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More Info!

Mapping of groundwater-dependent ecosystems based on a high-resolution global groundwater model

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1. Introduction

- Population growth has led to an increase in the **dependency** on groundwater resources.
- **Limited recharge** due to climate change and high abstractions may **adversely affect** groundwater dependent ecosystems (**GDEs**) and **biodiversity**.
- Inventory of GDEs on a global scale is not available.

2. Objective

To map groundwater-dependent ecosystems (GDEs) worldwide using a global hydrology model

3. Methodology

Classification based on typology and hydrology

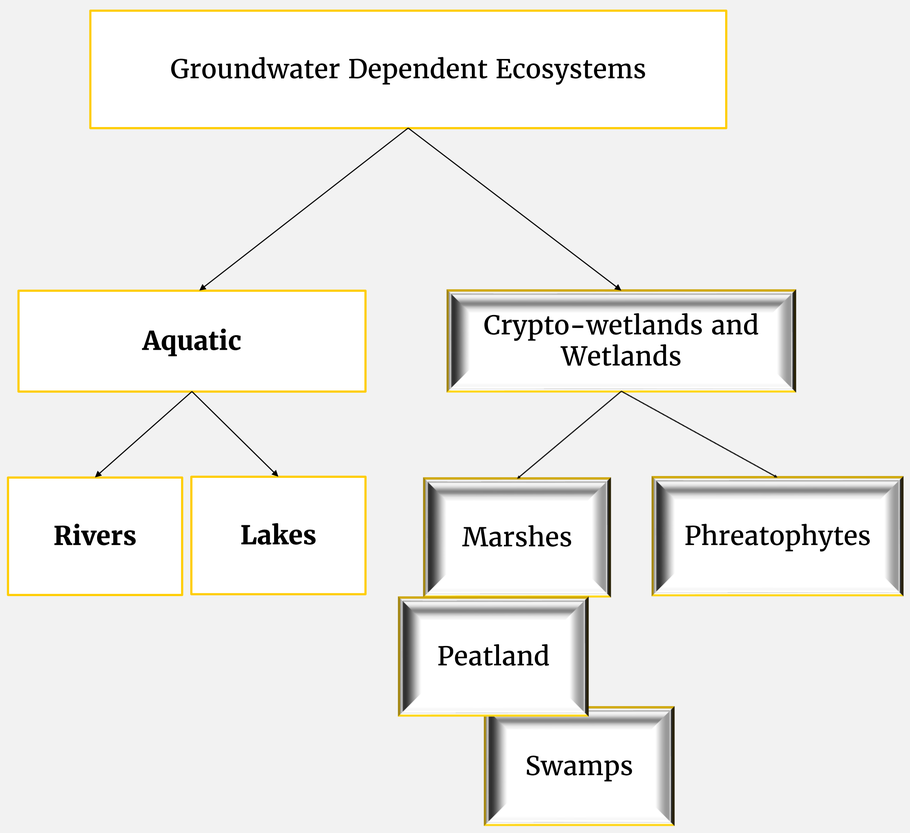

Figure 1: Classification of GDEs **N.B** : Results based on aquatic GDEs.

Model run (Australia) using the PCR GLOBWB 2.0

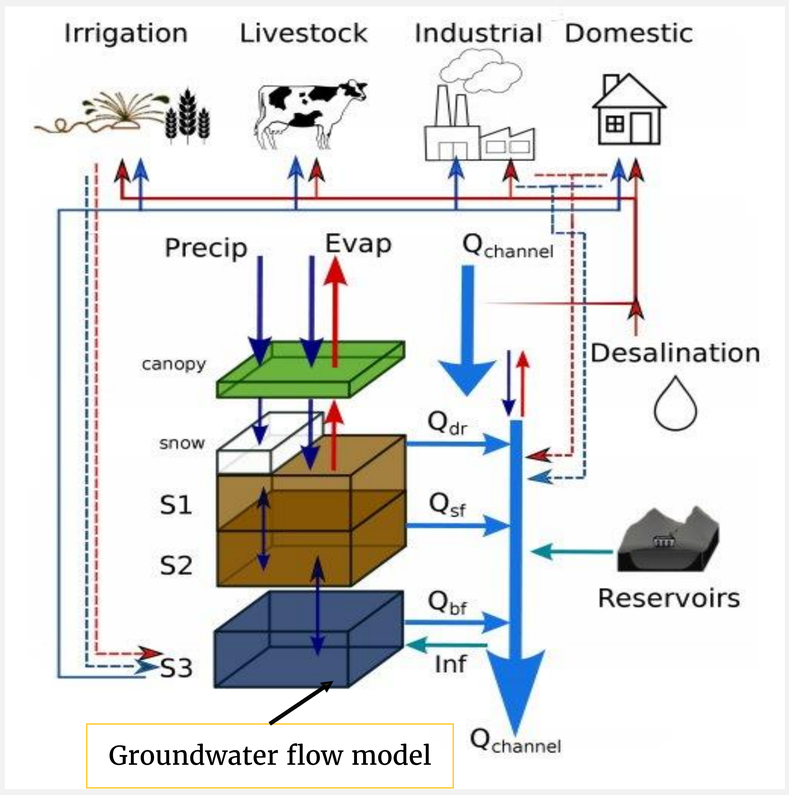

Figure 2: Schematic overview of PCR 2.0 (Sutanudjaja *et al.* 2018). Groundwater flow model used in this study is GLOGM *v*1.0 ,Verkaik *et al.* 2022)

4. Results

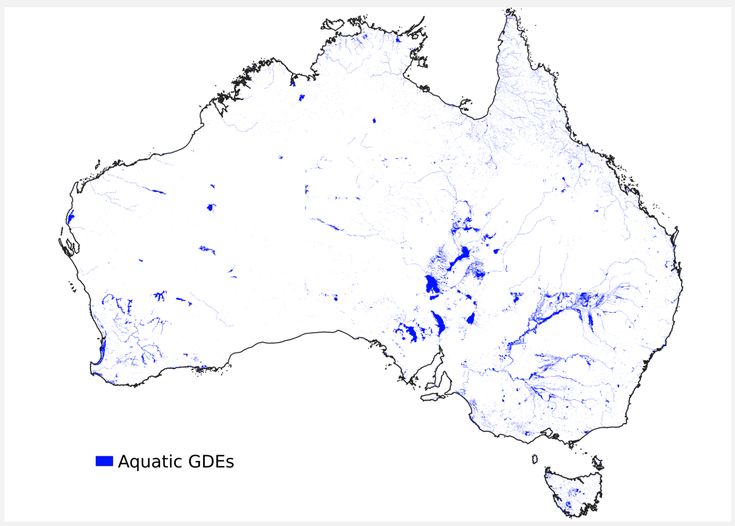

Figure 2a : Modelled Aquatic GDEs (River width threshold>100m)

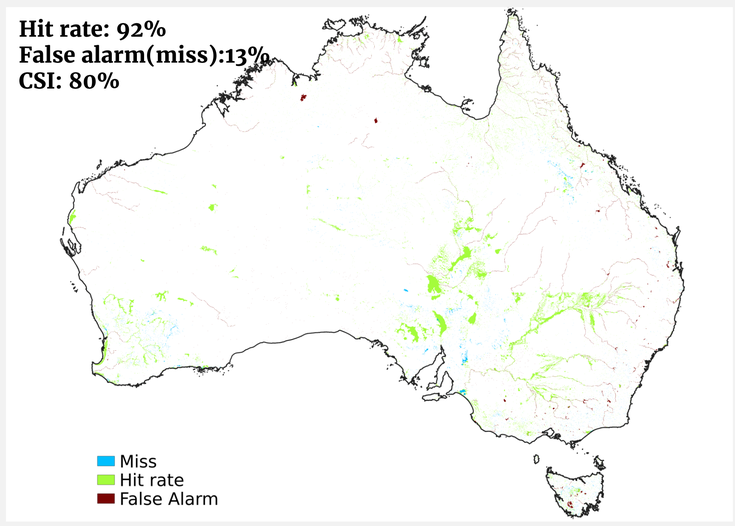

Figure 2b : Validation with Australian GDE Atlas (River width threshold>100m)

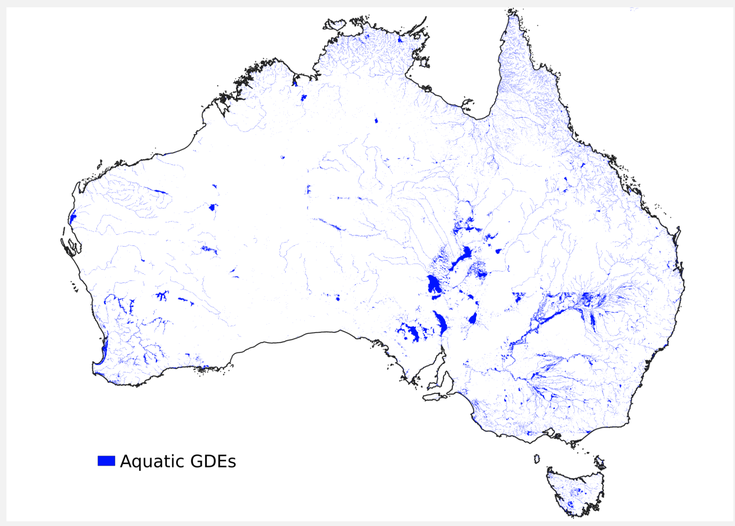

Figure 3a : Modelled Aquatic GDEs (River width threshold>30m)

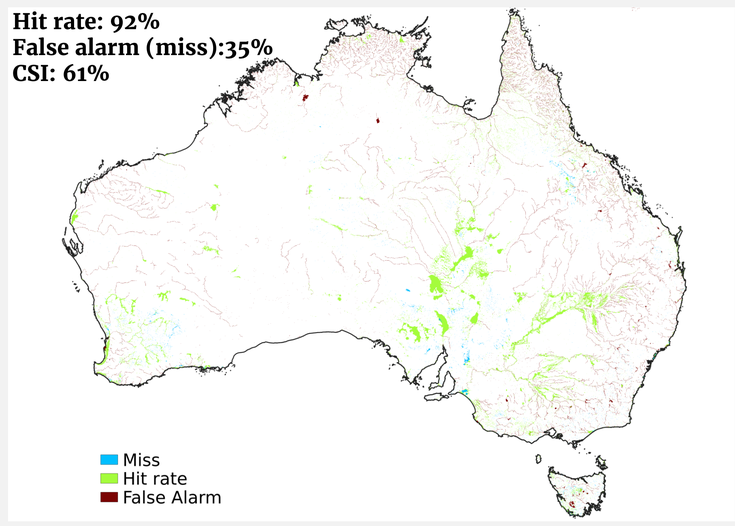

Figure 3b : Validation with Australian GDE Atlas (River width threshold>30m)

Validations

- **Hit rate** : Similarity index
- **False alarm** : Missed ecosystems
- **CSI**: Critical success index of the model run

5. Conclusions and Outlook

- Hyper resolution global hydrological models are **effective** for identifying GDEs.
- **Transient model** runs are essential for estimating **the extent** of dependency to groundwater.
- These results are important for **calibrating** the model .
- The next step is a **global run** for mapping the aquatic and terrestrial GDEs and make **future projections.**

References

1. Sutanudjaja, E. H., Van Beek, R., Wanders, N., Wada, Y., Bosmans, J. H., Drost, N., ... & Bierkens, M. F. (2018). PCR-GLOBWB 2: a 5 arcmin global hydrological and water resources model. *Geoscientific Model Development*, *11*(6), 2429-2453.
2. Verkaik, J., Sutanudjaja, E. H., Oude Essink, G. H., Lin, H. X., & Bierkens, M. F. (2022). GLOBGM v1. 0: a parallel implementation of a 30 arcsec PCR-GLOBWB-MODFLOW global-scale groundwater model. *Geoscientific Model Development Discussions*, 1-27.