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Is Domestic Rainwater Harvesting a Sustainable Water Supply Solution?

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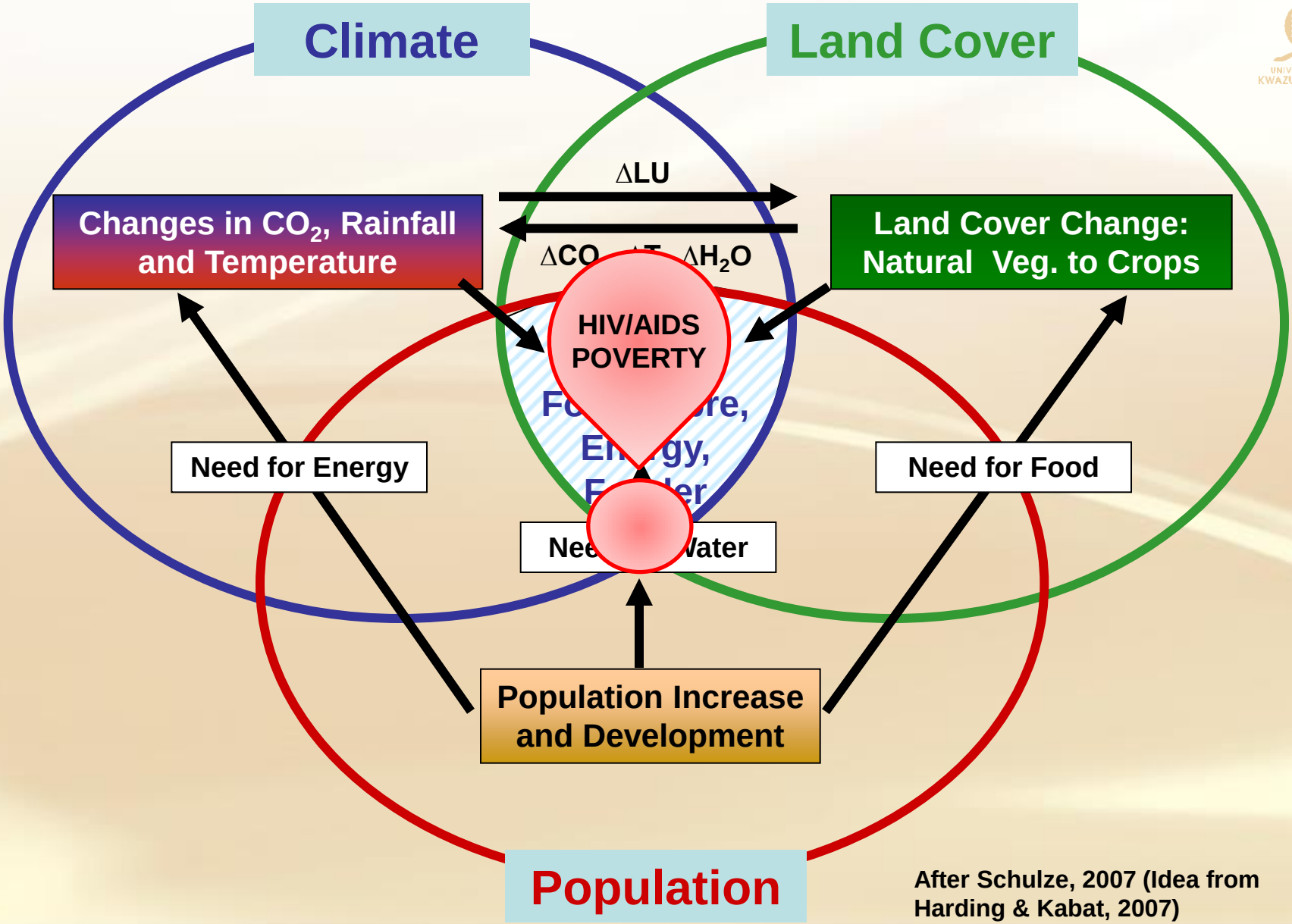
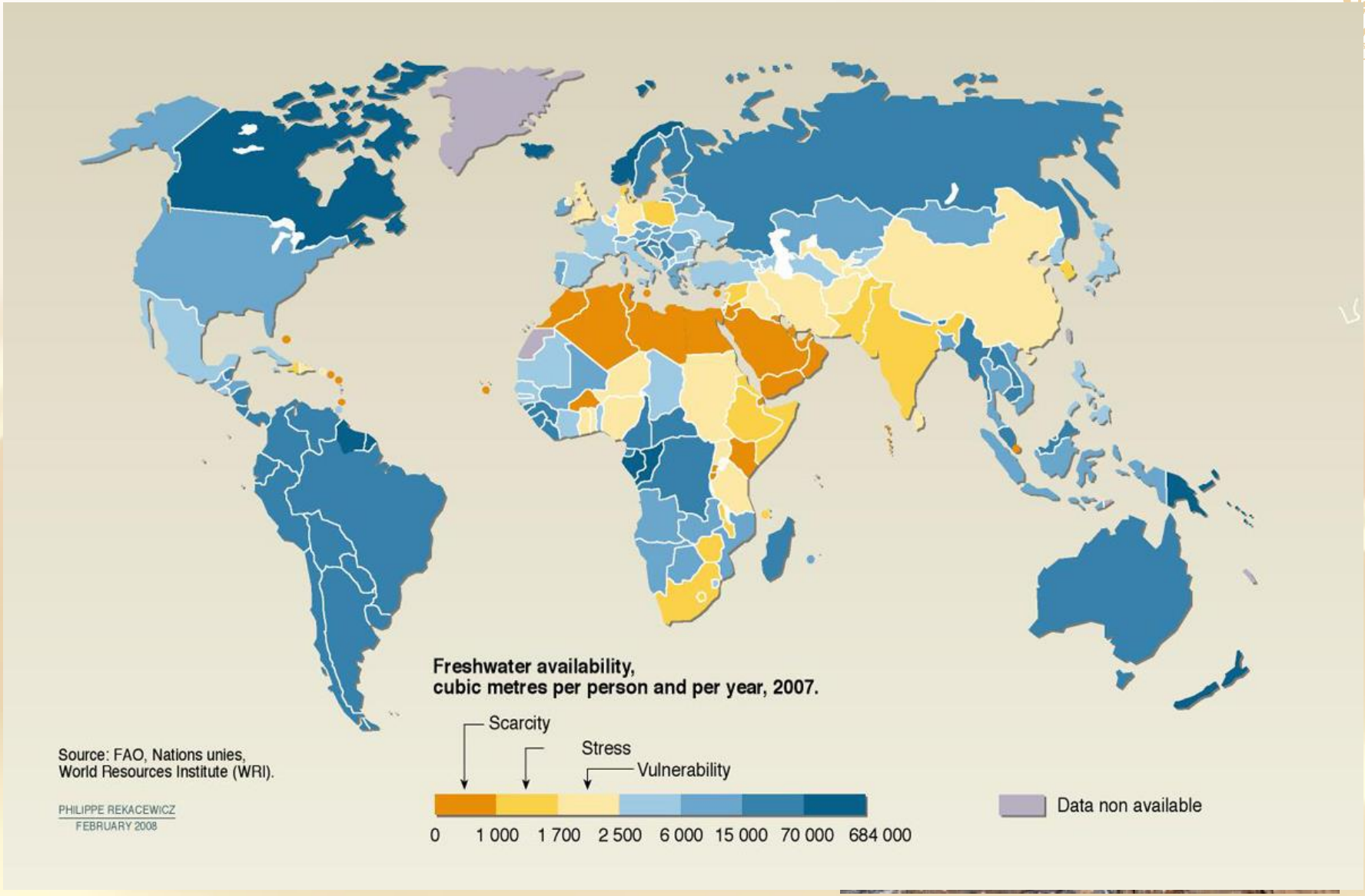
THE CLIMATE - LAND COVER - POPULATION - NATURAL RESOURCES CYCLE



After Schulze, 2007 (Idea from Harding & Kabat, 2007)

What is being done



- **African Union signed "SHARM EL-SHEIKH COMMITMENTS FOR ACCELERATING THE ACHIEVEMENT OF WATER AND SANITATION GOALS IN AFRICA"**

- **Increase RWH share of total water supply to 10% by 2015**

Theme 2	*Managing and Protecting Water Resources*
Performance Category	PC 2.4 Rainwater

1. Objective of the PC

Encourage African countries to promote rainwater harvesting and use, by facilitating intallation of rainwater haversting facilities to support the municipal (household and industrial) water supply.

2. Performance Target

Increase the share of rainwater use in total municipal water consumption up to 10% by 2015.

Reference in Regional Commtiments: Sh.el.Sk (h).

3. Performance Indicator

Indicator	Definition / Explanation
Percentage of rainwater use in total municipal water consumption (pRu).	Roof-collected rainwater can be used for a range of purposes to complement the municipal water supplies. The uses include personal washing, toilet flushing, laundry, use, surface and equipment washing, topping up spas and pools, garden irrigation, cooling and heating, and many industrial processes. It is not recommended that rainwater is used for drinking or food preparation in areas where a reticulated drinking water supply is provided, as the quality of rainwater is not as reliable as urban drinking water supplies. The total amount of rainwater used in the country by businesses, community groups, sporting clubs and residential developments, to supplement their water supply, constitutes with the total municipal water supply and other uses, the total municipal water consumption by the country.

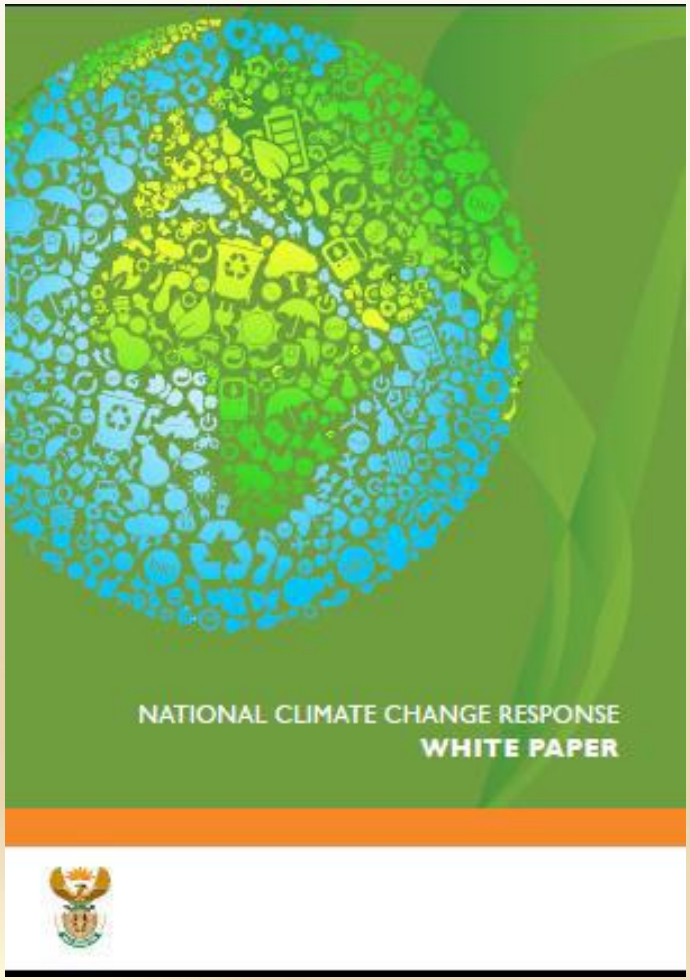
4. Disaggregation

Parameter/ Unit	Definition	Data required	Computing Methods	Possible Source
Total municipal water supply (A)	Total amount of water supplied to the country by existing water supply providers.	Companies records.	Specific and available at the water supliers companies.	Water supply companies
Rain water use (B)	Total amount of rainwater used in the country by businesses, and residential.		From Households surveys and industries records.	National statistics
Water use from other sources (C)	In cases other sources such wells, boreholds, rivers, etc are applicable.		From Households surveys and industries records.	National statistics
Total municipal water consumption (Twc).	The total water used by the country's population including businesses to supplement their water supply.	A; B; C	Twc = A+B+C	

5. Indicator Computing

For a given year(i), the percentage of rainwater use in total municipal water consumption (in%), is: pRu = B/Twc.

SA Climate Change Policy



8.2 The Water Conservation and DemandManagement Flagship Programme

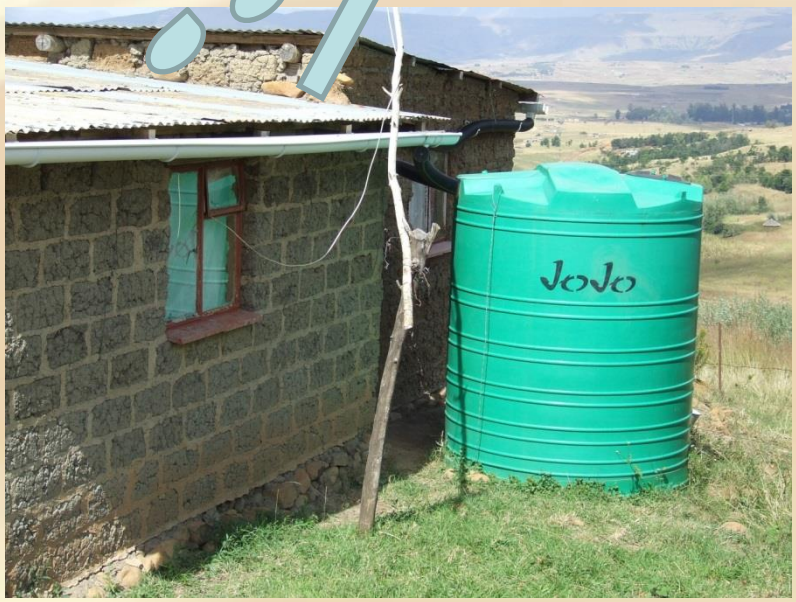
… The accelerated provision of rainwater harvesting tanks in rural and low-income settlements will also form part of this programme.

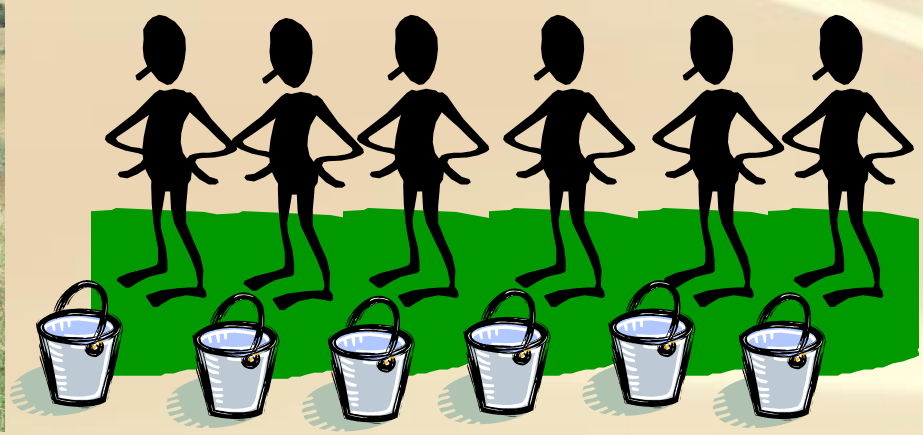
Research Aims

- Number of days per years that a rainwater tank will be able to provide some or all of the daily water requirements
  - Used case study of low cost household, with 6 occupants using 50ℓ per person per day (FAO minimum daily requirement)
- Important to use daily modelling to provide a detailed analyses of patterns of rainfall and extreme events
- Used 4 climate change GCM's to predict future sustainability of DRWH

Methodology

Institute	GCM
Canadian Center for Climate Modelling and Analysis (CCCma), Canada	**Name:** CGCM3.1(T47) **First published:** 2005 **Website:**http://www.cccma.bc.ec.gc.ca/models/cgcm3.shtml
Meteo-France / Centre National de Recherches Meteorologiques (CNRM), France	**Name:** CNRM-CM3 **First published:** 2004 **Website:**http://www.cnrm.meteo.fr/scenario2004/indexenglish.html
Max Planck Institute for Meteorology (MPI-M), Germany	**Name:** ECHAM5/MPI-OM **First published:** 2005 **Website:**http://www.mpimet.mpg.de/en/wissenschaft/modelle.html
Institut Pierre Simon Laplace (IPSL), France	**Name:** IPSL-CM4 **First published:** 2005 **Website:**http://mc2.ipsl.jussieu.fr/simules.html

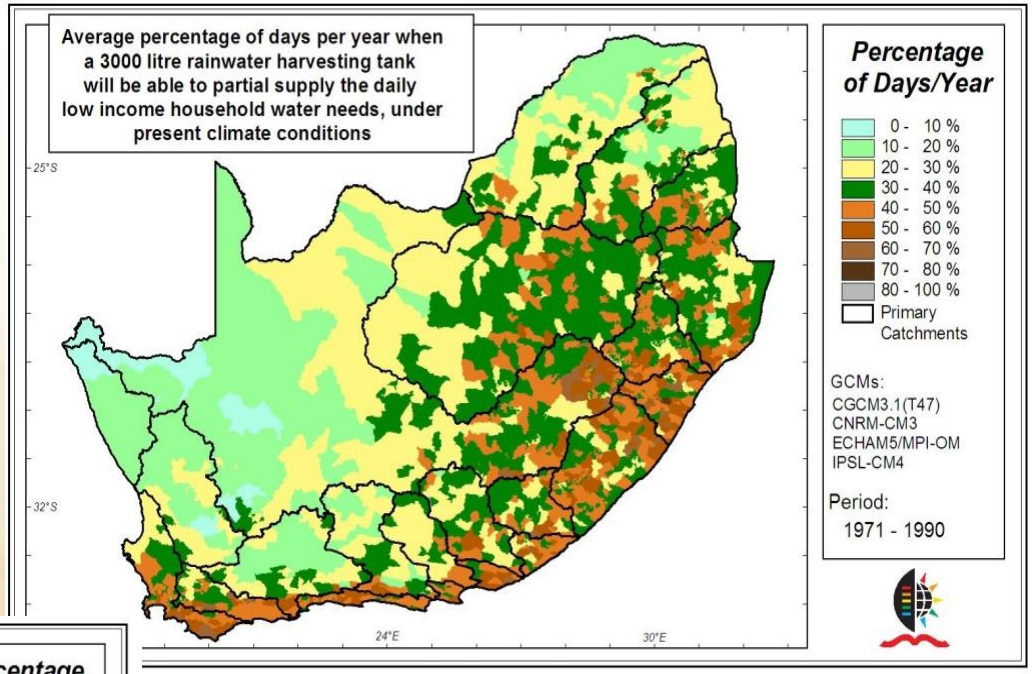


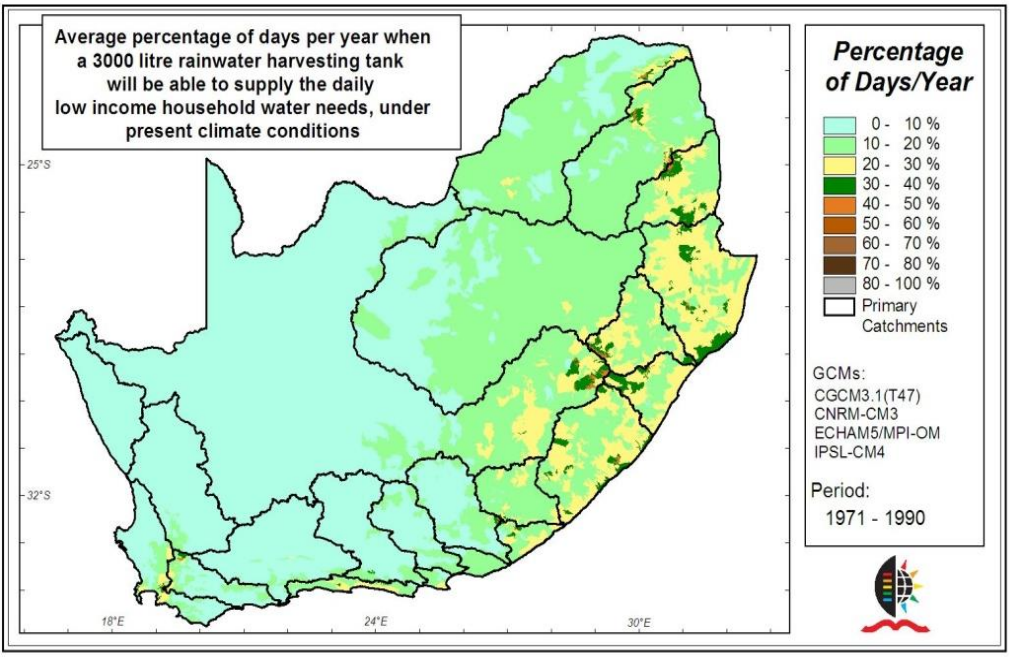


50ℓ/person/day x 6 people

Present Climate

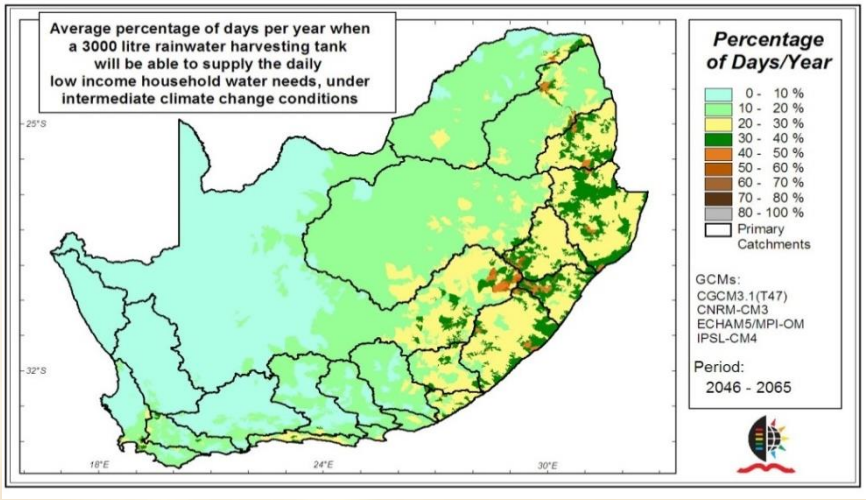
How often the RWH tank provides some water – average 145ℓ

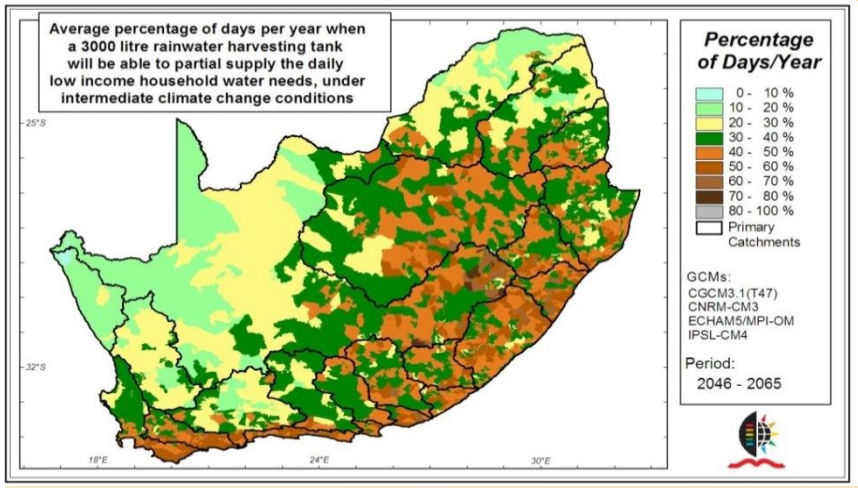




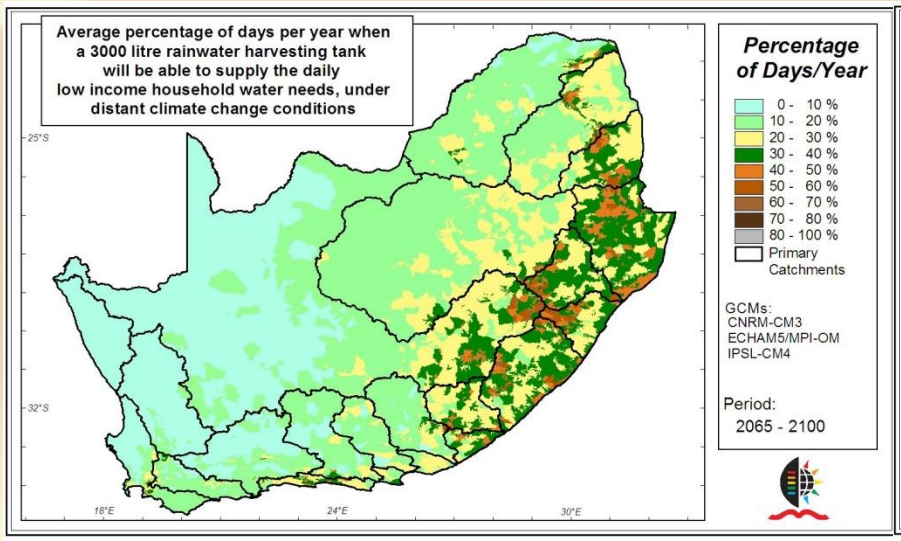
How often the RWH tank provides 300l per day

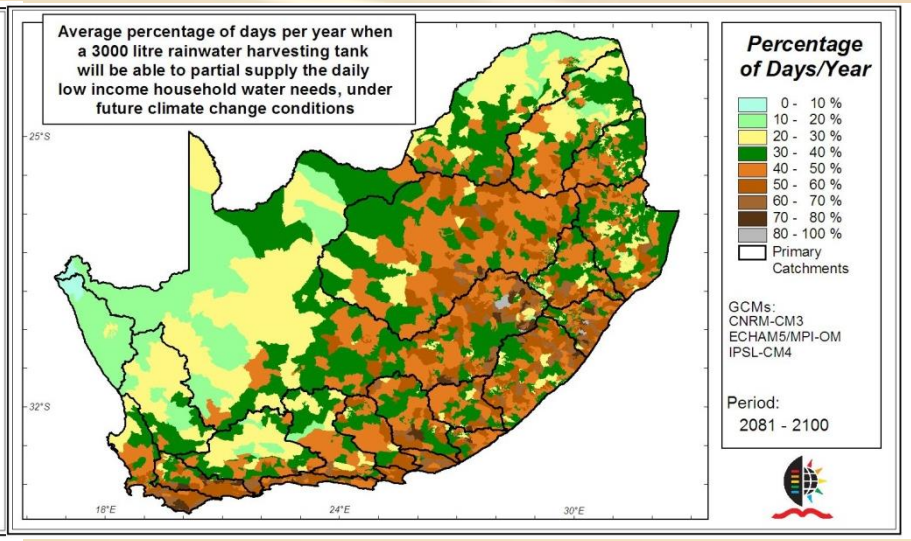
Intermediate Future(2046-2065)





Distant Future(2081-2100)



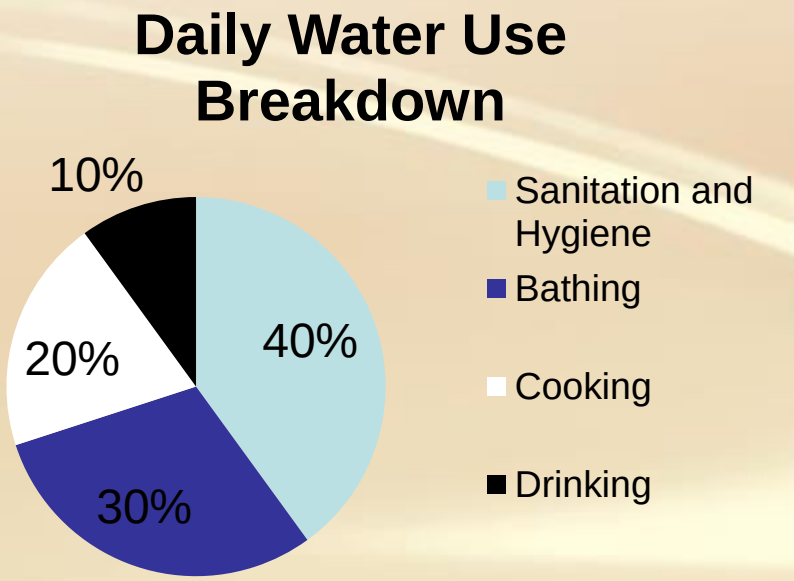


Does tank size make a difference?

	3000 litres tank			4000 litres tank		
	Present climate	Intermediate future climate	Distant future climate	Present climate	Intermediate future climate	Distant future climate
Average no. of overflows/year	4	8	11	3	5	8
Max amount of water lost in a single overflow event (ℓ)	1,295	1,961	2,265	804	961	1,265
Average amount of water lost per overflow event(ℓ)	687	870	2,265	635	885	1,026
Average total water lost/year(ℓ)	13,641	14,552	22350	10,293	10,984	16,455

Conclusion

- Eastern part of SA is best suited to DRWH
- Likely to become more favourable under intermediate and distant CC conditions
- Eastern SA should be able to meet at least some of daily water requirements
- AU goals of 10% of supply coming from RWH is achievable



Based on Gleick (1996)

However,

- RWH can only ever been seen as a supplementary water supply
- Rainfall in SA has too many intra- and inter-seasonal variability to be a sole water supply
- Investigate the potential for commercial applications

Bigger Picture

- Water Harvesting Technologies Revisited: Potentials for Innovations, Improvements and Upscaling in Sub-Saharan Africa (http://whater.eu/)
- EU – FP7 Funded
- 2011-2014
- Partners:
  - Centre for Water Resources Research, UKZN (South Africa)
  - The Water Technology Institute in Arba Minch University (Ethiopia)
  - Institut de l'Environnement et de Recherches Agricoles (INERA) (Burkina Faso)
  - Southern and Eastern Africa Rainwater Network (SearNet) (Kenya)
  - Sokoine University of Agriculture (Tanzania)
  - The Stockholm Resilience Centre (SRC) (Sweden)
  - University of Newcastle Upon Tyne (UNEW)(United Kingdom)
  - The Centre for International Cooperation (CIS) at Vrij University Amsterdam

South African Catchment Study