British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

DFID Department for International Development

Preliminary Results from a Water Economy and Livelihoods Survey (WELs) in Nigeria and Mali, Sub-Saharan Africa, Investigating Water Security and Access

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Introduction

In stark contrast to food security, very little systematic data collection has been done to investigate the role water security has on livelihoods within rural communities in sub-Saharan Africa, particularly during droughts or periods of water stress (Calow et al. 2009). The sustainable development and management of water resources in Africa, particularly perennial groundwater resources, remains a major priority, especially within the context of climate variability, population growth and pressures to increase food production.

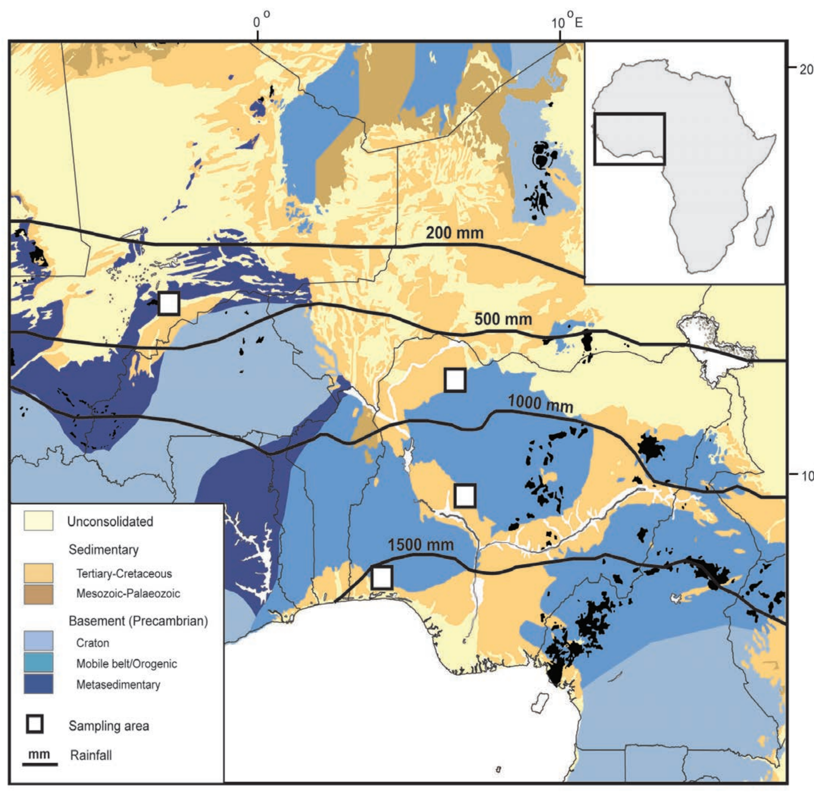


Figure 1 Location of the four study areas across Sub-Saharan Africa.

The main purpose of this study was to investigate changes in access and domestic use of a range of water sources (hand pumps, wells, surface water sources and rainfall harvesting) within rural communities across a rainfall transect in Nigeria and Mali, sub-Saharan Africa. A slimmed down water, economy and livelihoods (WEL) survey methodology (Coulter 2010) was used. Seasonal water use and security /stress indices (e.g. collection times and per capita volumes) were investigated at approximately 50 locations using community discussions and questionnaires in four different study areas across the climate/rainfall transect (see Figure 1).

What we investigated

(i) How does access to different water sources vary across the transect?

(ii) Does access to improved water sources in the dry season meet basic needs for domestic use?

(iii) How does rationing and charging at hand pumps vary across the transect?

Plate 1 *(left)* Queuing for water at a hand pump in Northern Nigeria.

Plate 2 *(right)* Shallow hand dug wells are an important source of drinking water.

Conclusions

- On basement sites median collection times for hand pumps in the dry season were 50 minutes, around twice that of the sedimentary sites. This is an indicator of poor water access, exceeding the recommended value of around 20 minutes (Sphere 2011).
- At 50% of sites, communities accessed less than 10 L/capita/day for drinking, food, cooking and hygiene from hand pump sources, the average recommended water use (Sphere, 2011).
- Hand pumps are critical improved sources of water for rural populations during the dry season but waiting times and water use data suggest that they are under stress during these periods, particularly on the basement geology.
- The slimmed down WEL survey is an effective way of rapidly gathering information on water access in West Africa. These preliminary findings are from a small (high quality) sample, further research drawing from a larger sample is needed to validate these conclusions and investigate their wider significance.

References

Calow, R C, MacDonald, A M, Nicol, A L, and Robins, N S. 2009. Ground water security and drought in Africa: linking availability, access and demand. Ground Water, 48, 2, 246–256.

Coulter, L, and Calow, R C. 2011. Assessing seasonal water access and implications for livelihoods, RiPPLE WELS Toolkit report, RiPPLE-ODI Ethiopia. www.rippleethiopia.org

Lapworth, D J, MacDonald, A M, Bonsor, H, Tijani, M N, Calow, R C. 2011. Preliminary results from a Water Economy and Livelihoods Survey (WELS) in Nigeria and Mali, sub-Saharan Africa: investigating water security across a rainfall transect. British Geological Survey, 65pp. (OR/11/018). http://nora.nerc.ac.uk/14997/

Sphere. 2011. Humanitarian Charter and Minimum Standards in Disaster Response. http://www.sphereproject.org/content/view/40/83/lang,english/ (accessed 15th March 2011).

Preliminary results

Table 1 summarises the changes in collection times and water use for the four case studies. Figure 2 shows the variation in collection times from hand pumps and hand-dug wells across the transect for sites on basement and sedimentary aquifers.

Table 1 Summary water access and use results for different water sources in wet and dry seasons.

Climate zone Rainfall: (mm/yr)	Country and region	Hand pumps: Uses and average collection times (min)		Traditional wells: Uses and average collection times (min)		Rivers: Uses and average collection times (min)		Rainfall harvesting Uses	Seasonal Ponds: Uses
		Wet	Dry	Wet	Dry	Wet	Dry	Wet	Wet
Wet (1800–2000)	NIGERIA, Abeokuta	D, C, W **(25)**	D, C, W (32)	D*, C, W **(11)**	D*, C, W, A **(13)**	D*, C*, W* ,A (34)	W*, A (34)	D, C	N/A
Seasonal wet (1200–1500)	NIGERIA Minna	D, C **(15)**	D, C, A (44)	D, C, W **(8)**	D, C, W, A **(18)**	D*, W, A **(31)**	W, A **(30)**	D, C	A, W, C, B
Seasonal wet (700–850)	NIGERIA, Gusau	D, C, W (33)	D, C, A (56)	D, C, W, A **(16)**	D, C, W, A, I* **(29)**	D*, W, A **(35)**	N/A	D, C	D*, A, W, B
Semi-arid (350–400)	MALI, Bandigara	D, C, W **(30)**	D, C, W, A* (57)	D, C, W, A **(29)**	D, C, W, A, I* (48)	N/A	N/A	D*, C*	D*, A, W, B

Uses: D = drinking, C = cooking, W = washing, A = animals, I = irrigation, B= building, * = few instances , waiting times >30 min are highlighted in red. Source: Lapworth et al. (2011).

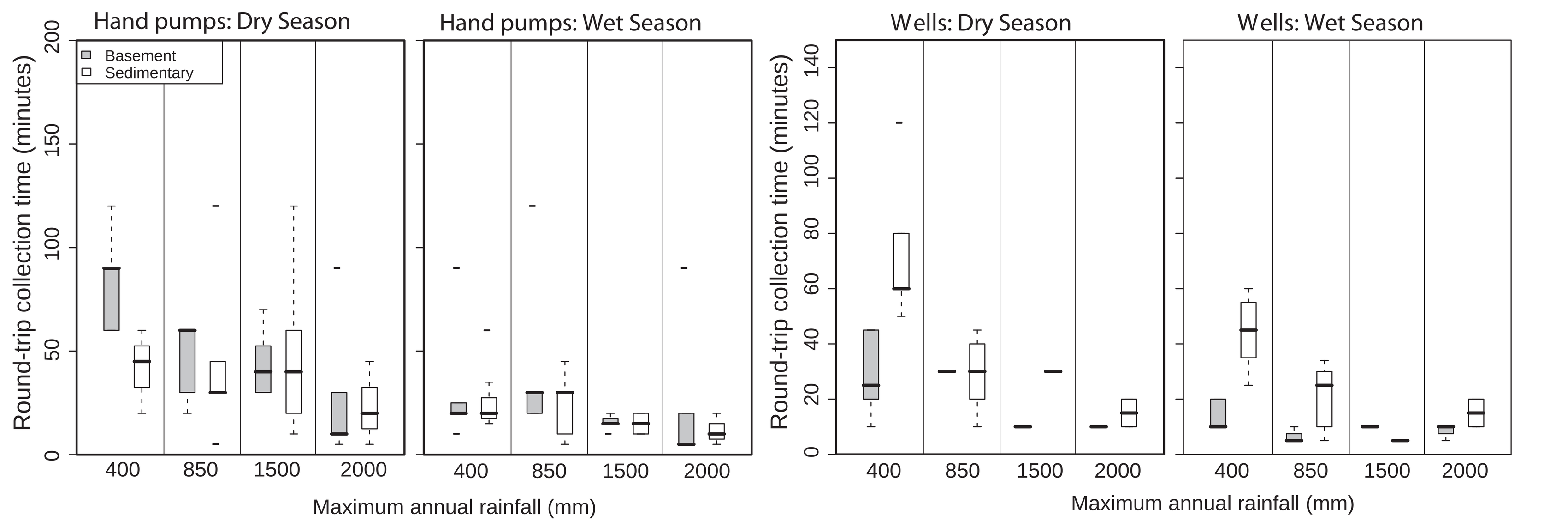
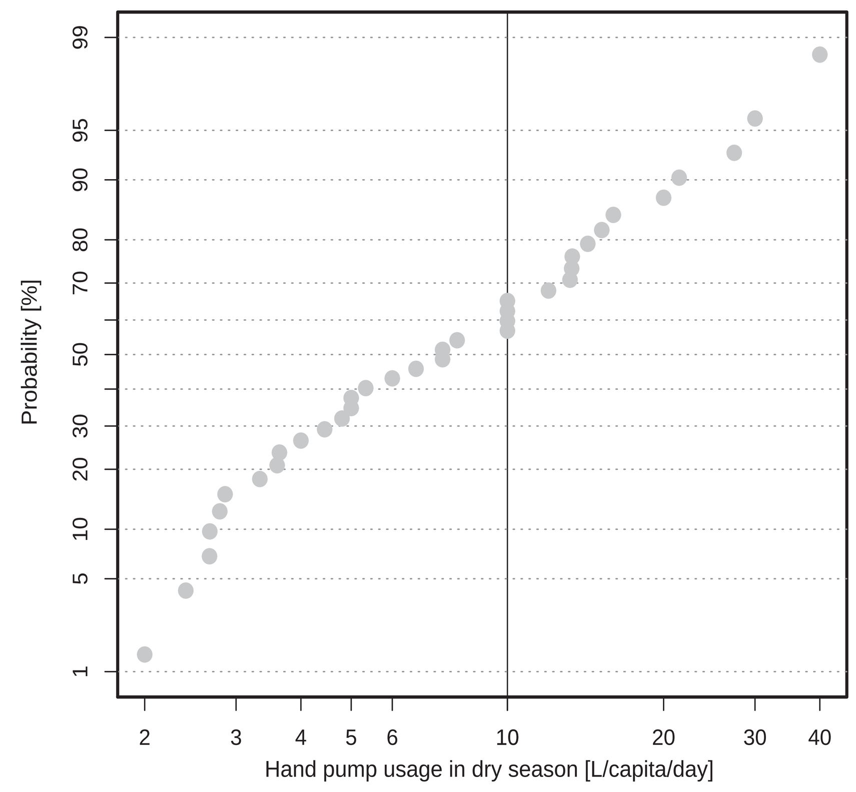


Figure 2 *(above)* Variation in collection times at hand pumps and wells.

Figure 3 *(right)* Distribution of water usage from hand pumps in the dry season.



Overall, collection times from groundwater sources were found to be significantly different ($p<0.05$) during the dry season across the climate transect, but only found to be significantly different for the sedimentary and basement sources for each study area in the two most arid zones (Figure 2). There is an increase in mean and median collection times from these groundwater sources as the climate becomes more arid, in both the wet and dry season, although the differences are not significant ($p>0.05$) for the wet season.

Charging was only found to occur in around 10% of villages surveyed. Four of the five communities (80%) which had introduced charging were found in the most arid case study in Mali.

Rationing was found to occur in the dry season in around 20% of the villages surveyed. Around 60% of the instances of rationing were found in the seasonally wet Minna case study in Nigeria which has a rainfall of 1500 mm/y.

Figure 3 shows a cumulative probability plot for estimated hand pump use (L/capita/day) for all the sites across the transect in the dry season. For 50% of hand pumps, water use was less than 10 L/capita/day for domestic use, and 80% of sites were using less than the upper limit of average usage i.e. 15 L/capita/day (Sphere, 2011).

Additional information

BGS work on groundwater resilience to climate change: http://www.bgs.ac.uk/GWResilience/

MacDonald et al., 2011 Groundwater resilience to climate change in Africa. British Geological Survey, 32pp. (OR/11/031), http://nora.nerc.ac.uk/15772/

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