



British Geological Survey

NATURAL ENVIRONMENT RESEARCH COUNCIL

Gateway to the Earth

Using emerging contaminants to trace rapid recharge pathways in urban groundwater: an example from Kabwe, Zambia

Dan Lapworth* (a), James Sorensen (a), Daniel Nkhuwa (b)

(a) *British Geological Survey*

(b) *University of Zambia*

**djla@bgs.ac.uk*

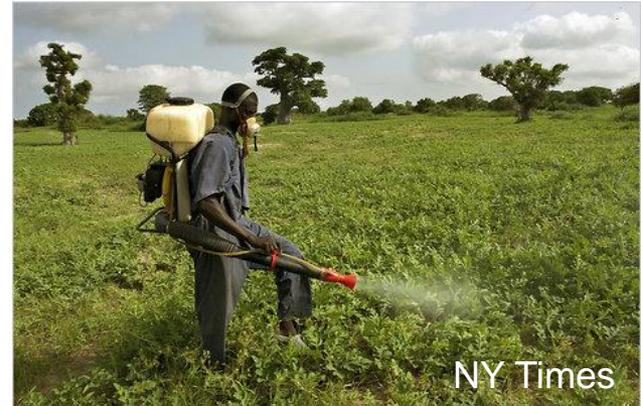


Unlocking the Potential of Groundwater for the Poor



Emerging contaminants in Africa

- Increasing use of synthetic compounds – incl import of developed world's waste
- Wastewaters are typically a major source
 - 80% is discharged untreated from large urban areas in Africa (Nyenje et al. 2010)
- Potential as tracers



Kabwe – Africa's most toxic city



EC sampling in Kabwe

- Investigate seasonal occurrence of ECs in 20 drinking water supplies
- >1000 organic contaminants screened by GC-MS

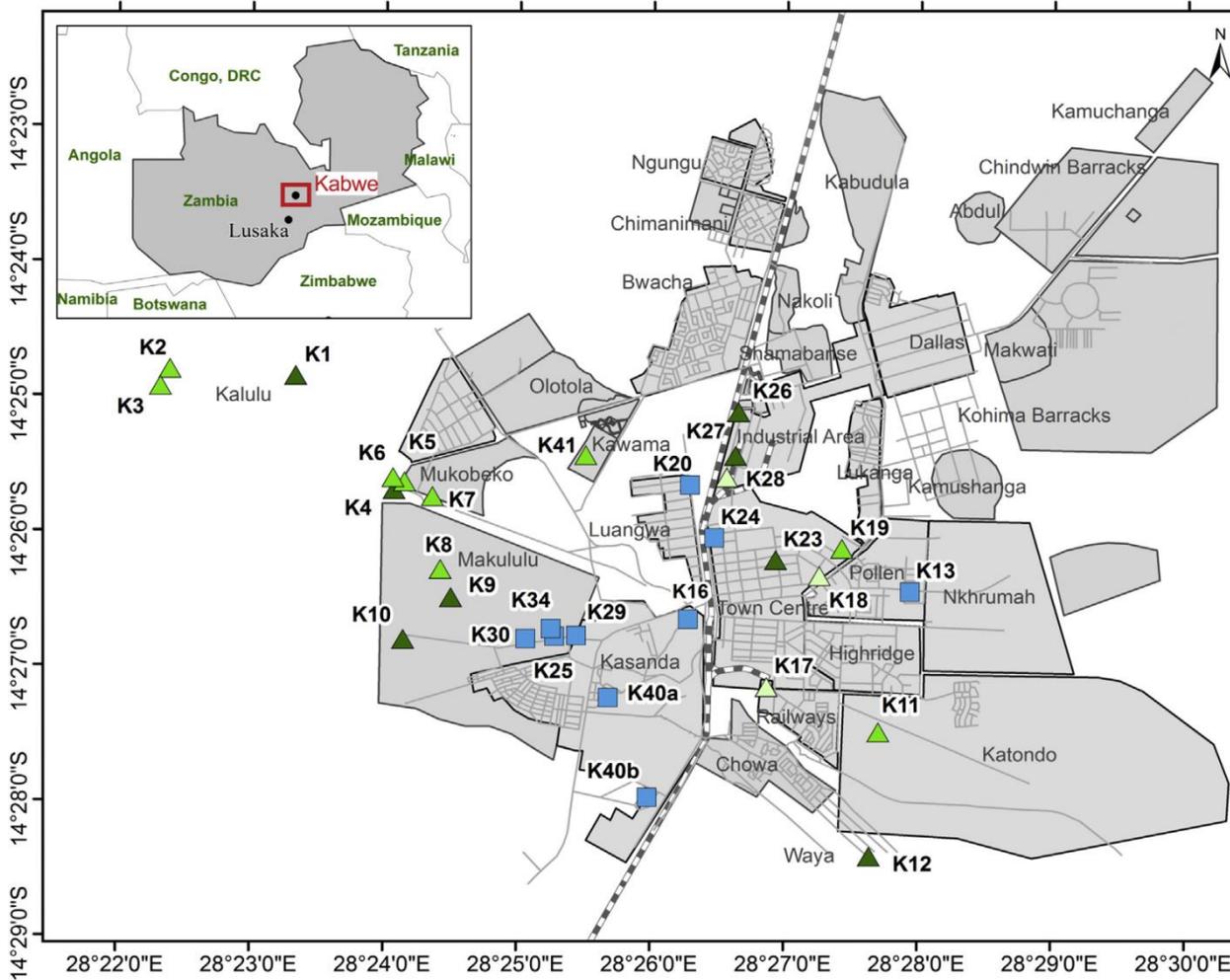
Shallow wells in laterite/saprolite



Dolomite exploited through boreholes



Supplies spread across city



Legend

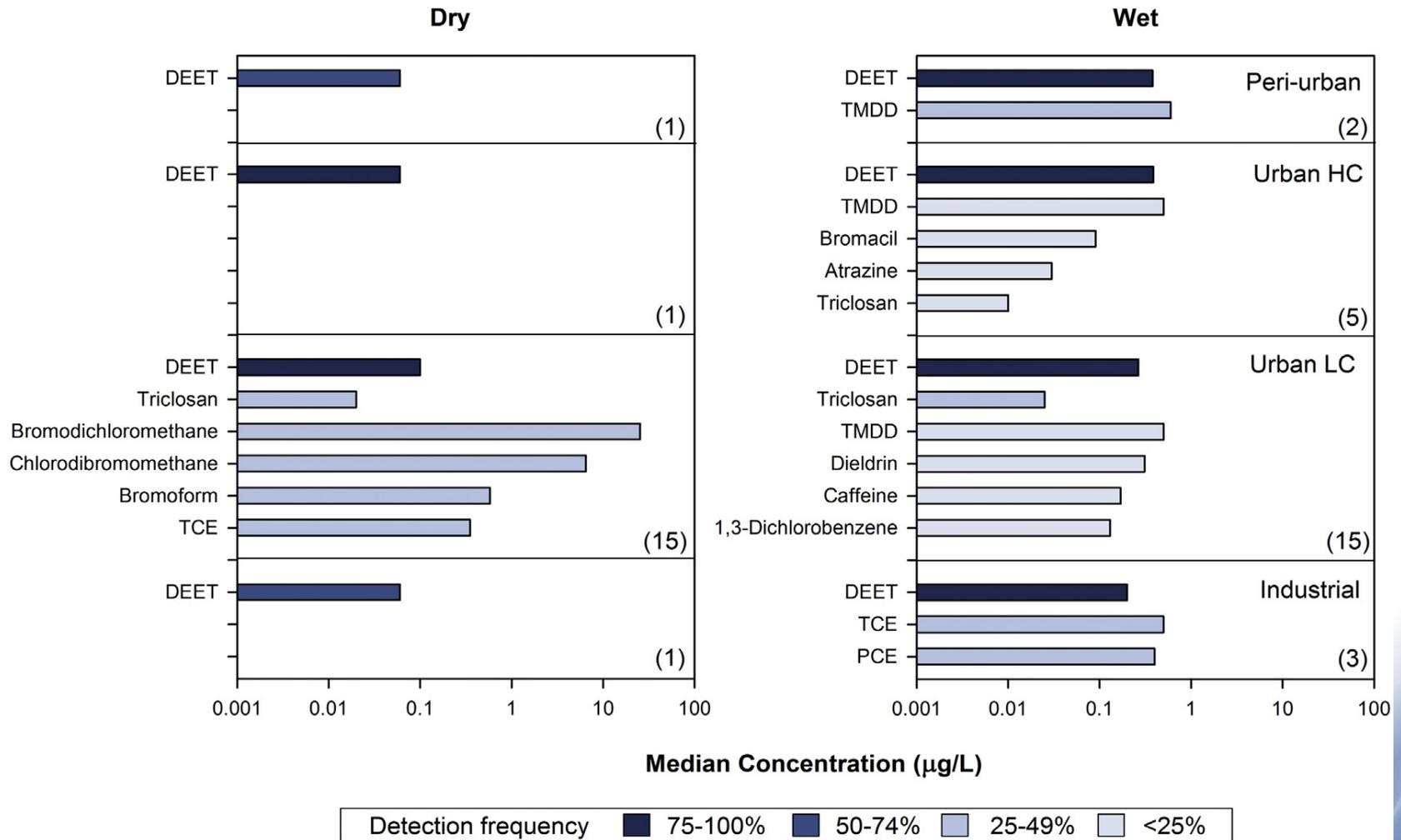
Deep boreholes

-  Both
-  CFC/SF₆
-  EC

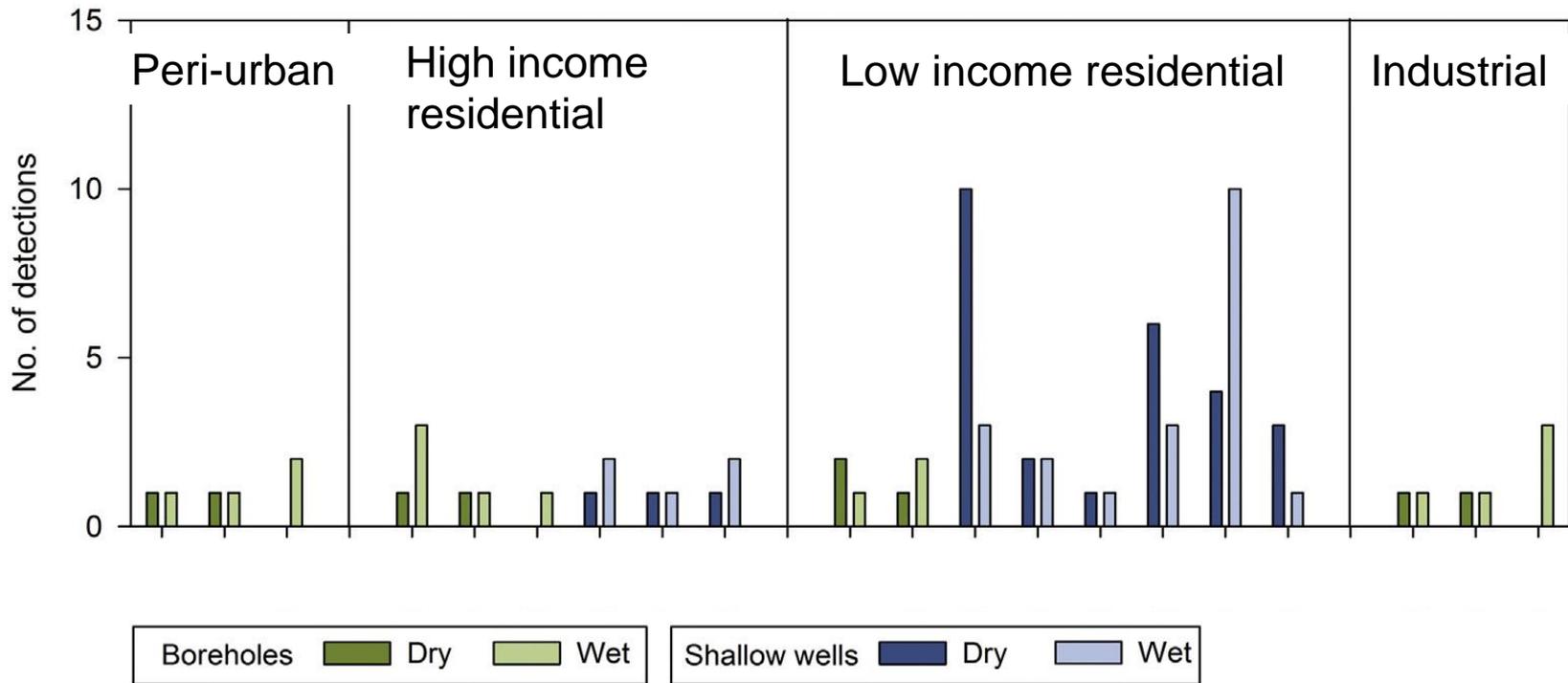
Shallow wells

-  EC

Seasonal ECs in drinking water



Total ECs in different supplies



Vulnerability of certain supplies

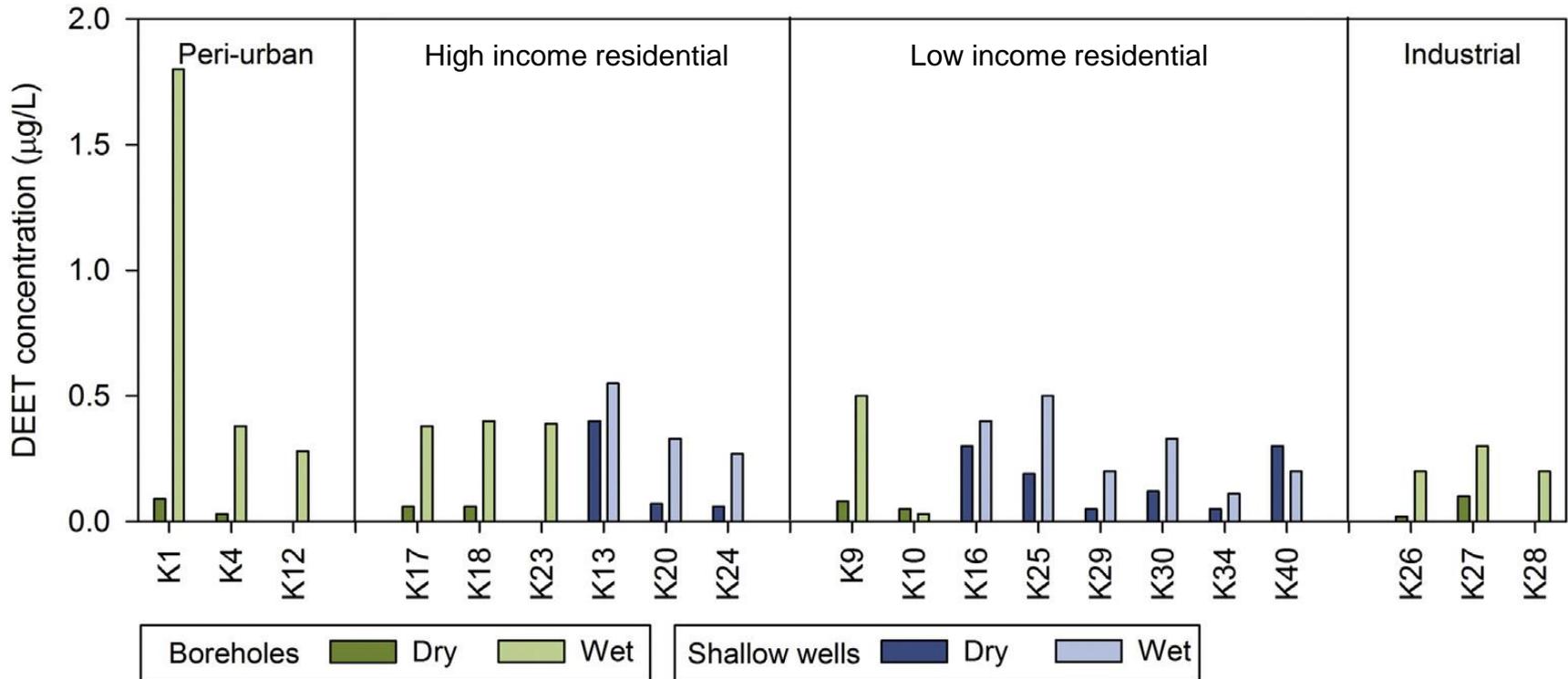


DEET – main contaminant



Bushmanreppellen.eu

- Concentrations higher in all supplies in wet season
- Highlights rapid pathways to all supplies



Conclusions

- First study to look at emerging contaminants in Africa
- The insect repellent DEET was ubiquitous
- Higher numbers of ECs in poorly protected hand-dug shallow wells in lower income areas
- Seasonal changes in DEET highlight rapid pathways and vulnerability of all supplies to near-surface pollution