Diagnosing drought for dealing with drought

in Northeast Brazil

Pieter R. van Oel, David W. Walker, Sarra Kchouk, Germano Ribeiro Neto, Louise Cavalcante, Lieke A. Melsen, Art Dewulf, Alexandre C. Costa, Rubens S. Gondim, Eduardo S.P.R. Martins

3ddd-project.org

Drought Diagnosis in 5 steps

1. **Initial diagnostic assessment** (anamnesis) of drought history and impacts
2. **Diagnostic testing** (data collection and analysis)
3. **Consultation** (local and cross-disciplinary expertise)
4. **Communication** of the diagnosis (engaging relevant stakeholders)
5. **Treatment and prognosis** (both to cure and prevent)

Walker et al. (2022) Drought Diagnosis: What the Medical Sciences Can Teach Us. *Earth's Future*, 10(4)

Warning: Misdiagnosis leads to wrong treatment!

Our ***3D Drought Diagnosis*** (3DDD) approach involves human **Dimensions (D_1)** of drought; human-water **Dynamics (D_2)**; and supporting **Dialogue (D_3)**.

We place drought in context by focusing on impacts, resilience, and tools to inform policy and action.

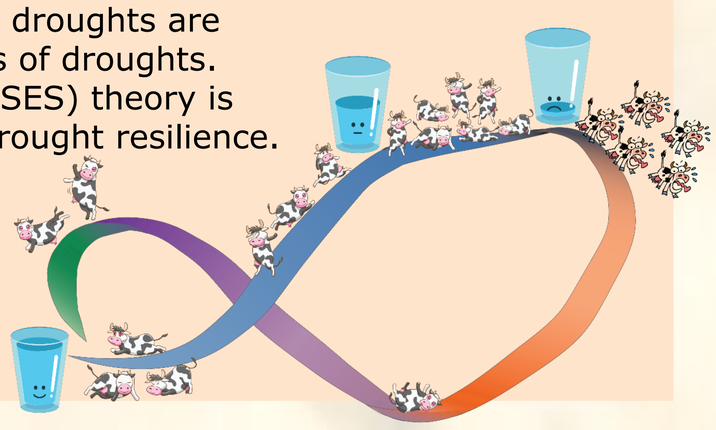
D_1 Human **Dimensions** of drought: **context matters**

- Worldwide, different drought drivers and impacts are experienced.
- Scientific literature focuses on drivers rather than on impacts.
- Many impact studies focus on food security (e.g. for Africa) and water security (e.g. for Australia).

Kchouk et al. (2022) A geography of drought indices: mismatch between indicators of drought and its impacts on water and food securities. *Natural Hazards and Earth System Sciences*, 22(2), 323-344.

- In Brazil, responses to past droughts are relevant for today's impacts of droughts.
- Social-Ecological Systems (SES) theory is helpful for understanding drought resilience.

Kchouk et al. (2023) Drought-impacted communities in social-ecological systems: Exploration of different system states in Northeast Brazil. *International Journal of Disaster Risk Reduction*, 97 104026.



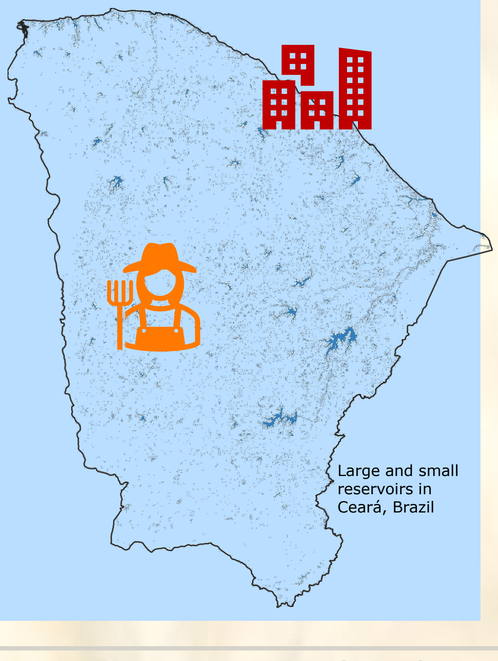
D_2 Human-water **Dynamics:** don't ignore **small reservoirs**

In areas with high reservoir densities, a balanced approach is needed, weighing local benefits of small reservoirs against downstream impacts.

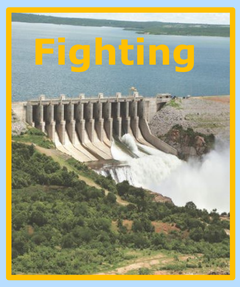
Ribeiro Neto et al. (2024) Clash of drought narratives: A study on the role of small reservoirs in the emergence of drought impacts. *Earth's Future* 12(7)

Drought Cycle Analysis can be used for monitoring and comparing droughts, while considering the downstream effect of small reservoirs.

Ribeiro Neto et al. (2022) Drought Cycle Analysis to Evaluate the Influence of a Dense Network of Small Reservoirs on Drought Evolution. *Water Resources Research*, 58(1)



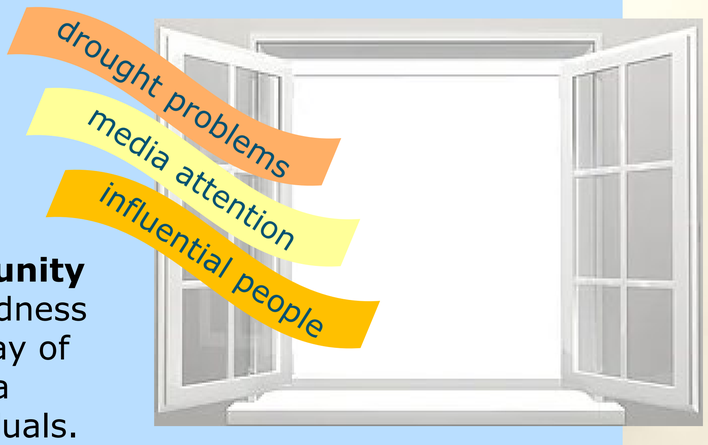
D_3 Supporting **Dialogue:** preparedness by **fighting and coping**



Brazilian drought policy traditionally focused on fighting drought, involving large-scale infrastructure. The current drought-preparedness approach includes elements of both **coping and fighting**.

Cavalcante et al. (2022) Fighting against, and coping with, drought in Brazil: two policy paradigms intertwined. *Regional Environmental Change*, 22(4), 111

In Brazil, a **window of opportunity** for developing drought-preparedness policy opened due to an interplay of multiple severe droughts, media attention, and influential individuals.



Cavalcante et al. (2023) From creeping crisis to policy change: The adoption of drought preparedness policy in Brazil. *Water Policy*, 25(10), pp. 949–965

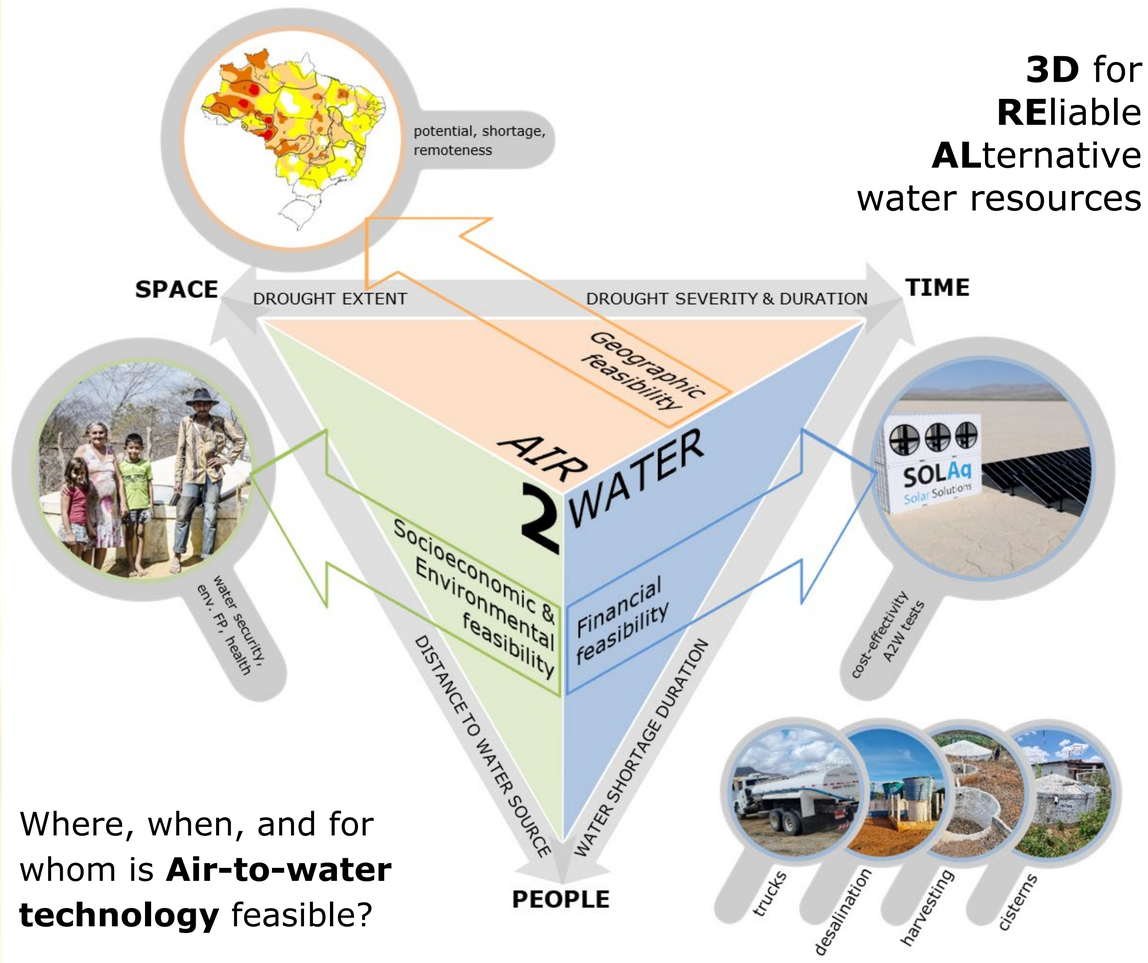
Impacts occur despite a lack of drought!

In Brazil, drought **impacts occur** during non-drought periods also, either **following drought**, driven by **non-extreme** conditions, or resulting from increases in **people's vulnerabilities**.

Walker et al. (2024) It's not all about drought: What "drought impacts" monitoring can reveal. *International Journal of Disaster Risk Reduction*, 103 104338

Next phase: 3D4REAL (2024-2026)

3D for **RE**liable **AL**ternative water resources



Where, when, and for whom is **Air-to-water technology** feasible?

Pieter R. van Oel
Associate professor
pieter.vanoel@wur.nl

Wageningen University & Research (www.wur.nl)
Water Resources Management group
Water and Food team

PhD theses from the 3DDD project: