



Water truck, or *carro pipa*, delivering water to a household cistern that is usually filled by rooftop rainfall harvesting during the wet season.

WUR Contact Person

David Walker

david.walker@wur.nl

Project information



3DDD: Diagnosing drought for dealing with drought in 3D

Status: Active

Start project: 01/06/2019

End project: Ongoing

Location: Ceará, Brazil

Funder(s): NWO

Partners: WUR, FUNCEME (*Fundação Cearense de Meteorologia e Recursos Hídricos*), Ematerce (*Empresa de Assistência Técnica Extensão Rural do Ceará*), CIRAD (*Centre de coopération internationale en recherche*). WUR and FUNCEME are partners on the 3DDD project of which the citizen science drought impacts monitoring is a part. Ematerce, an agricultural extension office, are involved in data collection and we are collaborating with CIRAD in the establishment of another citizen science programme.

3DDD: Diagnosing drought for dealing with drought in 3D

How local communities experience drought is largely unknown anywhere in the world. We are establishing or adapting citizen science monitoring programmes in Ceará, Northeast Brazil, to learn from people on the ground about the drought impacts they experience and what makes them vulnerable or resilient to drought.

A snapshot of the project

The aim of the citizen science programmes established within this research project is to better understand how, where, and when drought is experienced on the ground. This knowledge will feed into the Brazilian Drought Monitor (a monthly map of drought condition utilised for drought management) to improve its validation and its relevance for policymaking and targeting of emergency drought response. Ultimately the aim is to identify vulnerabilities for research and development interventions. Hydrometeorological variables and vegetation condition are frequently monitored via direct measurement or by remote sensing. Drought indices are derived from these datasets to create maps of drought severity. However, in order to improve drought resilience, we need to better understand the socioeconomic impacts of drought that may or may not correlate with drought indices. Key uncertainties include: What drought impacts are experienced by different stakeholder groups? When are impacts experienced relative to hydrometeorological anomalies? Is there heterogeneity in how drought is experienced in time, space, between and within groups? What are the factors that aggravate or alleviate drought impacts? The NDMC (US National Drought Mitigation Center) and the IDMP (Integrated Drought Management Programme) have for many years spoken of the global blind spot that is drought impacts monitoring.

Two existing citizen science programmes that commenced prior to the 3DDD project have been adapted to incorporate or enhance monitoring of drought impacts, in addition to suggesting the non-climatic factors that aggravate or alleviate drought.

The first leverages already engaged citizen scientists who submit rainfall measurements everyday by telephone to FUNCEME. Essentially, FUNCEME have had a citizen programme since the 1970s where mostly farmers collect rainfall data and submit the data by telephone every morning to a call centre. This methodology was established as literacy is often low in the interior of Ceará state and communities are very far apart, but most would have a government phone. The citizen scientists have close relationships with the call centre operators and often chat about drought. Call centre operators, while recording rainfall

measurements, often discuss the drought situation and since 1st April 2022 they are now instigating a longer conversation on drought and recording the responses.

The second involves a questionnaire completed and submitted monthly since 2019 by Ematerce agricultural extension officers for the purpose of validating drought maps that are based on hydrometeorological and remote sensing drought indices (<https://monitordesecas.ana.gov.br/mapa>). The focus had been on agricultural drought impacts, however, through additional training and working together more closely. It has been running since 2019 but not very effectively: regularly no data is submitted, and different participants have different ideas about what data to collect. We are trying to harmonise the data collection and encourage greater participation.

A third programme will be co-designed with CIRAD and stakeholders using participatory research methods and will focus on rural resilience. This will be a high resolution and high-density monitoring of both quantitative (e.g., water quality, groundwater level) and qualitative data (e.g., perceptions of socioeconomic drought impacts and aggravating/alleviating factors like agricultural prices, social capital, and health) determined by stakeholders that will be immediately useful for their needs.

The results of the project

It is too early to say. We are learning a lot from the data that are currently being collected. Importantly, we are discovering that citizen science is a viable method of monitoring socioeconomic drought impacts. Analysis of the collected data is only just beginning.

Though the programmes are only just commencing, there is a lot of interest in what the data will show from various high-level stakeholders in Northeast Brazil.

Link and publications

<https://3ddd-project.org/>