

# 4<sup>th</sup> SADC GROUNDWATER CONFERENCE

10th -12th of November 2021  
VIRTUAL CONFERENCE



## Observation based continental-scale groundwater study in Africa: Drilling trends, water level fluctuations, and depletion

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International Association  
of Hydrogeologists  
the World-wide Groundwater Organisation



GRIPP  
GROUNDWATER SOLUTIONS  
INITIATIVE FOR  
POLICY AND PRACTICE



British  
Geological  
Survey

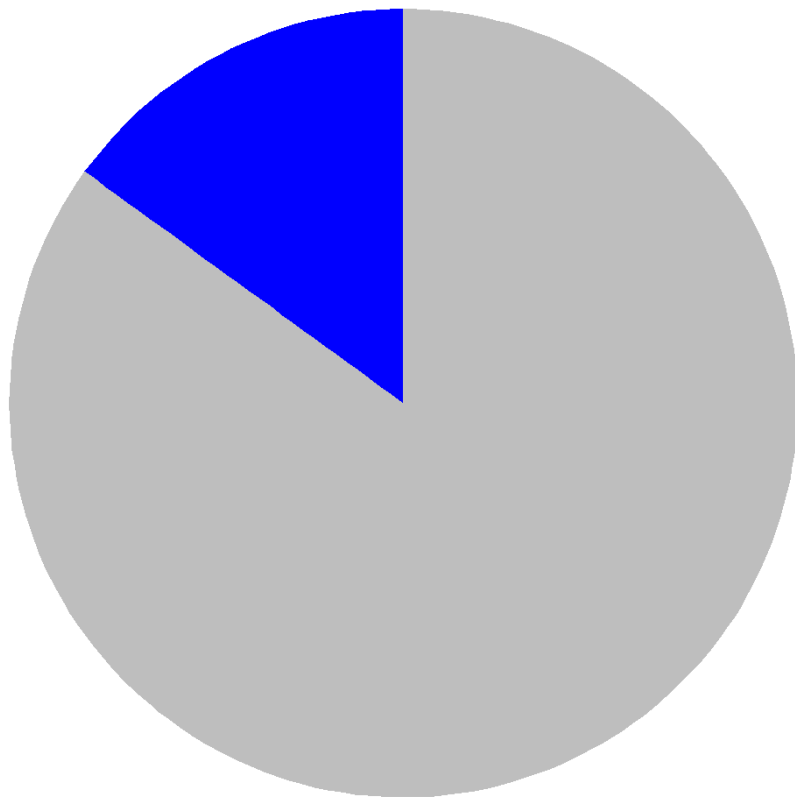


UNIVERSITY  
BOTSWANA

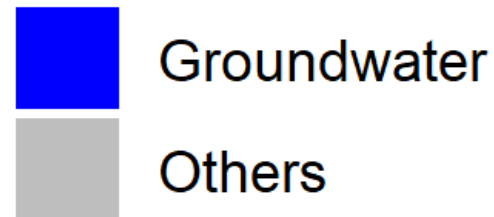
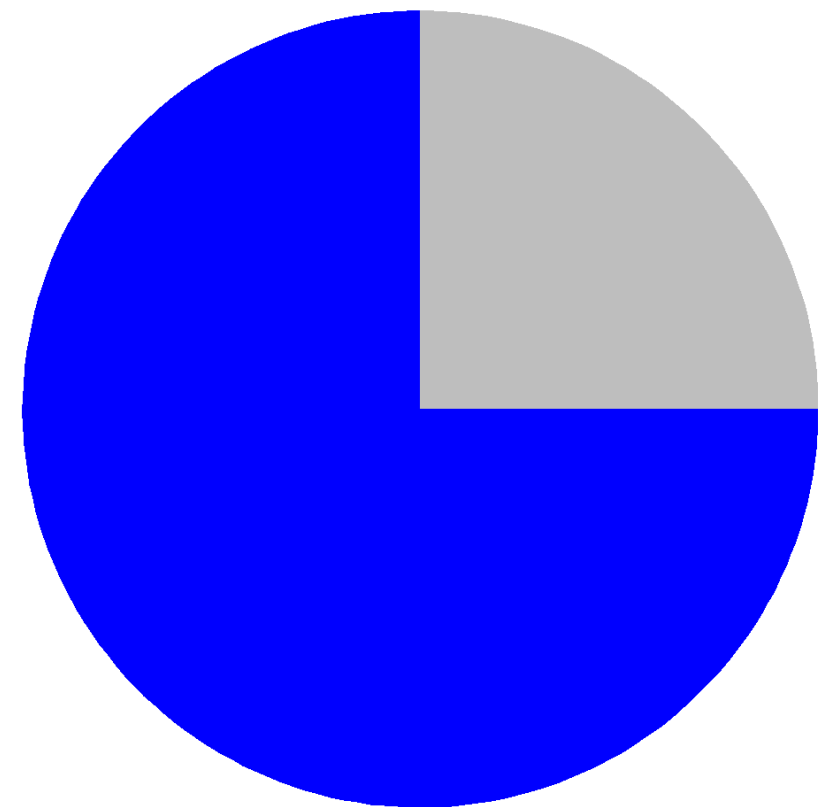


# Groundwater is important

**African renewable water resources (15% groundwater)**

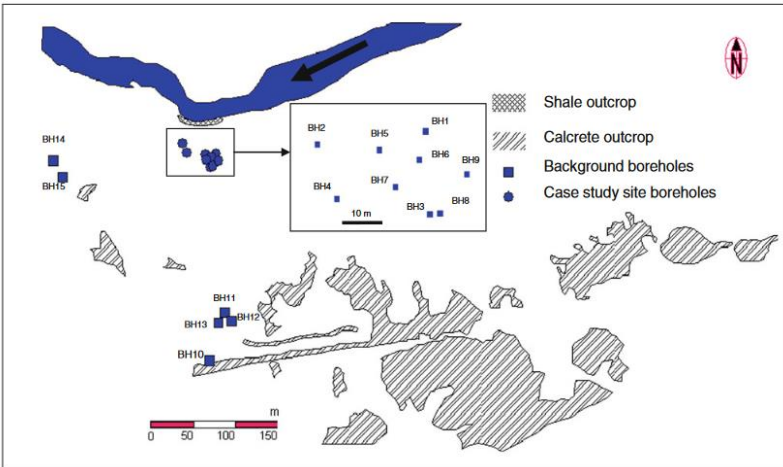


**People relying on different drinking water source (75 % groundwater)**

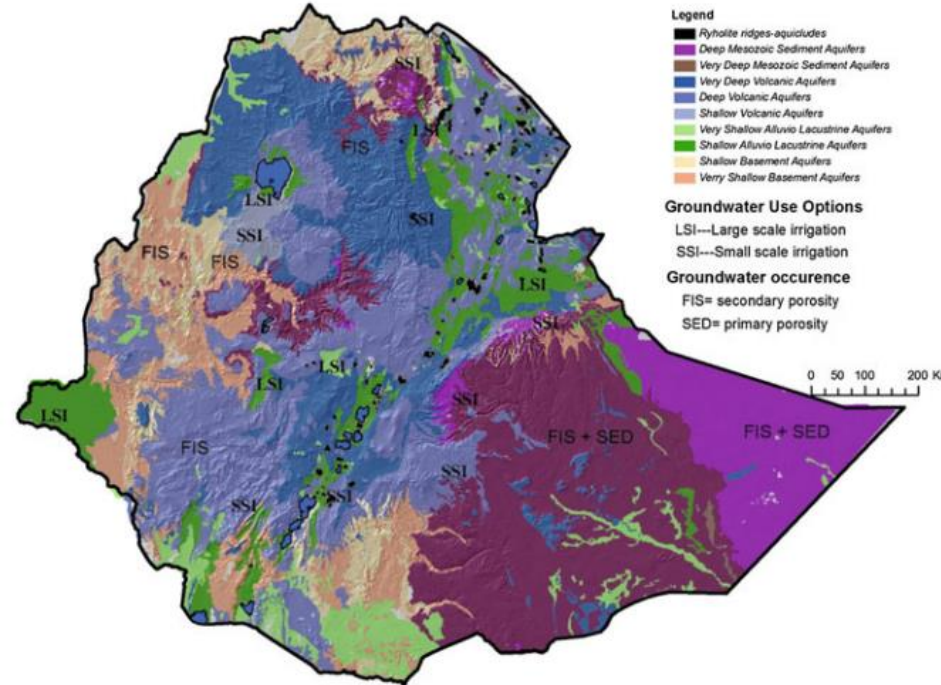


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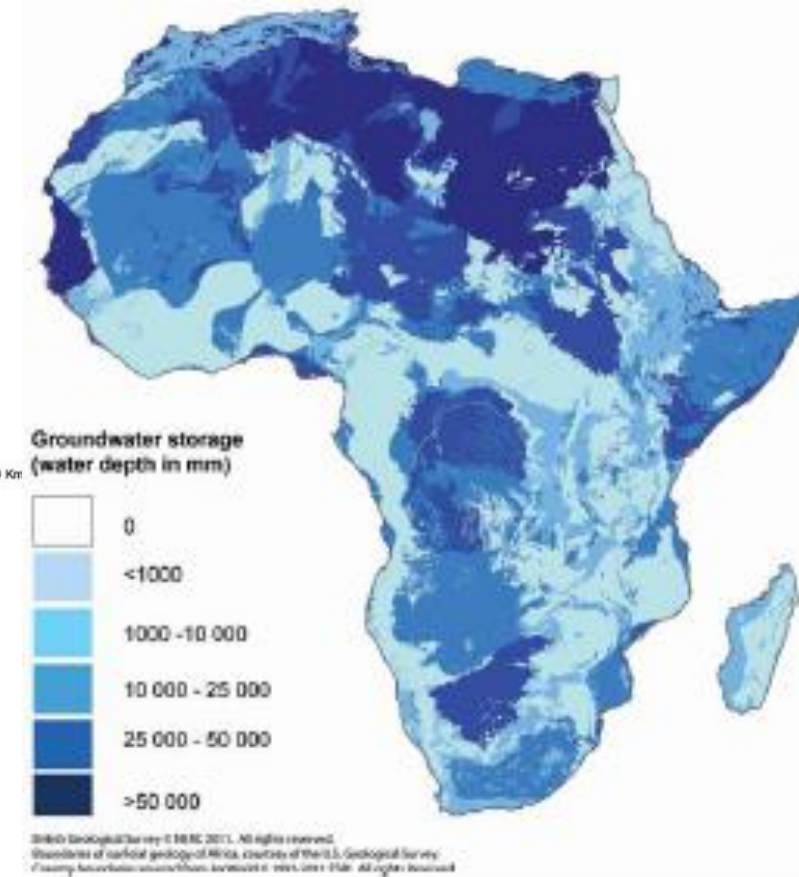
# Foundational Supply Studies



Karoo Basin of Southern Africa  
(Gomo et al., 2013)



Ethiopia, (Seifu Kebede, 2013)



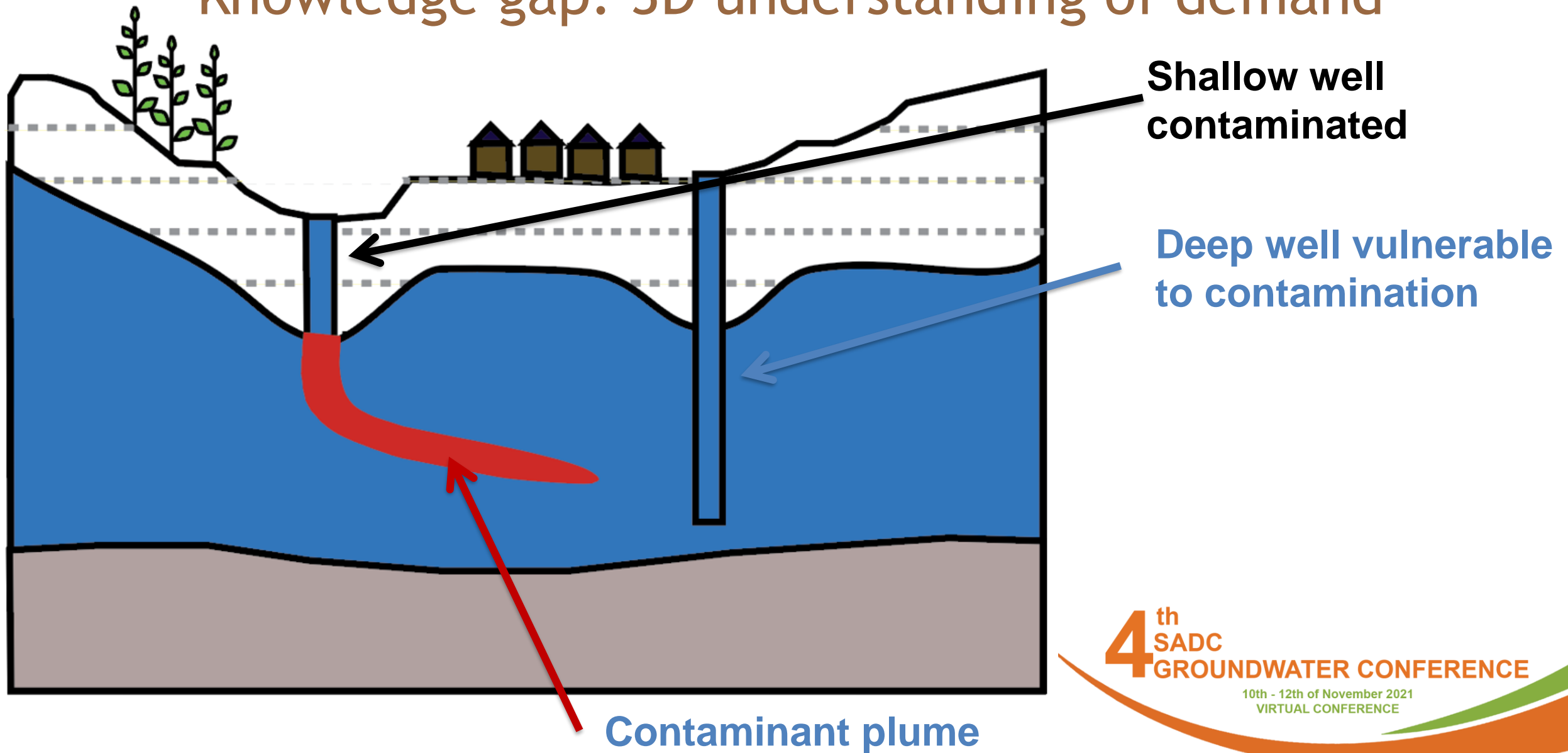
Groundwater storage  
(MacDonald et al., 2012)

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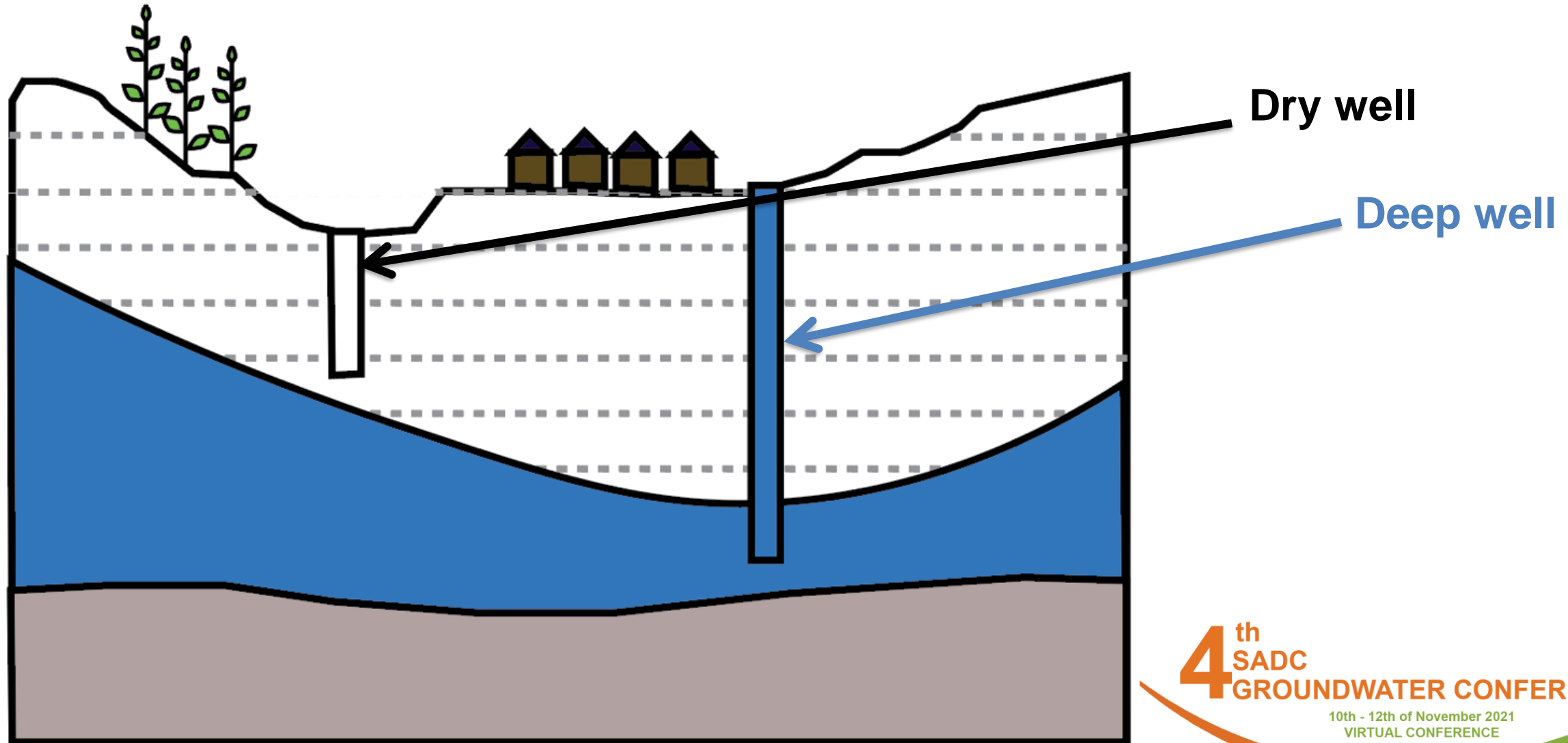
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# Knowledge gap: 3D understanding of demand

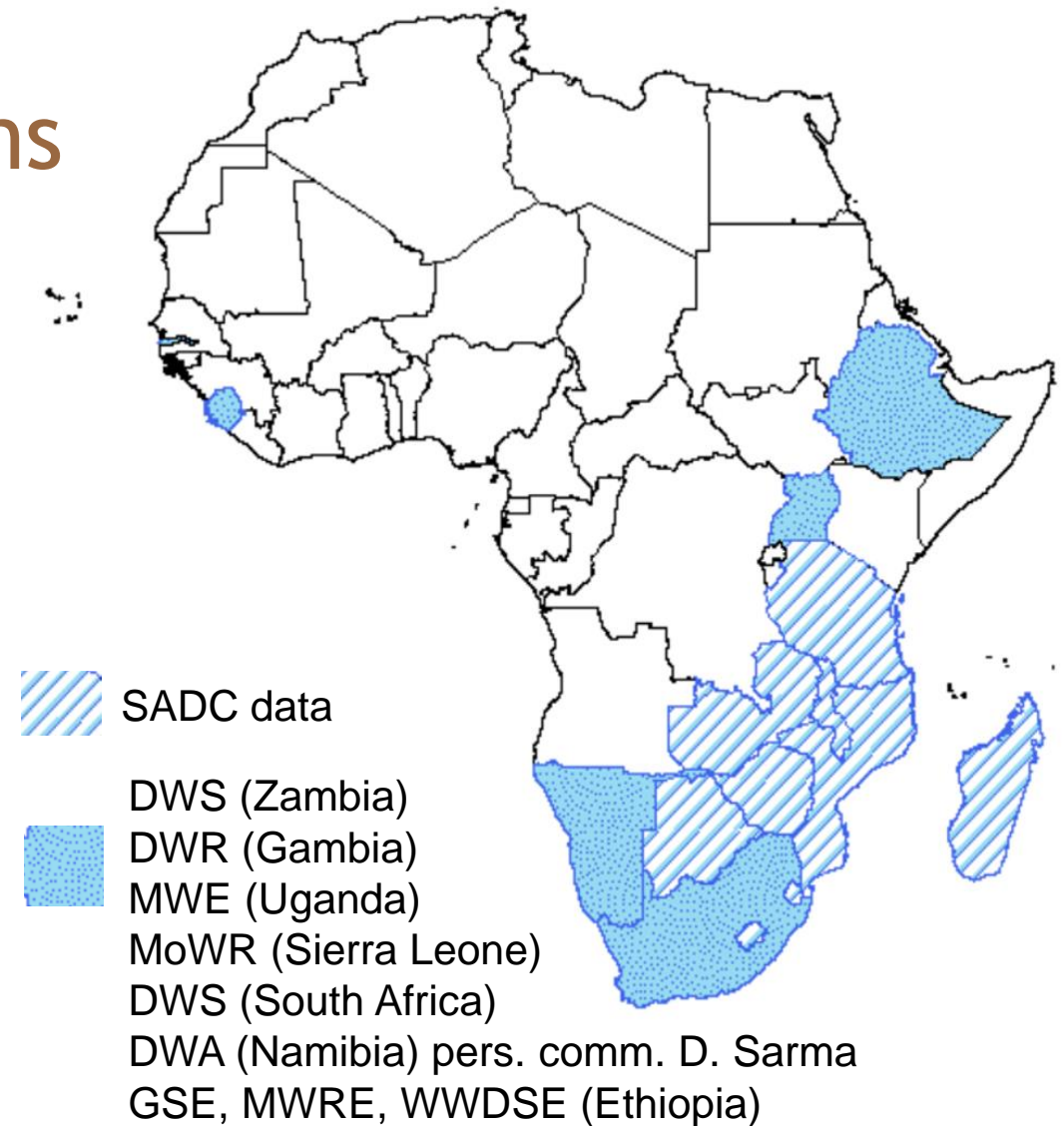


# Knowledge gap: 3D understanding of demand



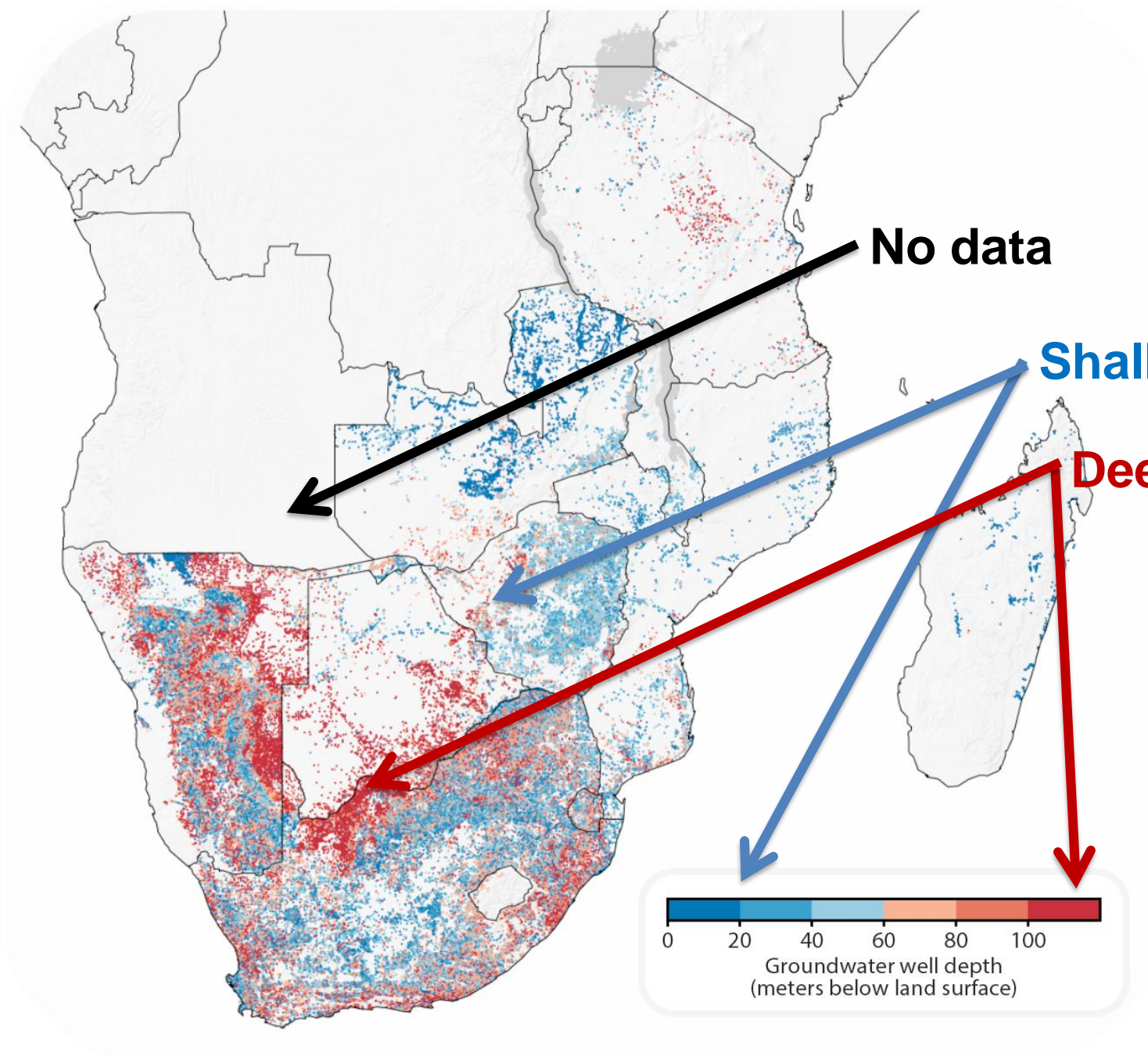
# Data for SADC and other regions

- To date
  - ~500,000 borehole data
  - 15 countries
- Data include
  - drilling depth
  - year of well construction
  - water-level change



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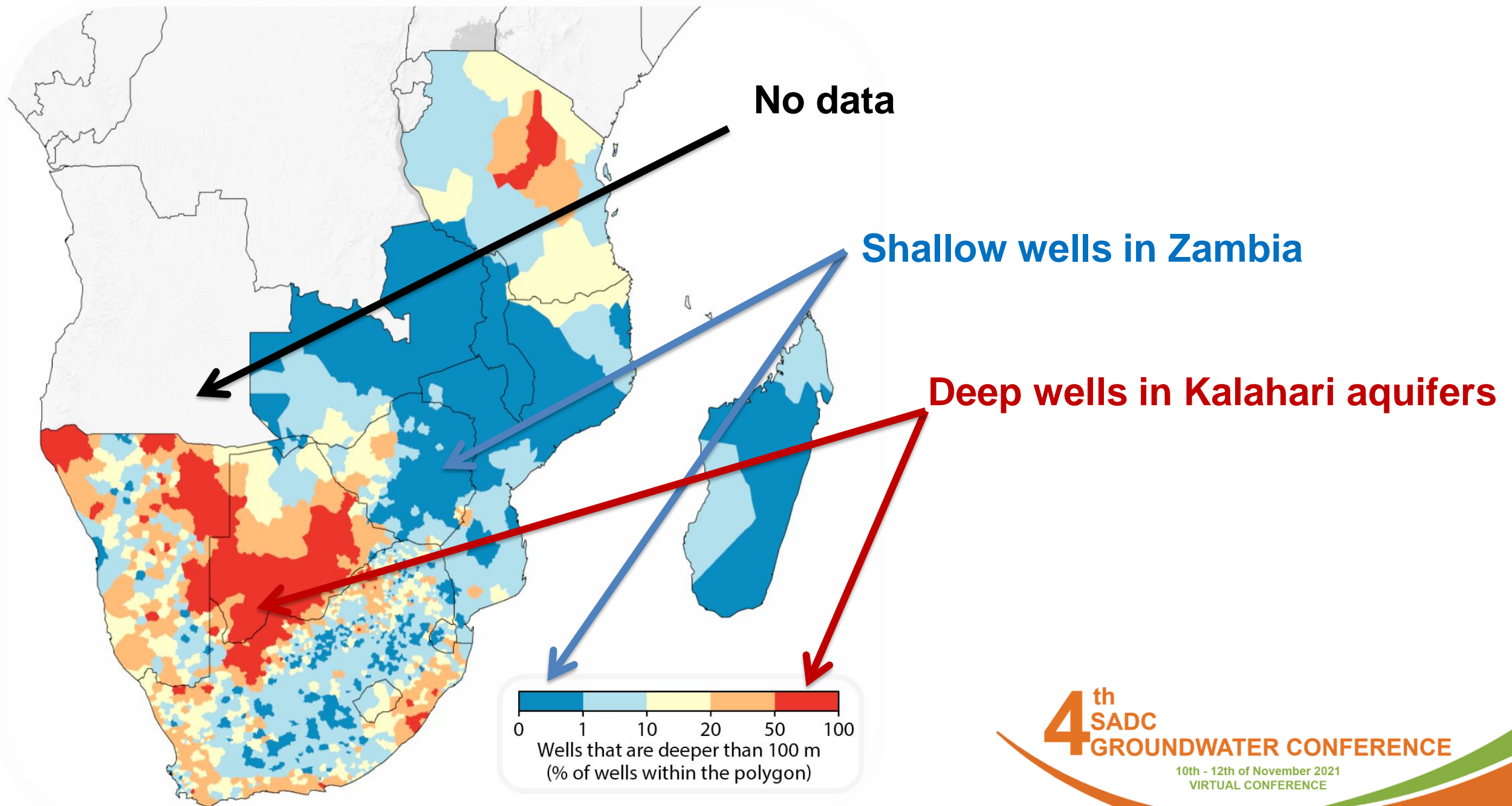
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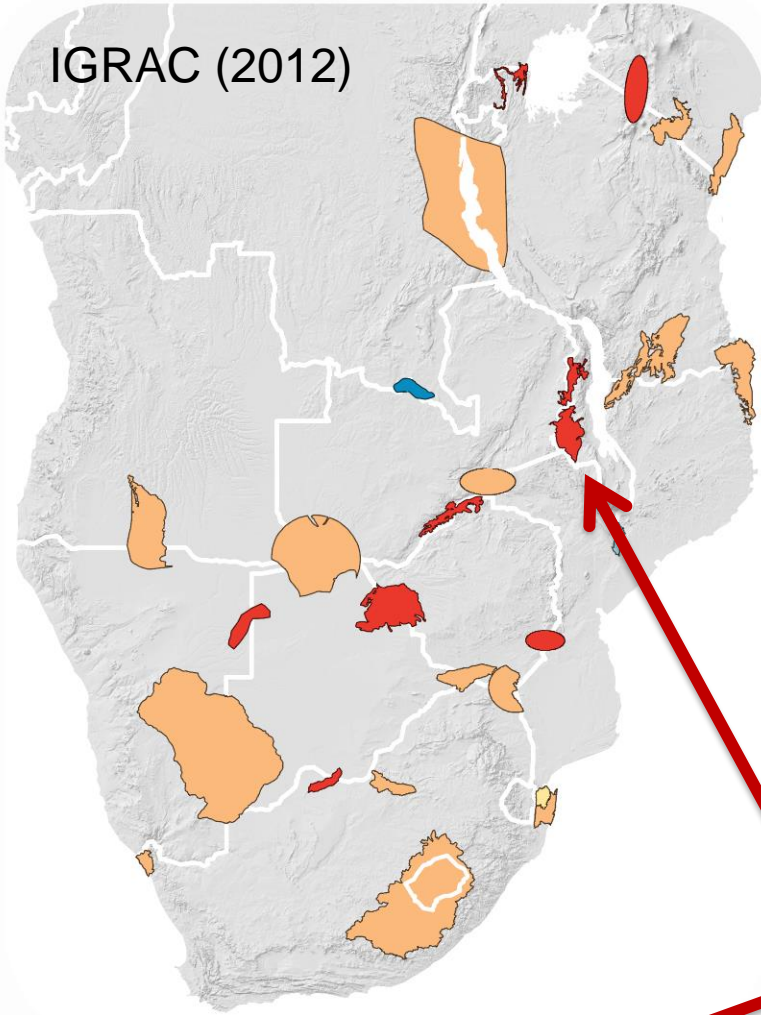




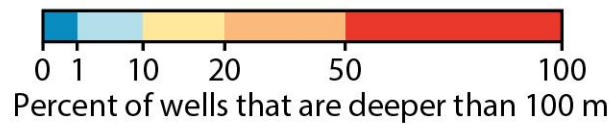
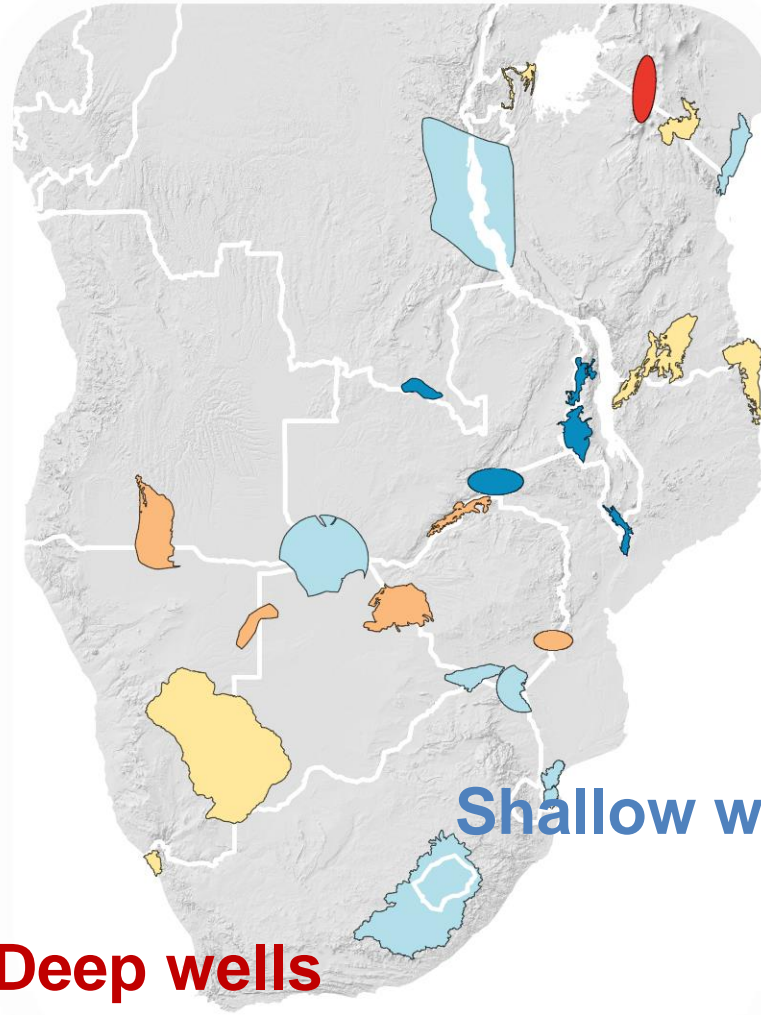
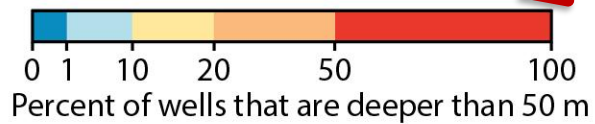


# Wells by transboundary aquifer

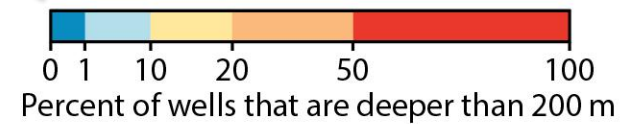
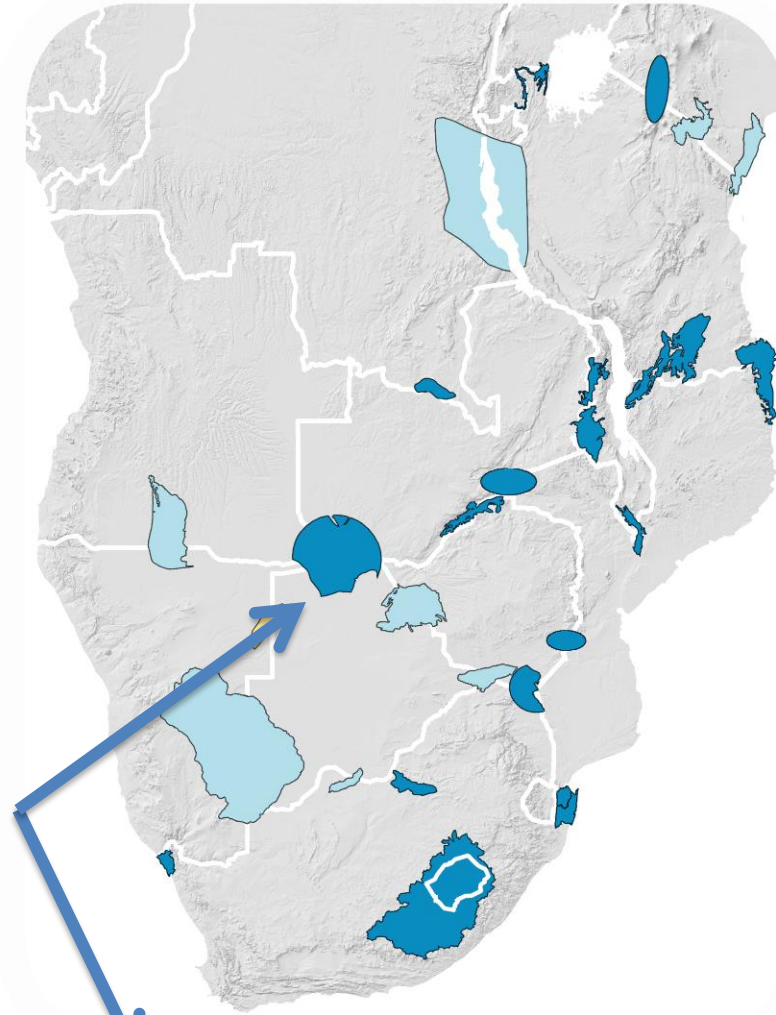
IGRAC (2012)



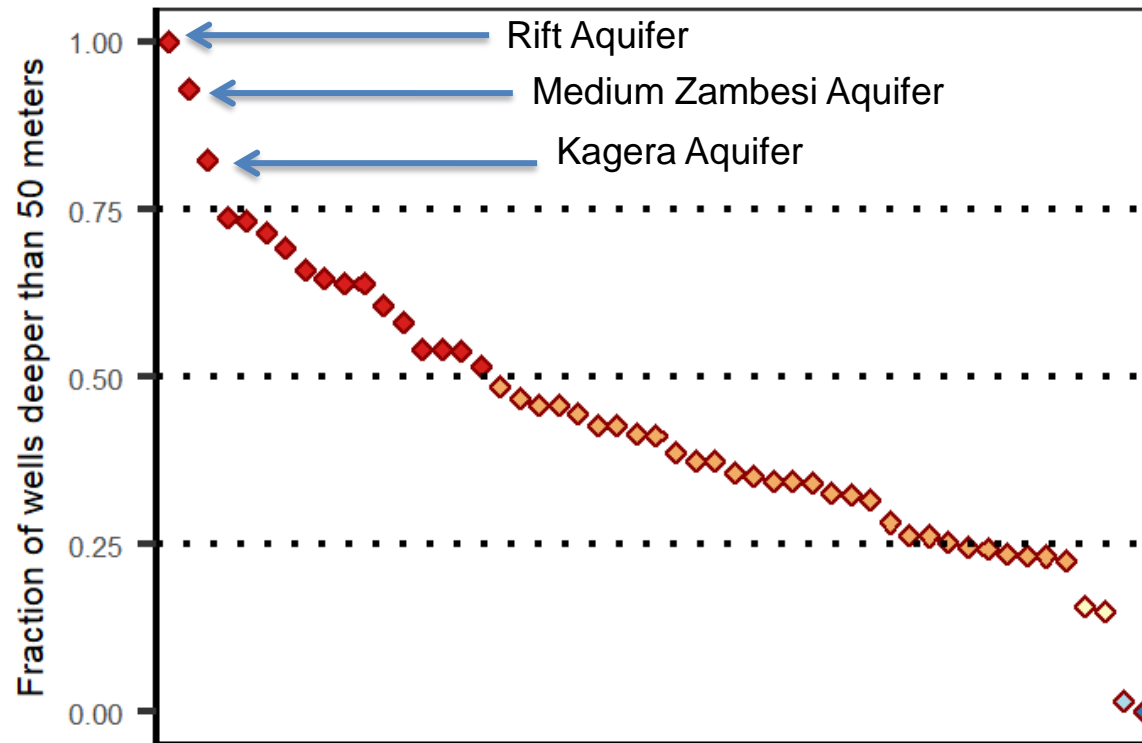
**Deep wells**



**Shallow wells**



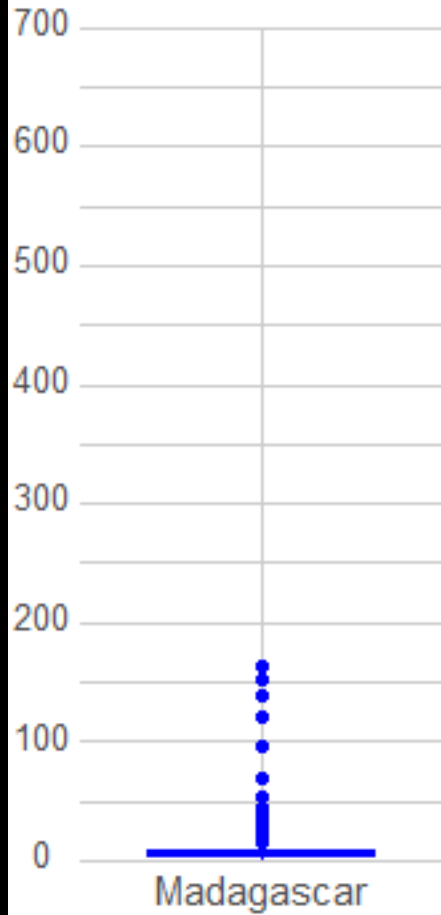
# More than one-quarter of the wells are deeper than 50 m in most aquifers.



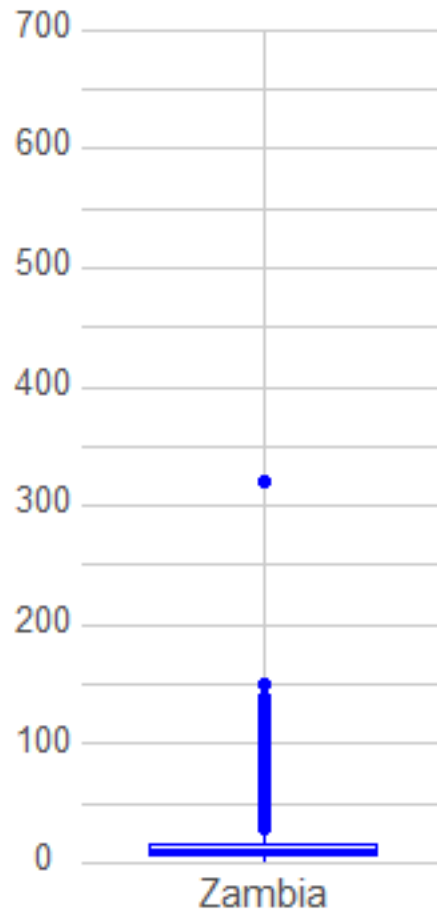
# Wells by country

Depth (m)

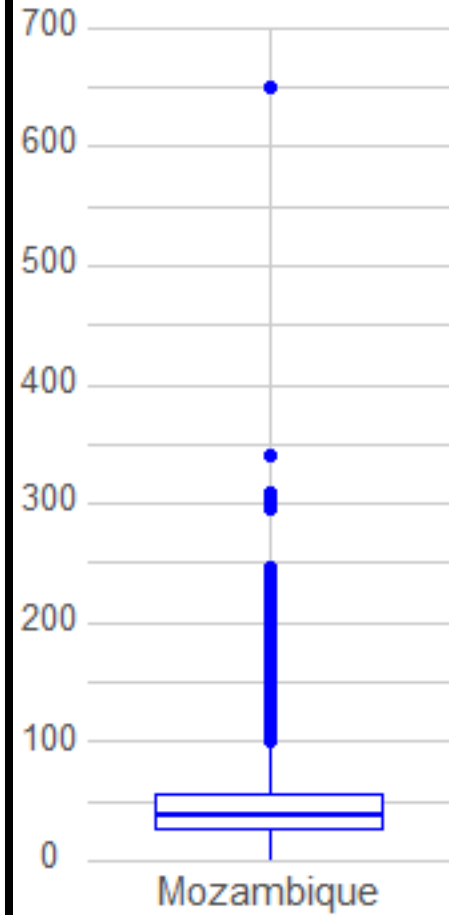
Madagascar Well Depth



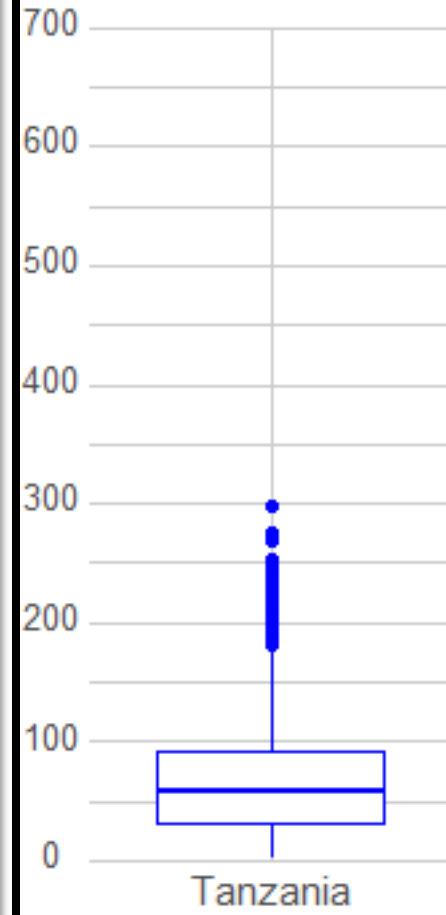
Zambia Well Depth



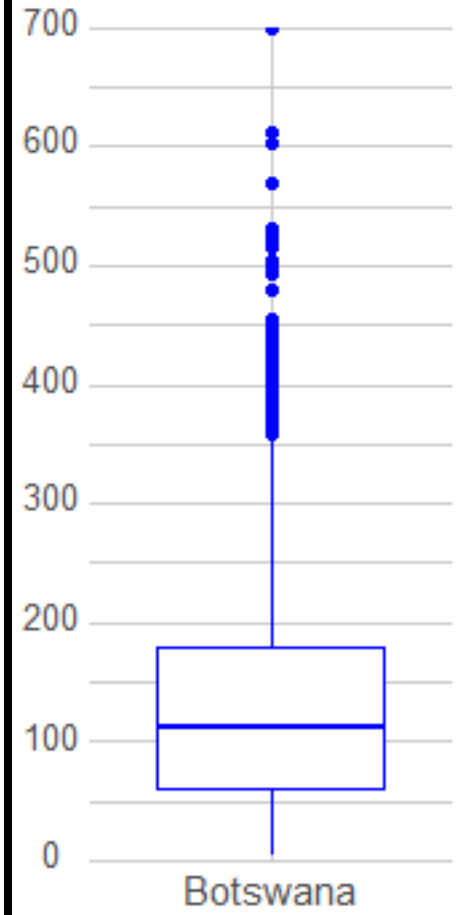
Mozambique Well Depth



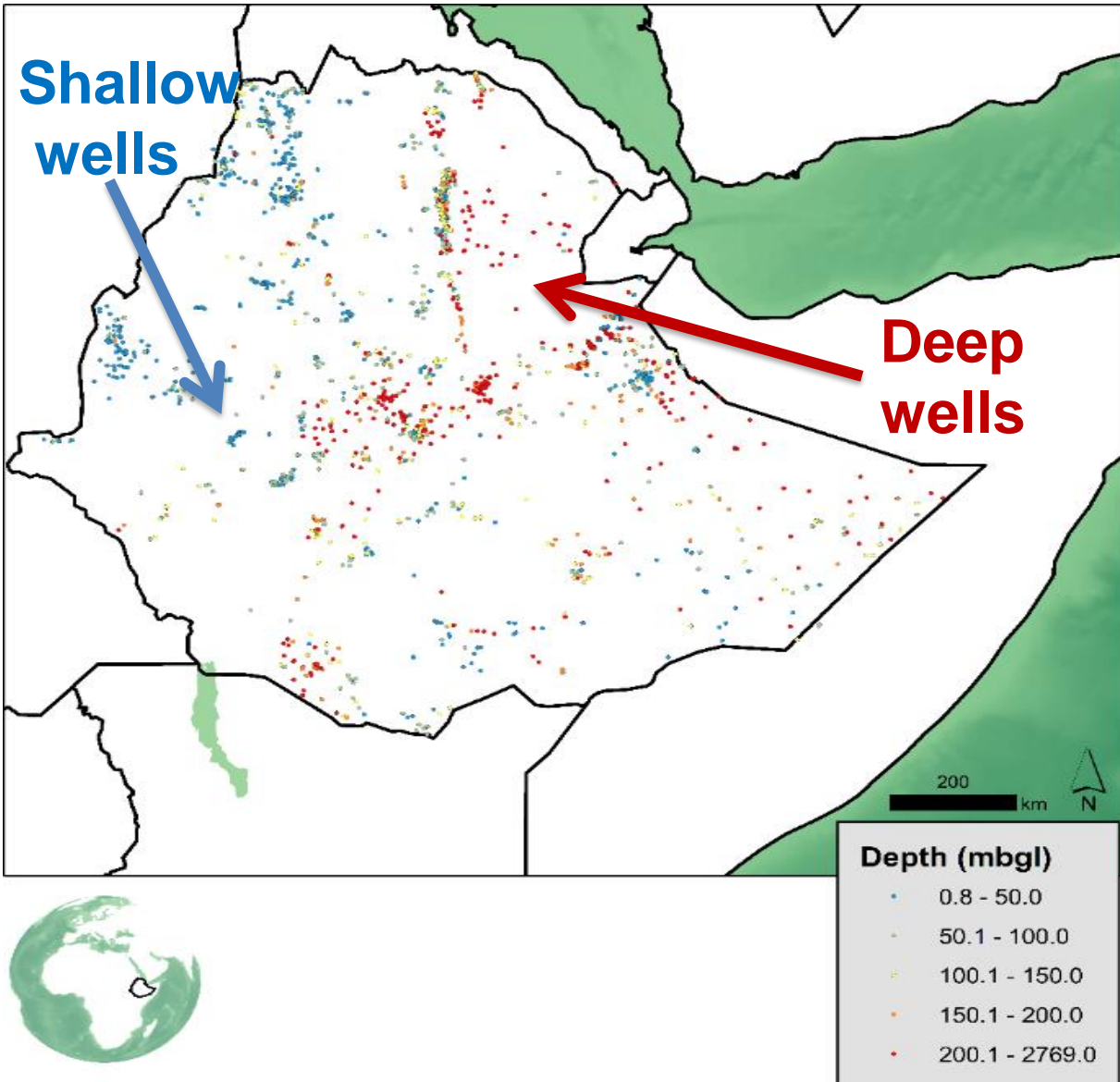
Tanzania Well Depth



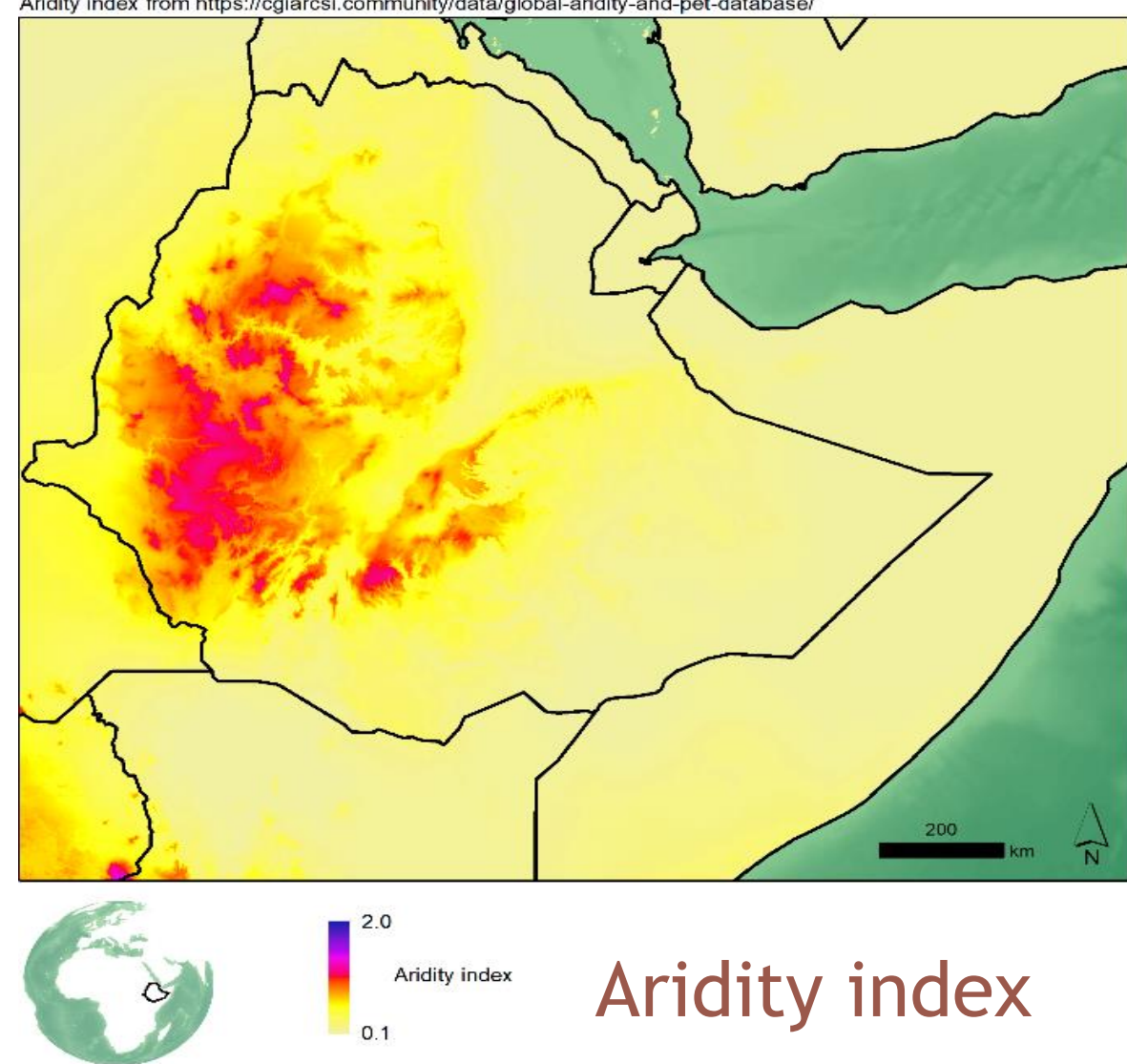
Botswana Well Depth







Ethiopian groundwater well depths

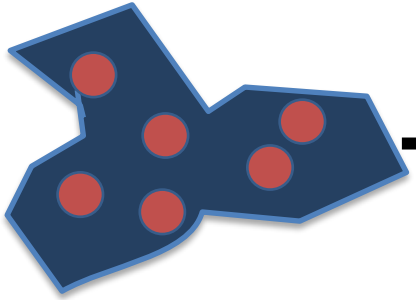


Aridity index

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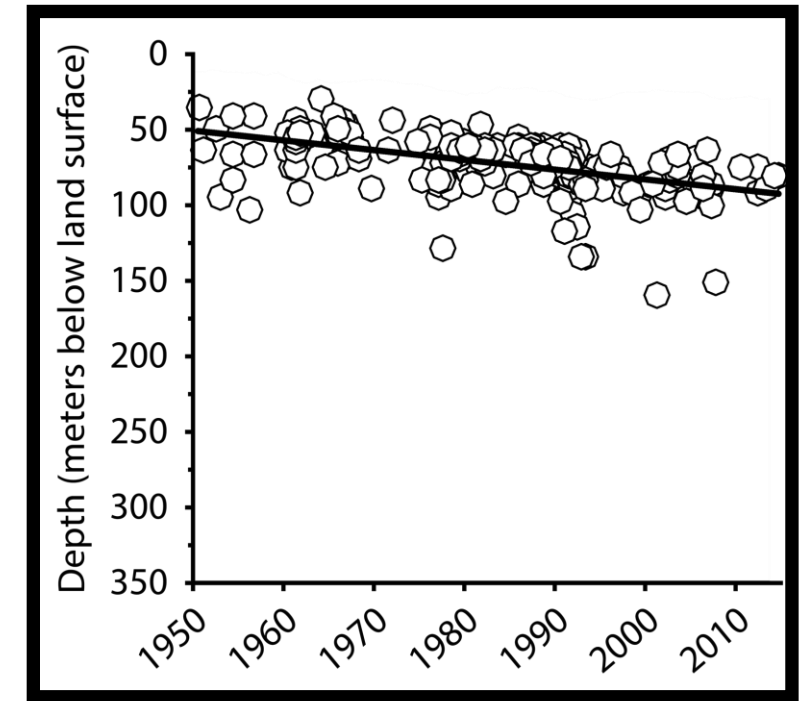
# Method



Group **wells** located within the same **100 km by 100 km area**

Plot '**well drilling year**' versus '**completed well depth**'

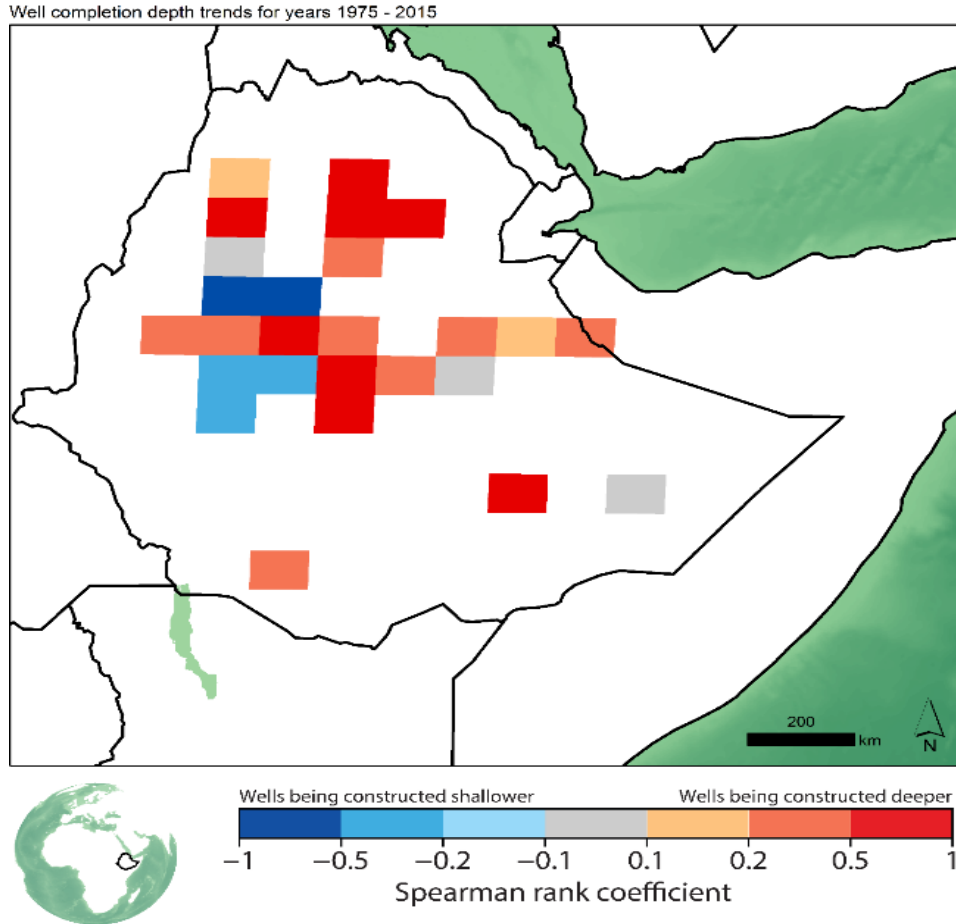
For **each 100 km by 100 km area** we calculate the spearman correlation of well construction year vs well depth



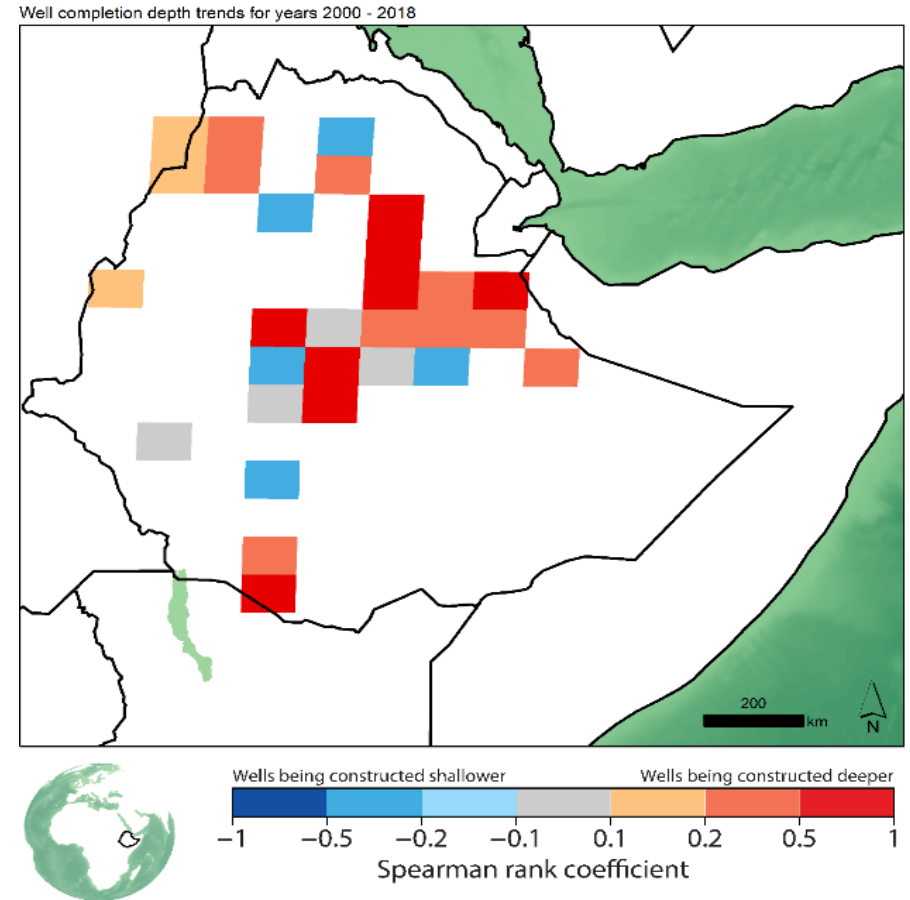
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In Ethiopia there is a tendency of drilling deeper to access groundwater (red areas on maps)



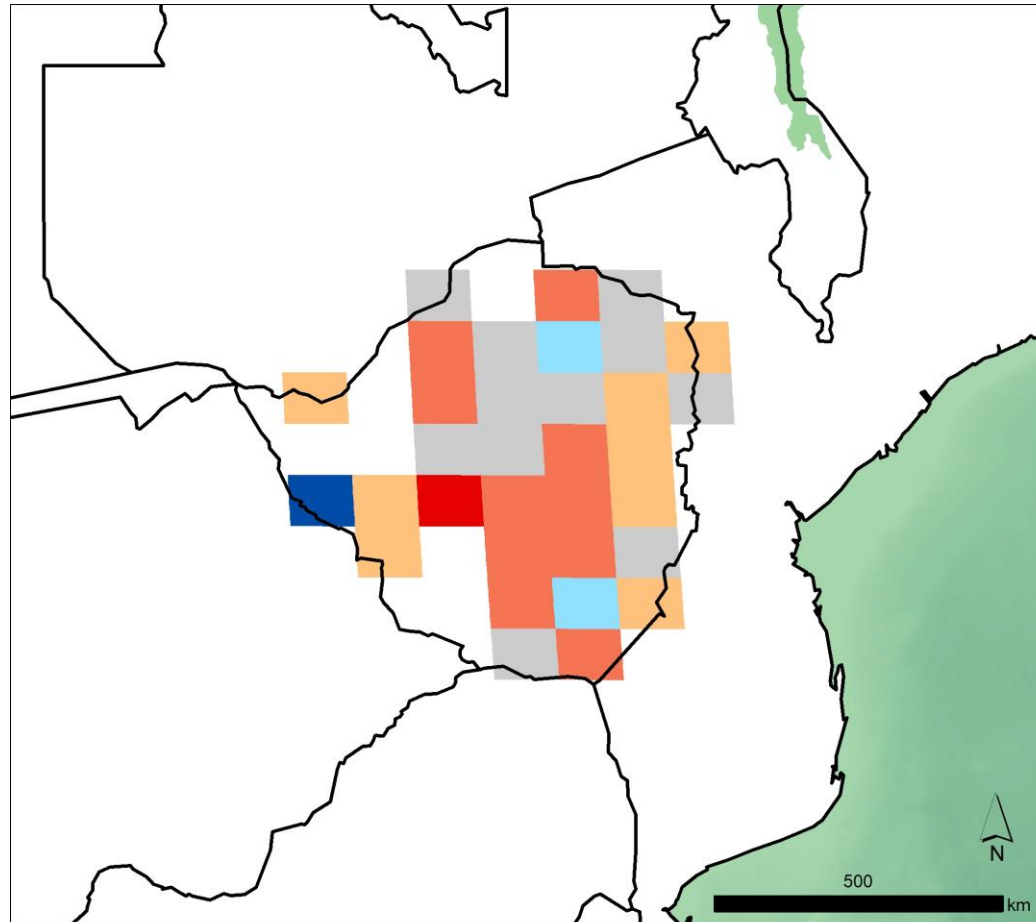
Drilling trend 1975-2015



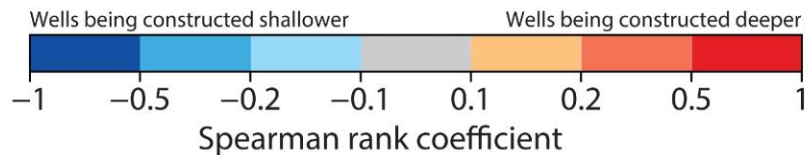
Drilling trend 2000-2018



In Zimbabwe there is a tendency of drilling deeper to access groundwater (red areas on maps)



Drilling trend 1975-2000



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# Implication of drilling deeper wells

- Quantity (Depletion)
- Quality (Fossil water contamination)
- Groundwater dependent ecosystem (Wetlands)

# Where we have data



**Botswana,  
Ethiopia,  
Gambia,  
Lesotho,  
Malawi,  
Madagascar,  
Mozambique,  
Namibia,**

**Sierra Leone  
South Africa,  
Eswatini,  
Tanzania,  
Uganda,  
Zambia,  
Zimbabwe**

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# Collaboration

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# Acknowledgements

Brighton Munyai and James Sauramba from SADC  
Debra Perrone and Scott Jasechko from University of California

South African Development Community (SADC) Hydrogeologic  
Mapping Borehole Database

# Collaboration

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