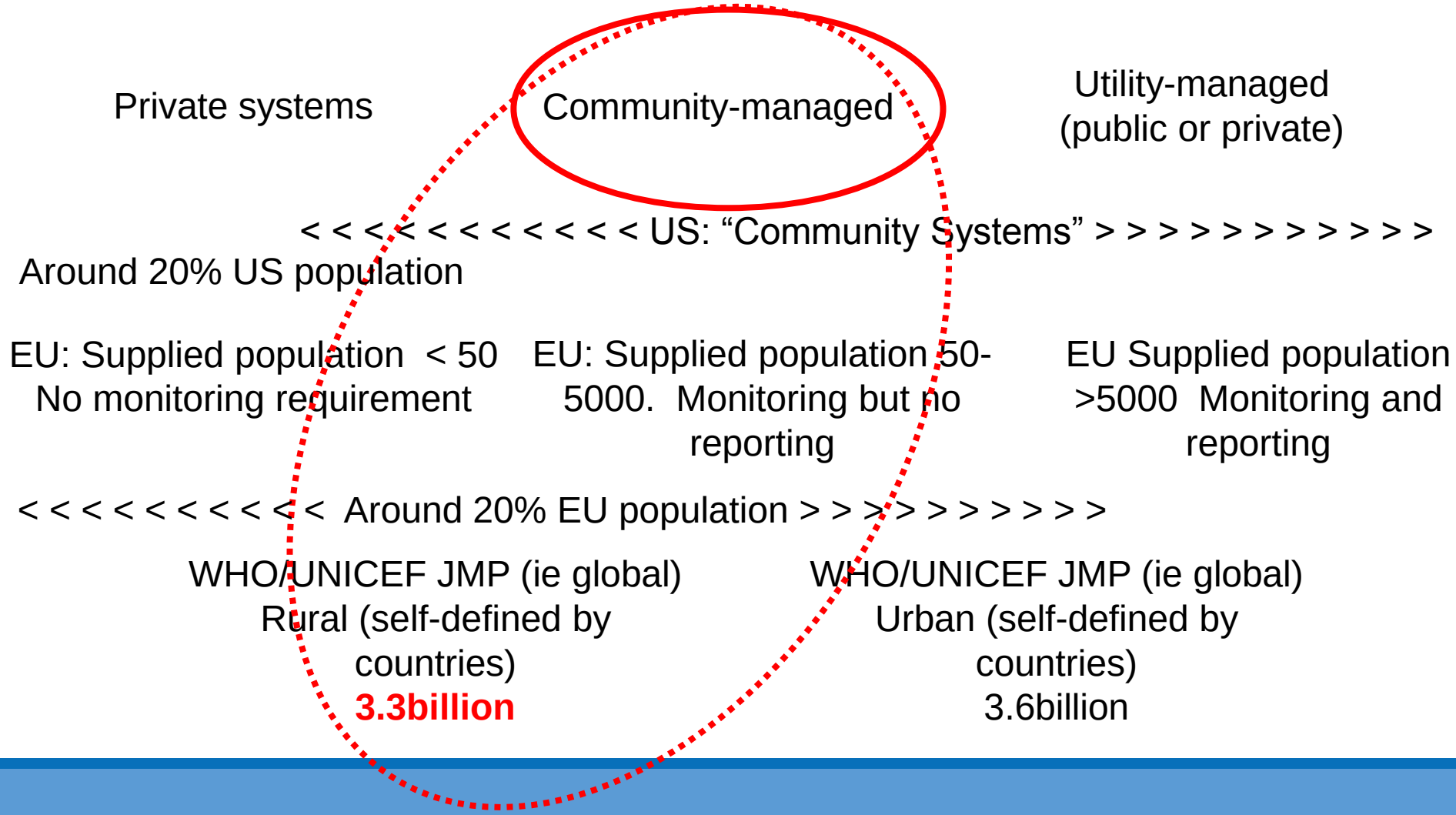
Community-managed

Utility-managed
(public or private)

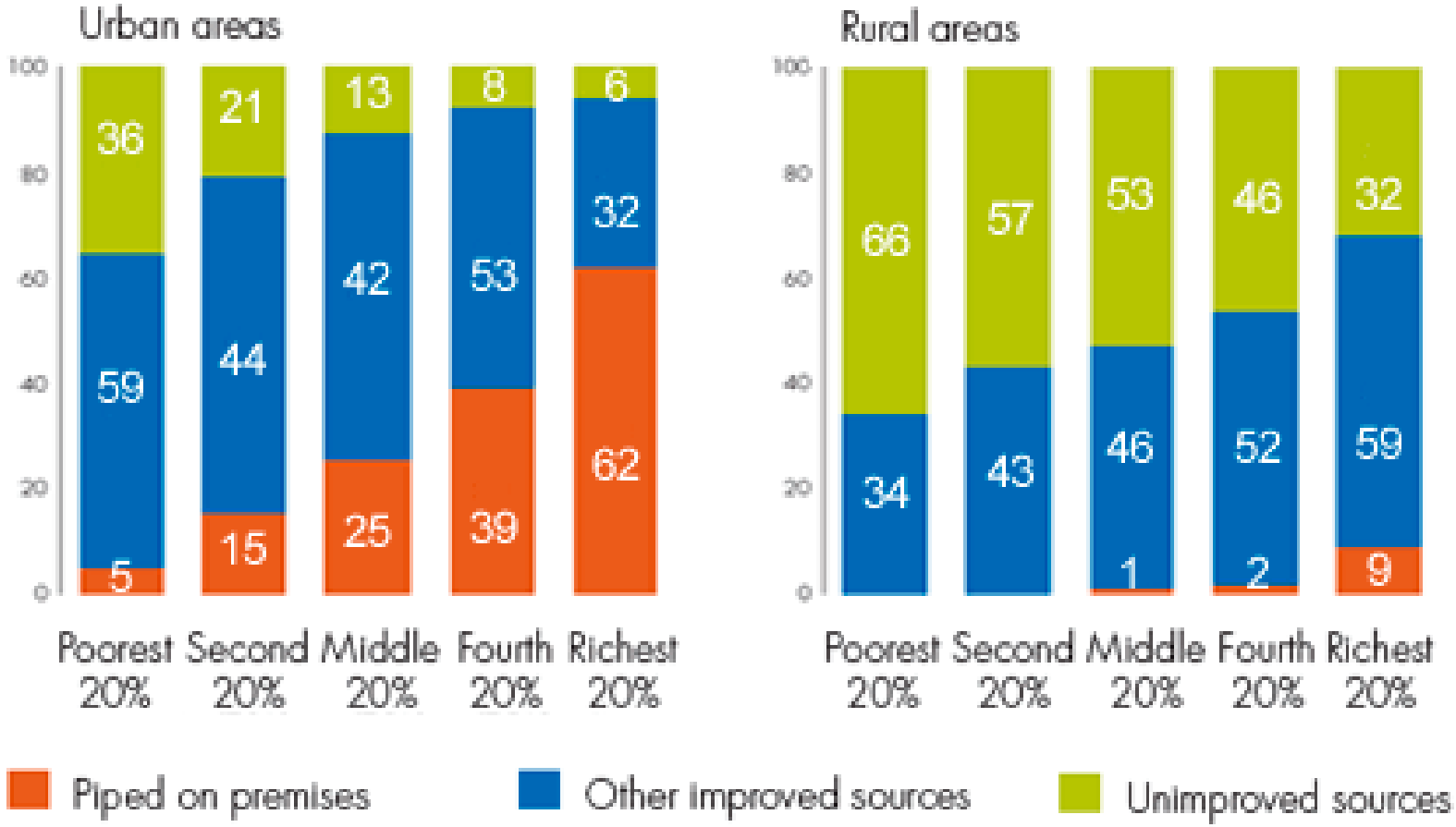
WHO/UNICEF JMP (ie global)
Rural (self-defined by countries)
3.3billion

WHO/UNICEF JMP (ie global)
Urban (self-defined by countries)
3.6billion

Water System Types



Low-income countries Inequality (example sub-Saharan Africa)



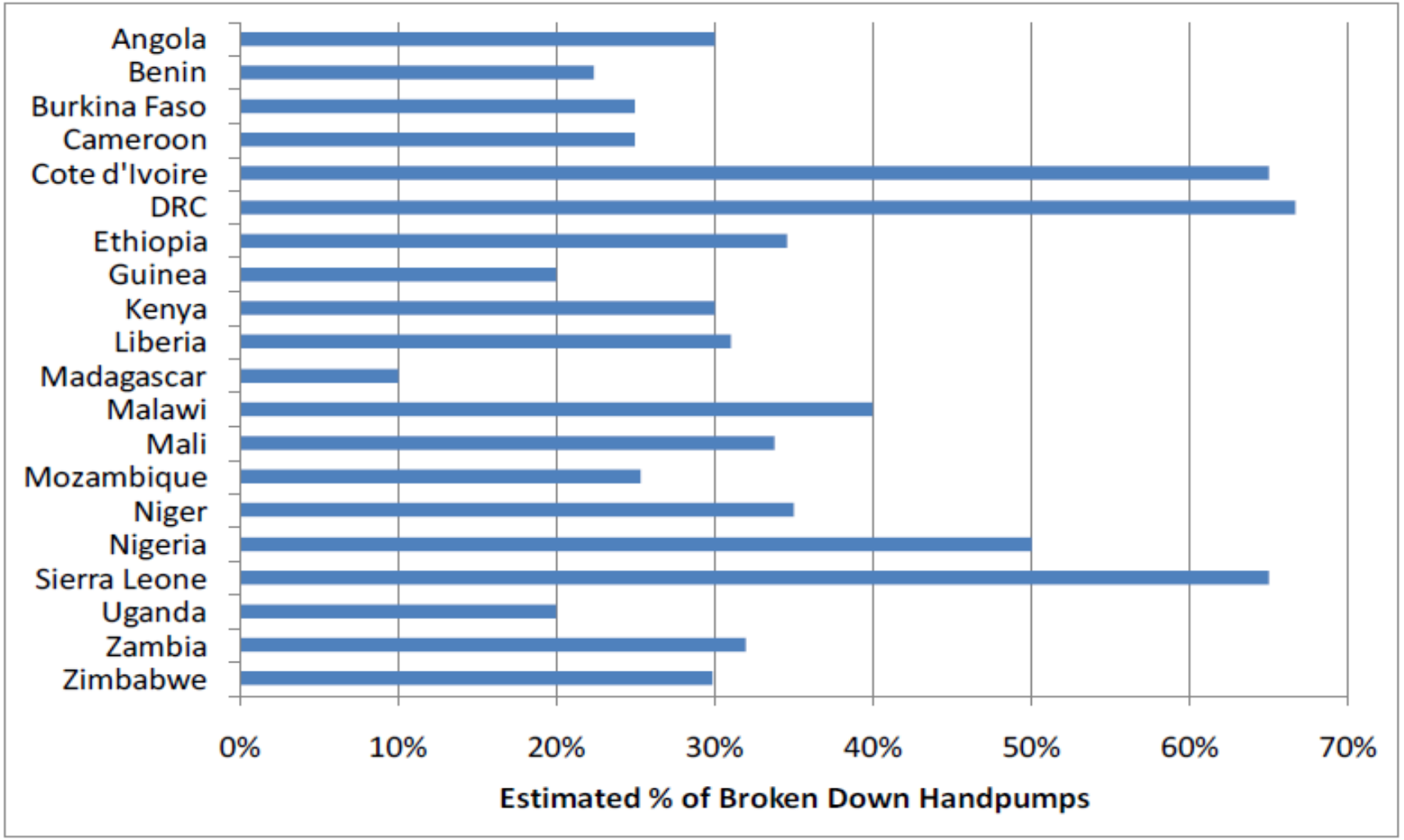
Drinking water coverage by wealth quintiles, urban and rural residence, sub-Saharan Africa, based on population-weight averages from 35 countries (percentage).

(Millennium Development Goals Report, 2012. UN.)

Rural:urban Inequalities in post-2015 Targets and Indicators for Drinking Water (Scientific Commentary). Bain R, Wright J, Christenson E and Bartram J. Science of the Total Environment 490 (2014) 509–513.

UNC WATER INSTITUTE

Low-income countries
Asset failure and inefficiency



UNC WATER INSTITUTE

High-income countries
Private supply in the UK

Supply contamination

- **Only one location** (7 sampled) met standards for *E. coli* and enterococci
- *Cryptosporidium* detected at **all seven locations**
- Viruses detected at **both locations** tested

Environmental impacts

- Contamination highly correlated with **rainfall events**
- Seasonal **increases in livestock** correlated with increased contaminants

Kay, D., Watkins, J., Francis, C. A., Wyn-Jones, A. P., Stapleton, C. M., Fewtrell, L., … Drury, D. (2007). The microbiological quality of seven large commercial private water supplies in the United Kingdom. *Journal of Water and Health*, *5*(4), 523–538. http://doi.org/10.2166/wh.2007.042

UNC WATER INSTITUTE

High-income countries
Outbreaks of Disease

Havelock North, pop 14,000 (2016)

Campylobacter

45 hospitalized (? 3 deaths), 4,500 sick

Earlier outbreak, causes knowable, preventable

Walkerton, pop 5000 (2000)

E coli O157:H7,

7 deaths, 2500 sick

Cost estimate Can$64.5–155 million

Causes known, preventable

North Battleford (pop 15,000), 2001

Cryptosporidium

Circa 6,500, plus visitors

Causes known, preventable

Nokia, pop 30,000 (2007)

Norovirus, Campylobacter, Giardia

circa8,500 sick

Cause generally known, preventable

UNC WATER INSTITUTE

High-income countries
Outbreaks of Disease

Havelock North, pop 14,000 (2016)

Campylobacter

45 hospitalized (? 3 deaths), 4,500 sick

Earlier outbreak, causes knowable, preventable

Walkerton, pop 5000 (2000)

E coli O157:H7,

7 deaths, 2500 sick

Cost estimate Can$64.5–155 million

Causes known, preventable

North Battleford (pop 15,000), 2001

Cryptosporidium

Circa 6,500, plus visitors

Causes known, preventable

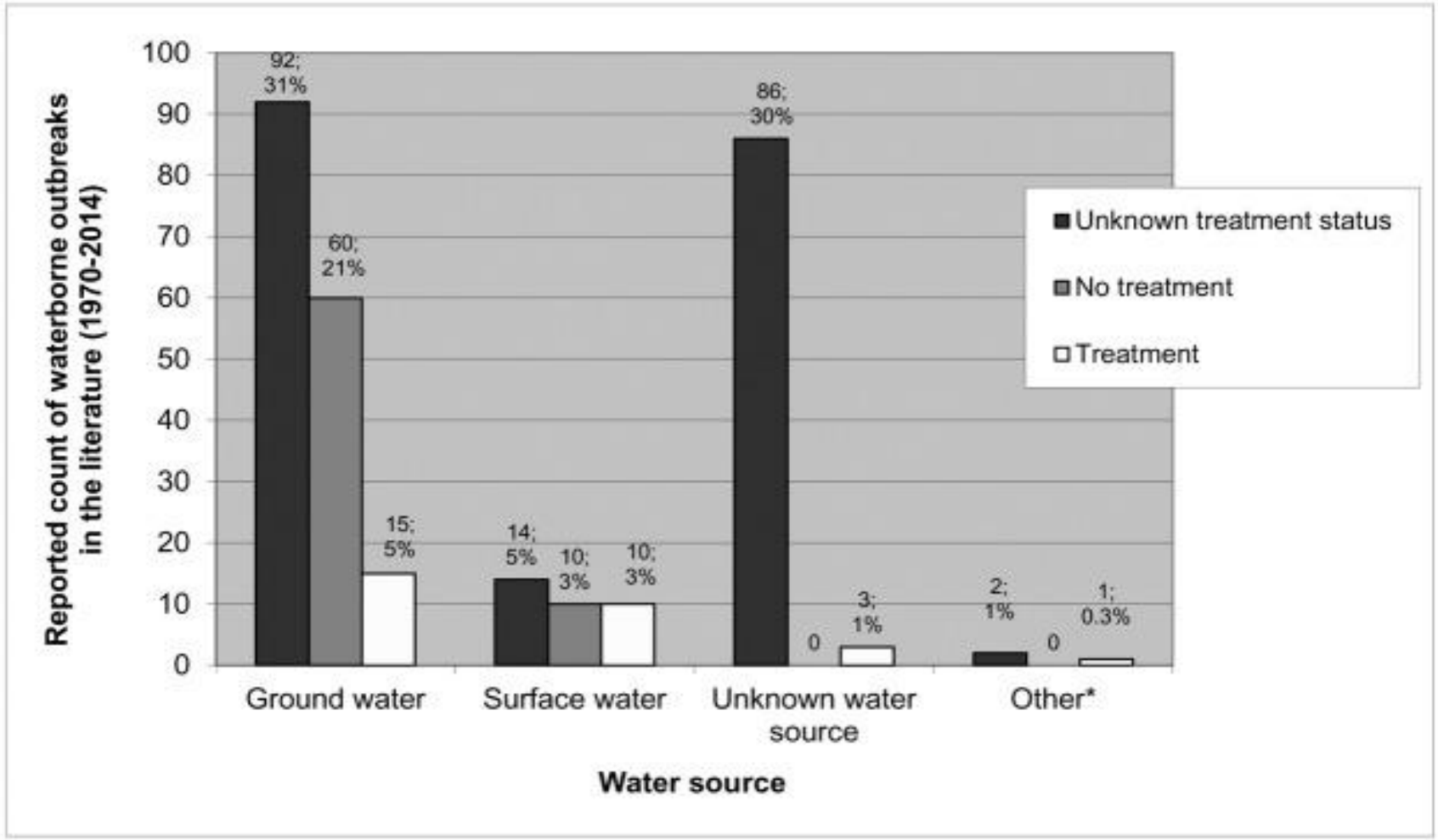
Nokia, pop 30,000 (2007)

Norovirus, Campylobacter, Giardia

circa8,500 sick

Cause generally known, preventable

High-income countries
Outbreaks of Disease



Pons, W., Young, I., Truong, J., Jones-Bitton, A., McEwen, S., Pintar, K., & Papadopoulos, A. (2015). A Systematic Review of Waterborne Disease Outbreaks Associated with Small Non-Community Drinking Water Systems in Canada and the United States. *PLoS ONE*, *10*(10), e0141646. http://doi.org/10.1371/journal.pone.0141646

High-income countries
Inequality and Discrimination

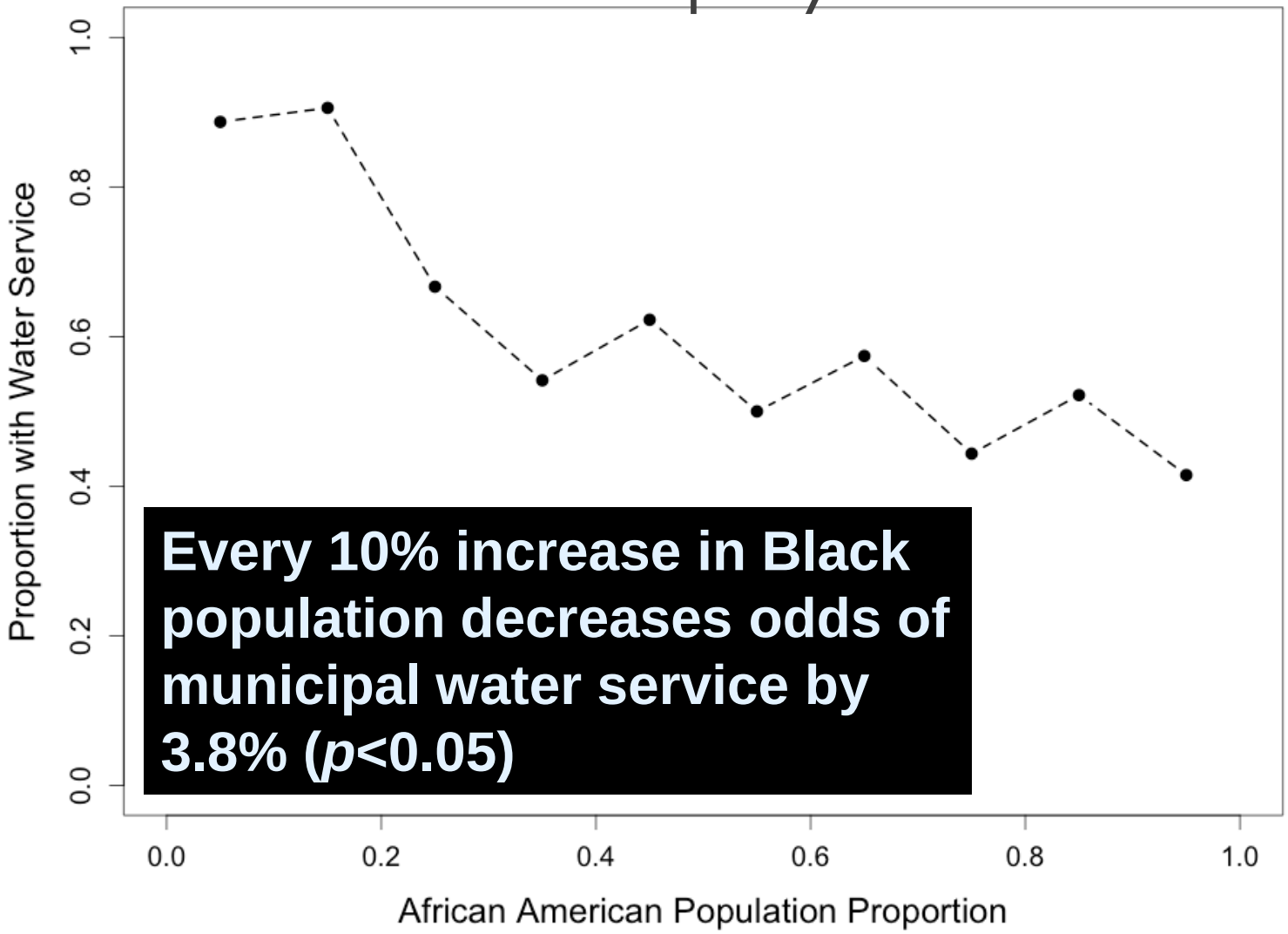
Native populations

Australia: Between July 2012 and July 2014, ***E. coli* or *Naegleria* microbes** were found in regular water tests of **68 of the 84 aboriginal communities** whose water, power and sewerage is provided under the **state-run** remote area essential services program.

Canada: As of **September 30, 2015**, there were **138 Drinking Water Advisories** in effect in **94 First Nations communities** across Canada, excluding British Columbia.

High-income countries

Inequality and Discrimination



Pre-publication heads-up

Literature review identified 77 relevant, codeable studies

Select 20 using fsQCA criteria

Code conditions and factors

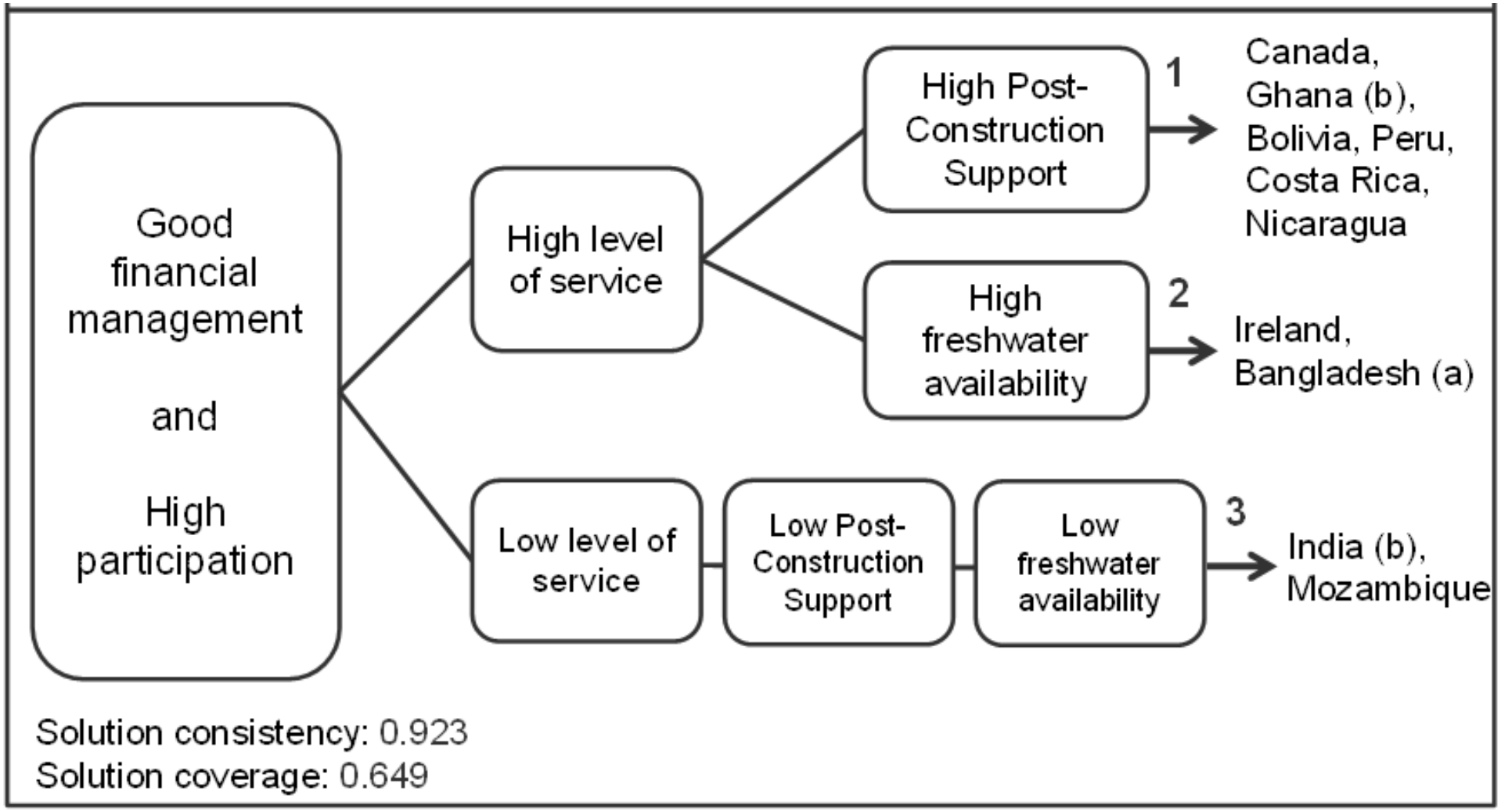
fsQCA identified 3 causal configurations (“pathways”) leading to sustained functionality of rural water supplies across diverse geographies.

Pathways to sustainability: A fuzzy-set qualitative comparative analysis of rural water supply programs

Sara J. Marks, Emily Kumpel, Jean Guo, Jamie Bartram, and Jennifer Davis.

(just resubmitted after dealing with reviewer comments)

Multiple pathways to success



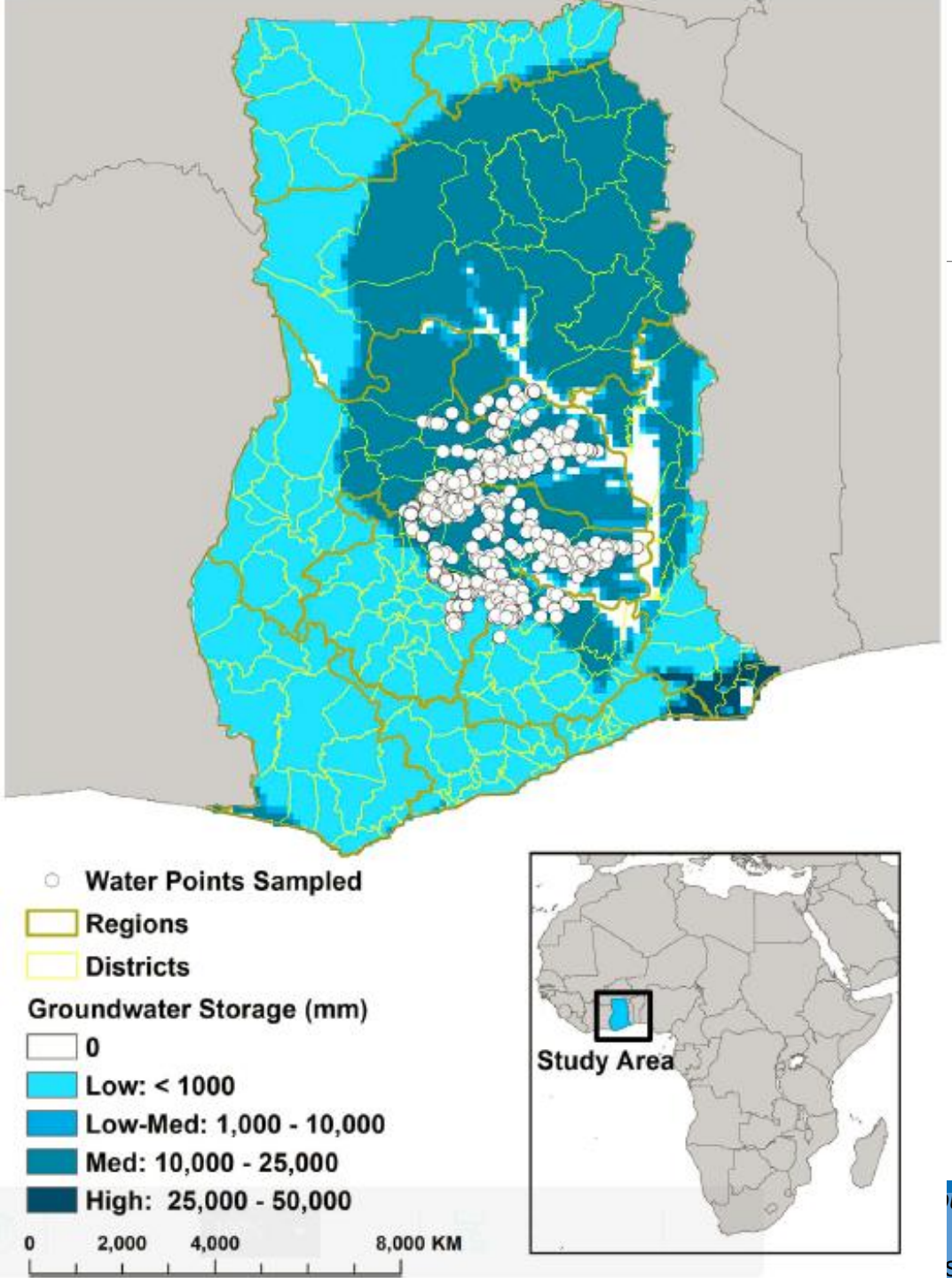
Community management *can* work but does not *always* work

Bad Press

"…community management has 'worked' for the state (and donors as a means of ***offloading*** responsibility for public service provision…" – Chowns 2015

"In answering the question 'Community-managed water supplies in Africa: sustainable or dispensable', although community ***participation*** **remains indispensable** for rural water provision in Africa, **community *management* does not**." – Harvey & Reed, 2007

"We demonstrate conceptually and empirically how wings of the CBM model individually and collectively are contributing to the ***disappointing outcomes*** and messy complex reality of rural environments." – van den Broek & Brown, 2015



Cross-sectional survey

1509 water sources (boreholes with handpumps)

570 rural communities

One of largest studies of its kind

79.4% functional at time of survey

Multivariable analysis

Bayesian network model

urce Functionality in the Greater Afram Plains Region of
Christenson; Ryan D. Cronk; Hannah Leker; Destina
s Research Volume 51, Issue 10, pp 8431–8449.

Community management *can* work but does not *always* work

Functional systems associated with:

Time since installation

Community management

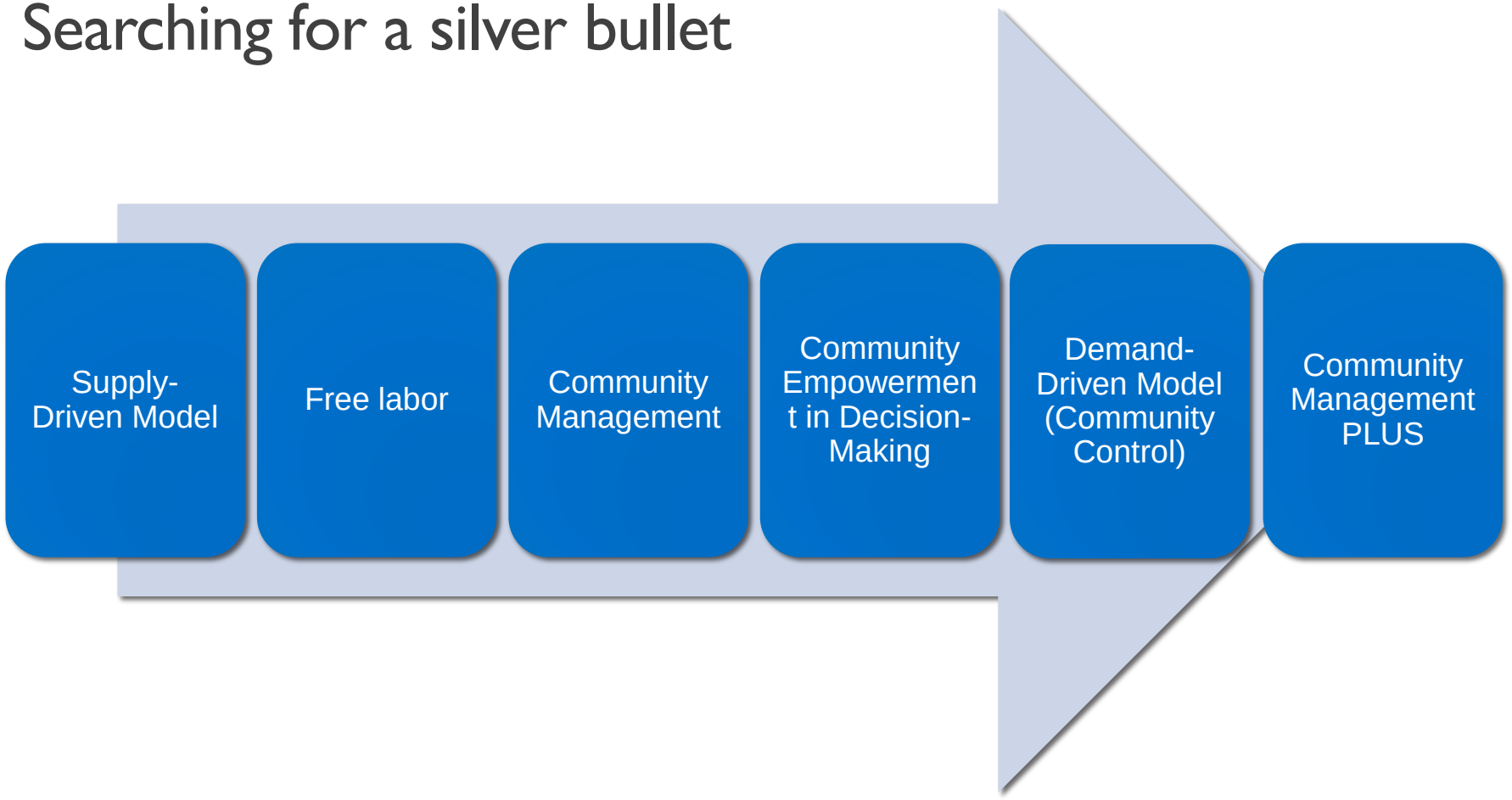
Tariff collection

Number of other sources

Understanding Handpump Sustainability: Determinants of Rural Water Source Functionality in the Greater Afram Plains Region of Ghana.
Michael B. Fisher; Katherine Shields; Terence U Chan; Elizabeth Christenson; Ryan D. Cronk; Hannah Leker; Destina Samani; Patrick Apoya; Alexandra Lutz; Jamie Bartram. Water Resources Research Volume 51, Issue 10, pp 8431–8449.

Community management *can* work but does not *always* work

Searching for a silver bullet



Community management *can* work but does not *always* work

Making community management work

5 Big Issues

UNC WATER INSTITUTE

Big Issue #1: Setting

aka applying it where it *could* work

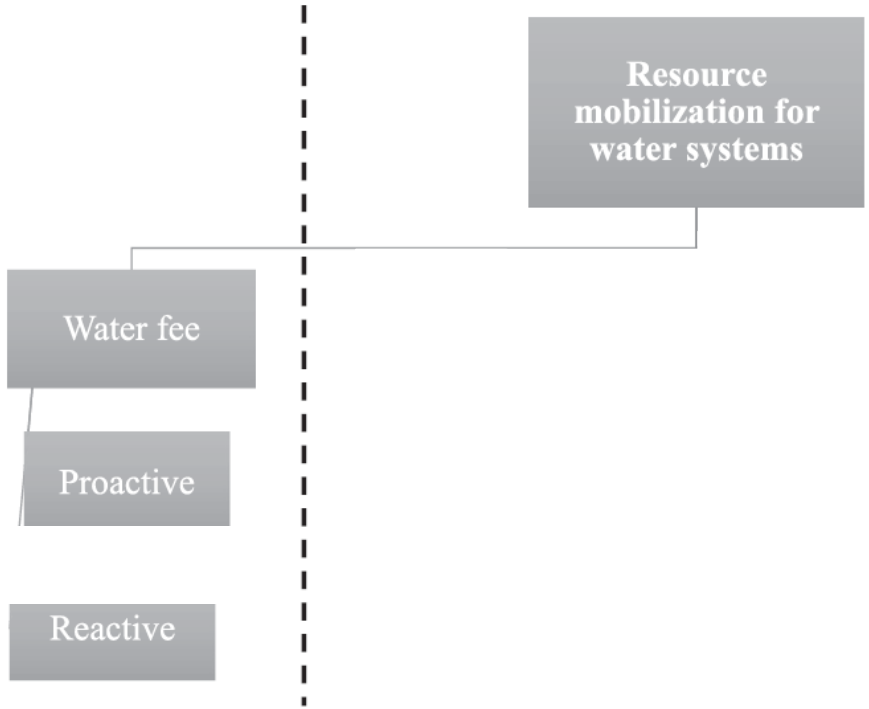
PHYSICAL

- Appropriate technology
- Access to resources
- Access to external support

SOCIAL

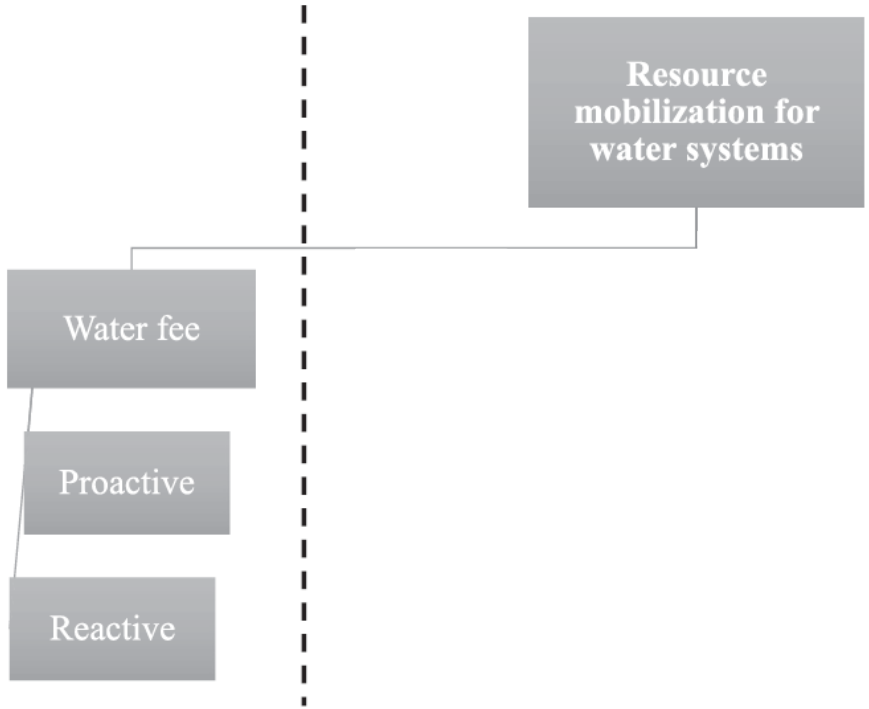
- Strength of community ("social capital")
- Skills and knowledge
- Willingness to participate

Big Issue #2: Financing
Conventional model



Behnke, N., Klug, T., Cronk, R., Shields, K., Lee, K., Kelly, E., … Bartram, J. (2017). Resource mobilization for community-managed rural water systems: Evidence from Ghana, Kenya, and Zambia. Journal of Cleaner Production, 156, 437–444. http://doi.org/10.1016/j.jclepro.2017.04.016

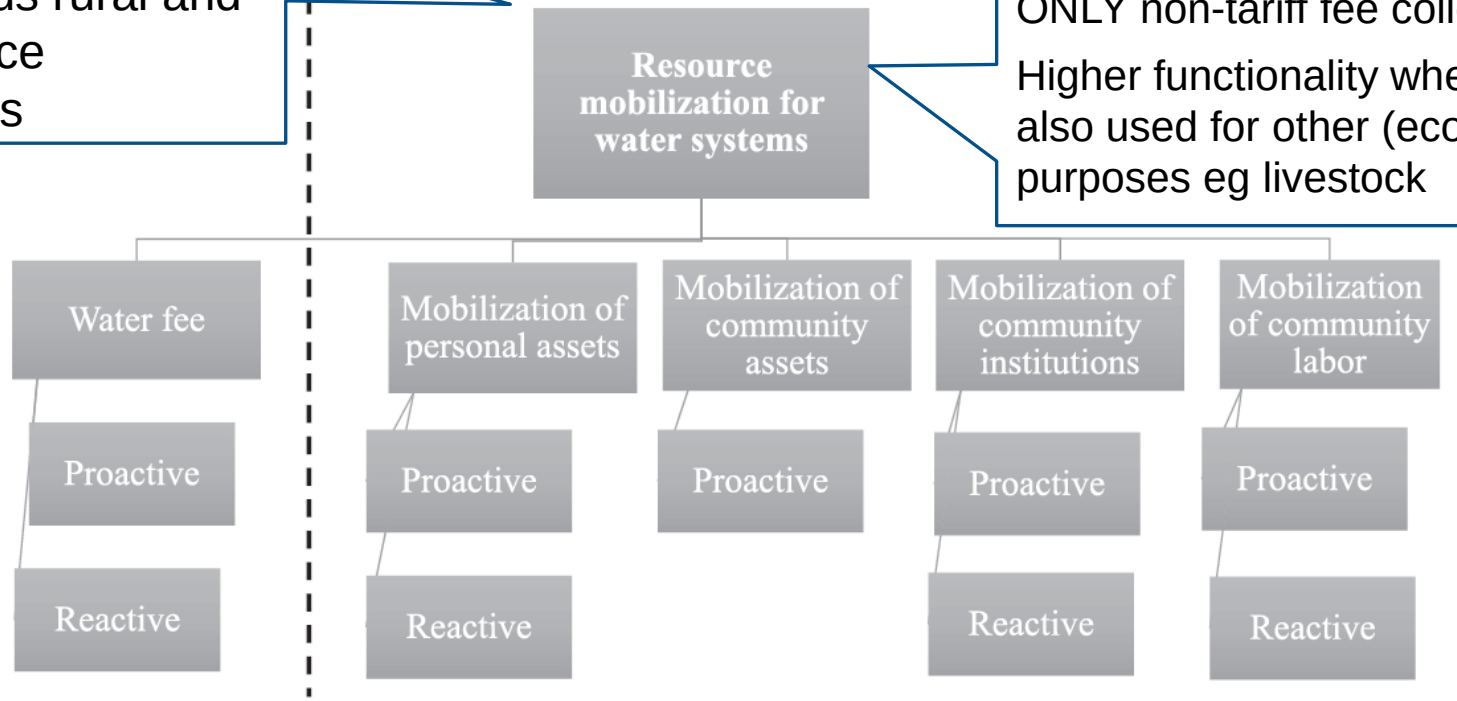
Big Issue #2: Financing
Conventional model



Behnke, N., Klug, T., Cronk, R., Shields, K., Lee, K., Kelly, E., … Bartram, J. (2017). Resource mobilization for community-managed rural water systems: Evidence from Ghana, Kenya, and Zambia. Journal of Cleaner Production, 156, 437–444. http://doi.org/10.1016/j.jclepro.2017.04.016

Big Issue #2: Financing
Rural economies

Conventional monthly tariff versus rural and subsistence economies



Separate studies:

Improved functionality where ONLY non-tariff fee collection

Higher functionality where sources also used for other (economic) purposes eg livestock

Behnke, N., Klug, T., Cronk, R., Shields, K., Lee, K., Kelly, E., … Bartram, J. (2017). Resource mobilization for community-managed rural water systems: Evidence from Ghana, Kenya, and Zambia. Journal of Cleaner Production, 156, 437–444. http://doi.org/10.1016/j.jclepro.2017.04.016

Big Issue #3: External support

Diagnose problem → Contact technical support → Acquire financial resources → Acquire materials → Repair hardware

Klug, T., Shields, K. F., Cronk, R., Kelly, E., Behnke, N., Lee, K., & Bartram, J. (2017). Water system hardware and management rehabilitation: Qualitative evidence from Ghana, Kenya, and Zambia. *International Journal of Hygiene and Environmental Health*, *220*(3), 531–538. http://doi.org/10.1016/j.ijheh.2017.02.009

Big Issue #3: External support Hurdles

"... more often there are **not [enough funds] (36%)** or there are funds that cover **only minor repairs (18%)**. "

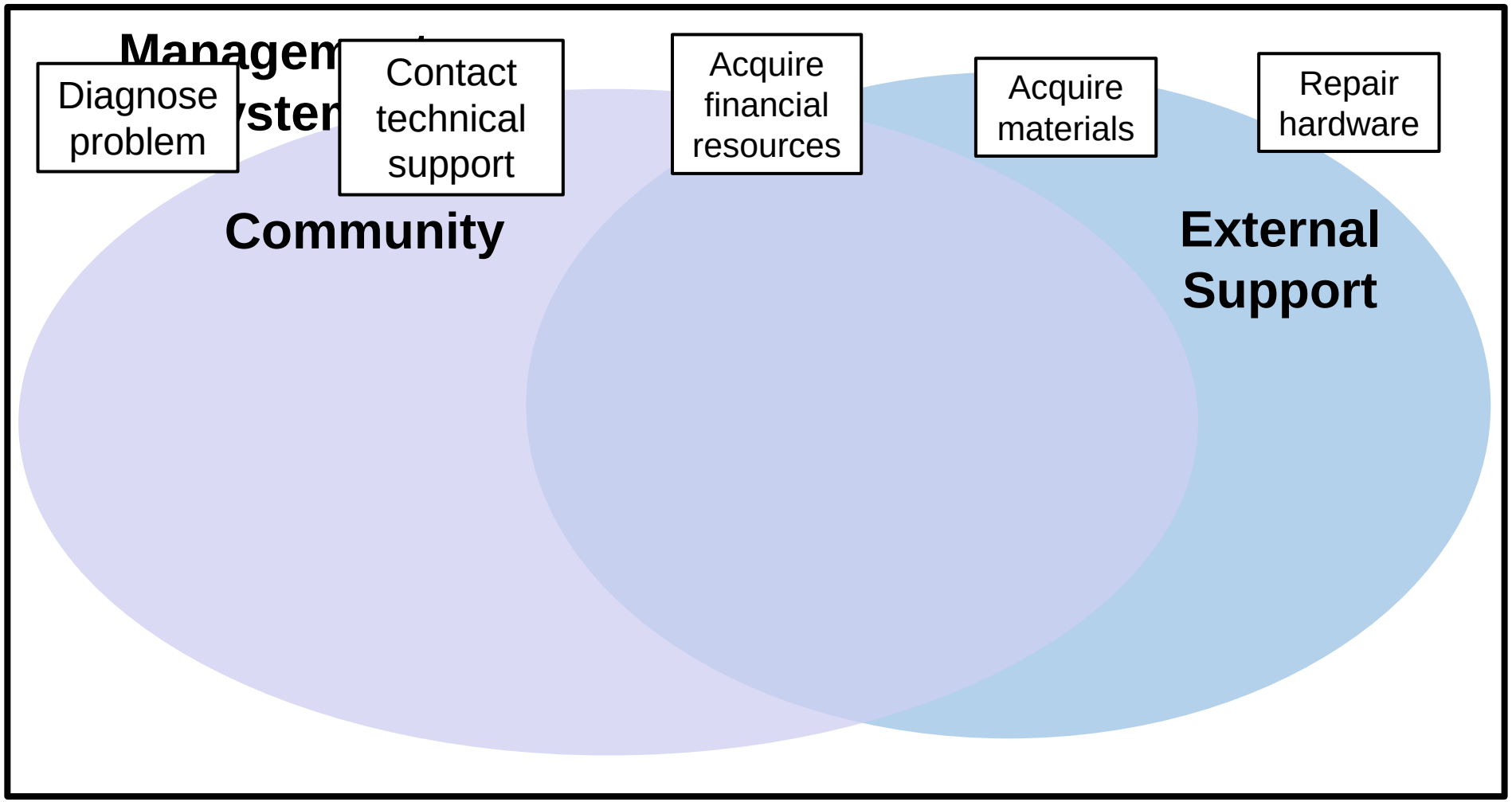
"….an **average of 18 days to raise sufficient funds** (median = 7 days; range 1–180 days)."

"The median repair time to fix a pump was **6 days** with an **average of 27 days** (range 0–365 days). "

Diagnose problem → Contact technical support → Acquire financial resources → Acquire materials → Repair hardware

Hope, R. (2015). Is community water management the community's choice? Implications for water and development policy in Africa. *Water Policy*, *17*(4), 664–678. http://doi.org/10.2166/wp.2014.170

Big Issue #3: External Support
Management system



Big Issue #3: External Support
Complex system example

"…[additional constraints] are contacting external support. This is especially limiting for complex mechanized water systems that **require high levels of expertise**…and whose services and transportation are **costly**."

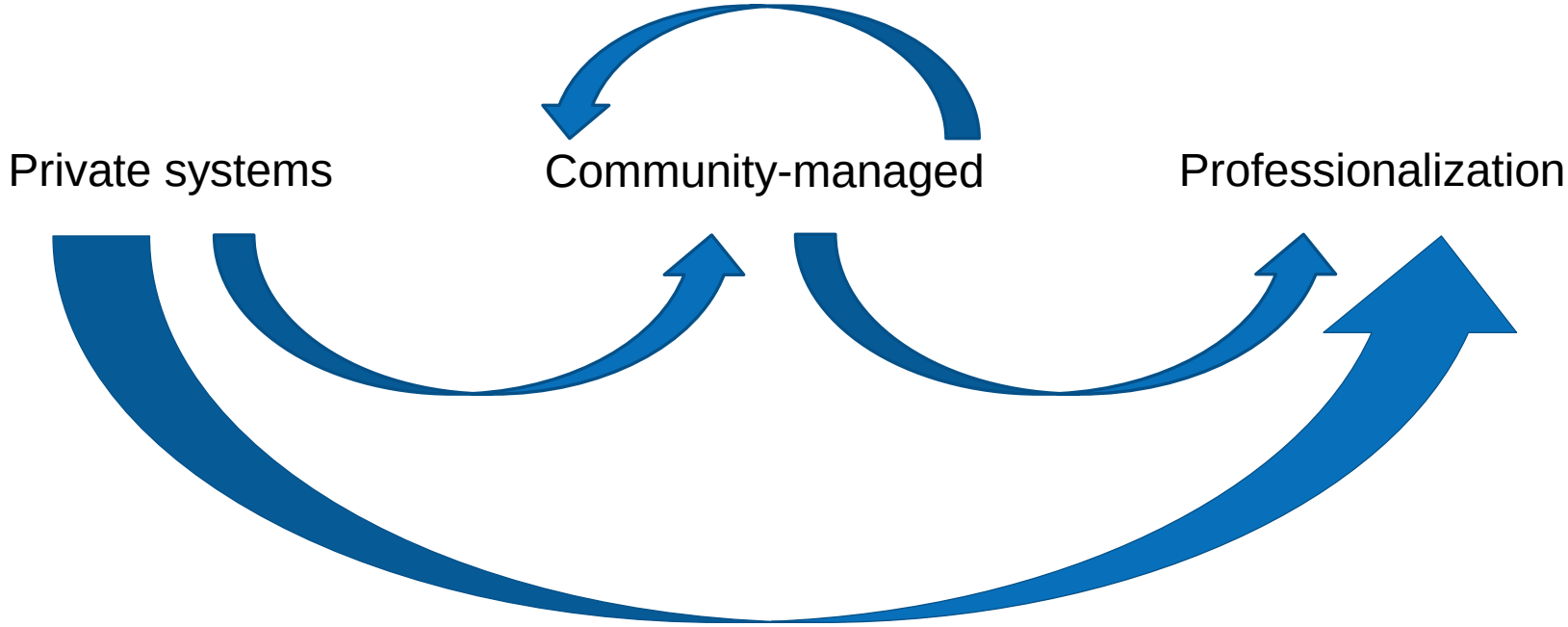
Klug, T., Shields, K. F., Cronk, R., Kelly, E., Behnke, N., Lee, K., & Bartram, J. (2017). Water system hardware and management rehabilitation: Qualitative evidence from Ghana, Kenya, and Zambia. *International Journal of Hygiene and Environmental Health*, *220*(3), 531–538. http://doi.org/10.1016/j.ijheh.2017.02.009

Big Issue #3: External Support
Complex system example

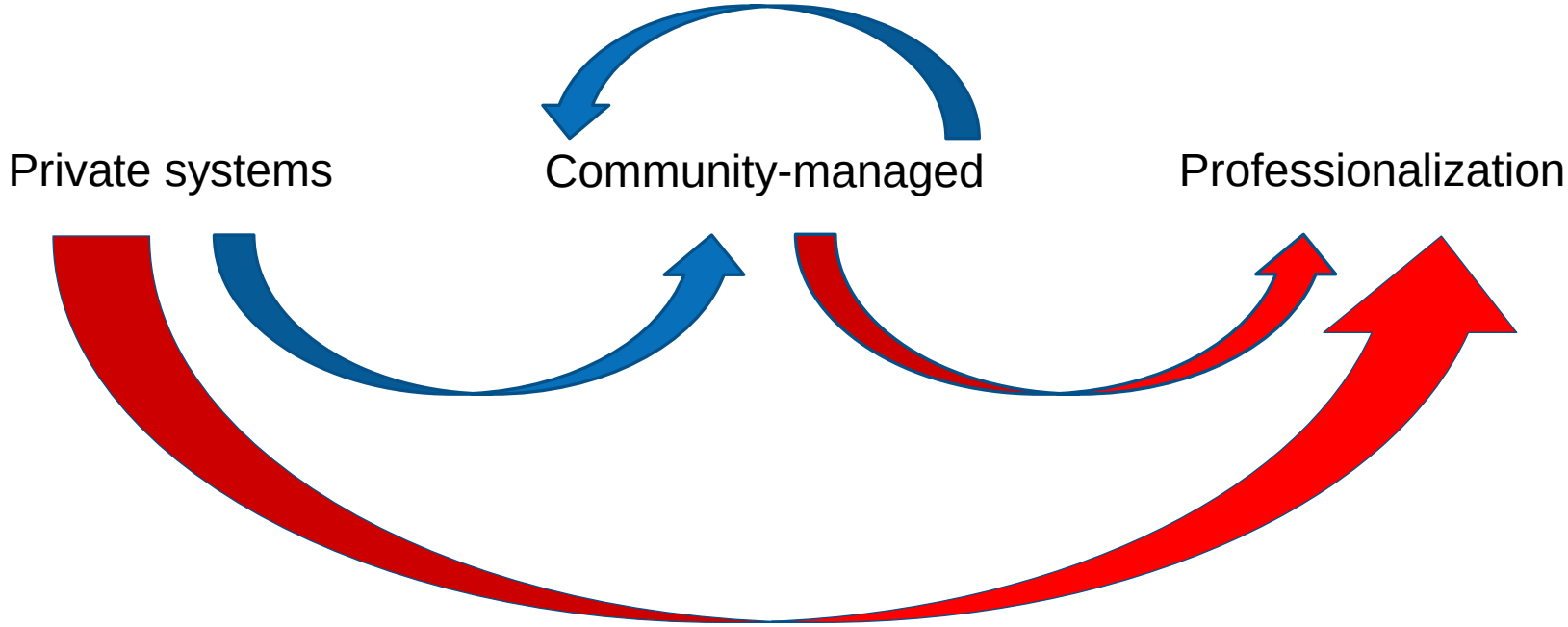
- 5 community caretakers trained in pump repair (21 sampled)
  - 4 caretakers trained in solar panel repair
- Communities **rely on external actors** for major breakdowns
  - (e.g. NGO, Area mechanics, local government)
- External support took a median of 4 days to respond to community call
  - Minimum: <1 day, **maximum: 1 year (2 communities)**

Big Issue #4: Professionalization

Eliminate the perceived problem?



Big Issue #4: Professionalization
Eliminate the perceived problem?



Big Issue #4: Professionalization
The Benin Case

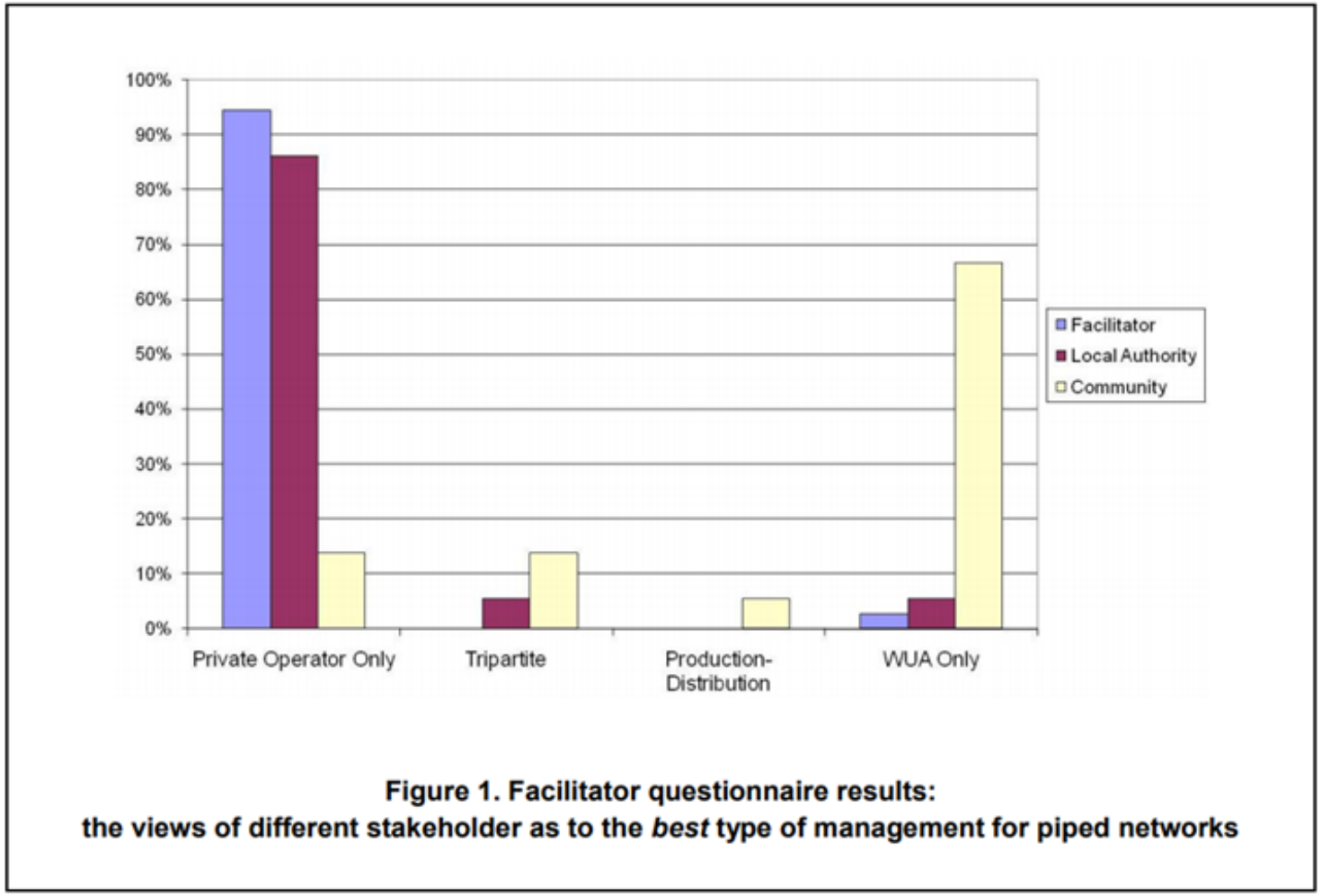


Figure 1. Facilitator questionnaire results:
the views of different stakeholder as to the *best* type of management for piped networks

Gouais, A. L., & Webster, J. (2011). Abdandoning community management for 'professionalization' of water supply in rural Benin . In Proceedings of the 35th WEDC International Conference.

UNC WATER INSTITUTE

Big Issue #5: Complex systems
Solar-powered systems

Communities can manage complex systems with **appropriate support**

Solar projects can provide **better service** that reaches more people with greater benefits

Opportunities for **multi-use** of systems (e.g. business)

More **resilient** technology and systems

- Of 23 solar projects visited, only 1 had ever needed repair of panels (Miller n.d.)

UNC WATER INSTITUTE

Take-aways

Conventional narrative is **over-simplified**

Community management **can** work

but

Works **better** in particular settings

Normally **needs** external support

Policy recognition: Sustainable Development Goals

Goal 6: Ensure availability and sustainable management of water and sanitation for all

Targets:

6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all

6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

6.4 By 2030, substantially increase water -use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

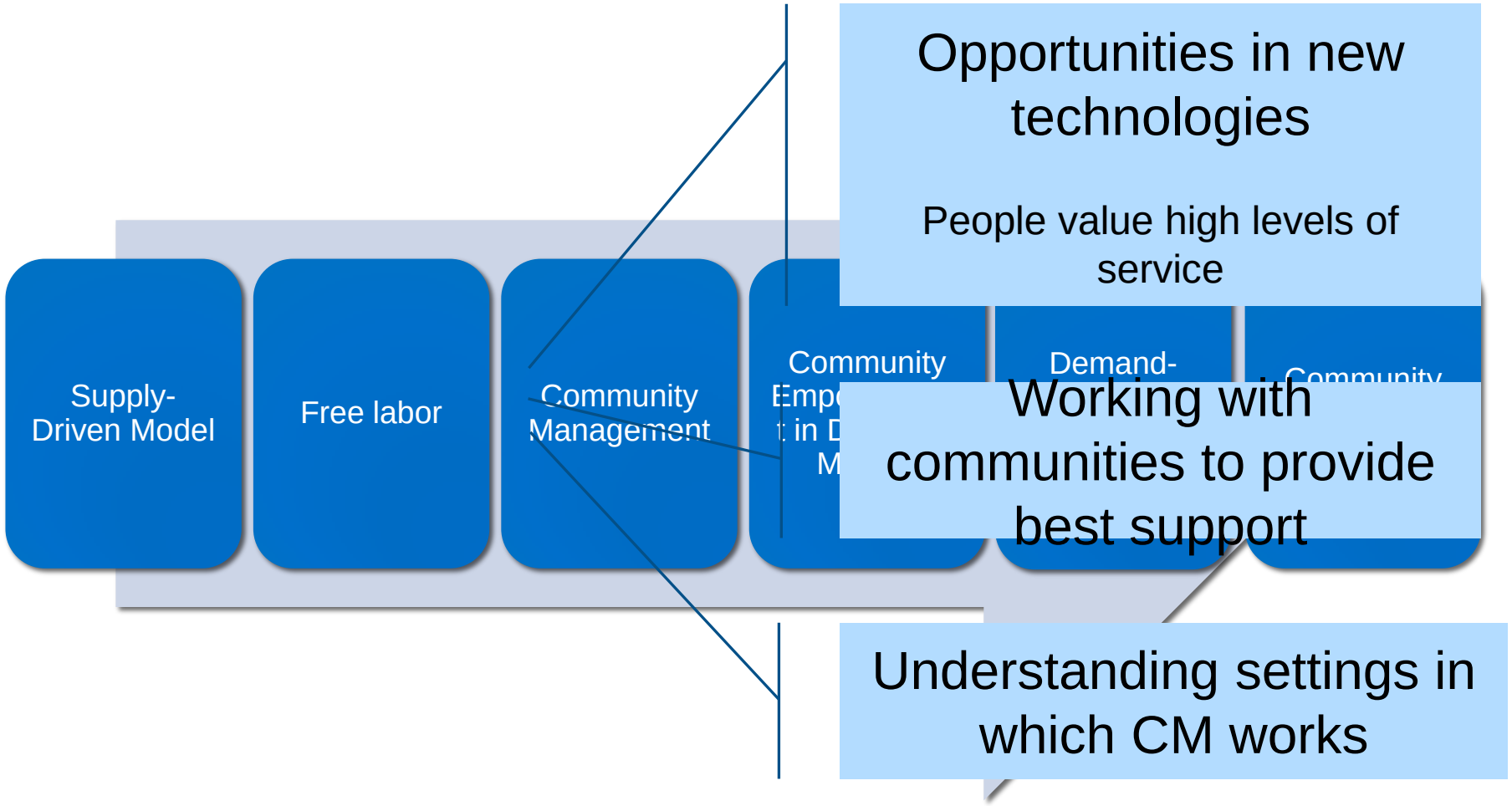
6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

6.a By 2030, expand international cooperation and capacity building support to developing countries in water-and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies

6.b Support and strengthen the participation of local communities in improving water and sanitation management

Future of community management



UNC WATER INSTITUTE

The Challenges of Community-Managed Water Supplies

THANK YOU

Q & A ?

UNC WATER INSTITUTE

DELETE FROM FINAL DECK

Submitted abstract:

Community-Managed Water Systems

World-wide small water supplies are widespread. In developed nations, they are disproportionately associated with disease outbreaks and contamination. In low and middle income countries, there is less evidence for outbreaks but they are widely associated with premature infrastructure failure. Whether by policy design or circumstances 'community management' is the principal organizational approach to them. This presentation outlines the findings of a series of studies into the reasons behind success and failure in community management, weaving together evidence from high and low-income settings. There are substantive common factors including financing, community involvement and training. Access to external expertise and government oversight are important. The implications of the work for water safety include the need to clarify and strengthen the roles of government in supporting community-management.