Governance and groundwater modeling: Addressing governance gaps on nitrate pollution

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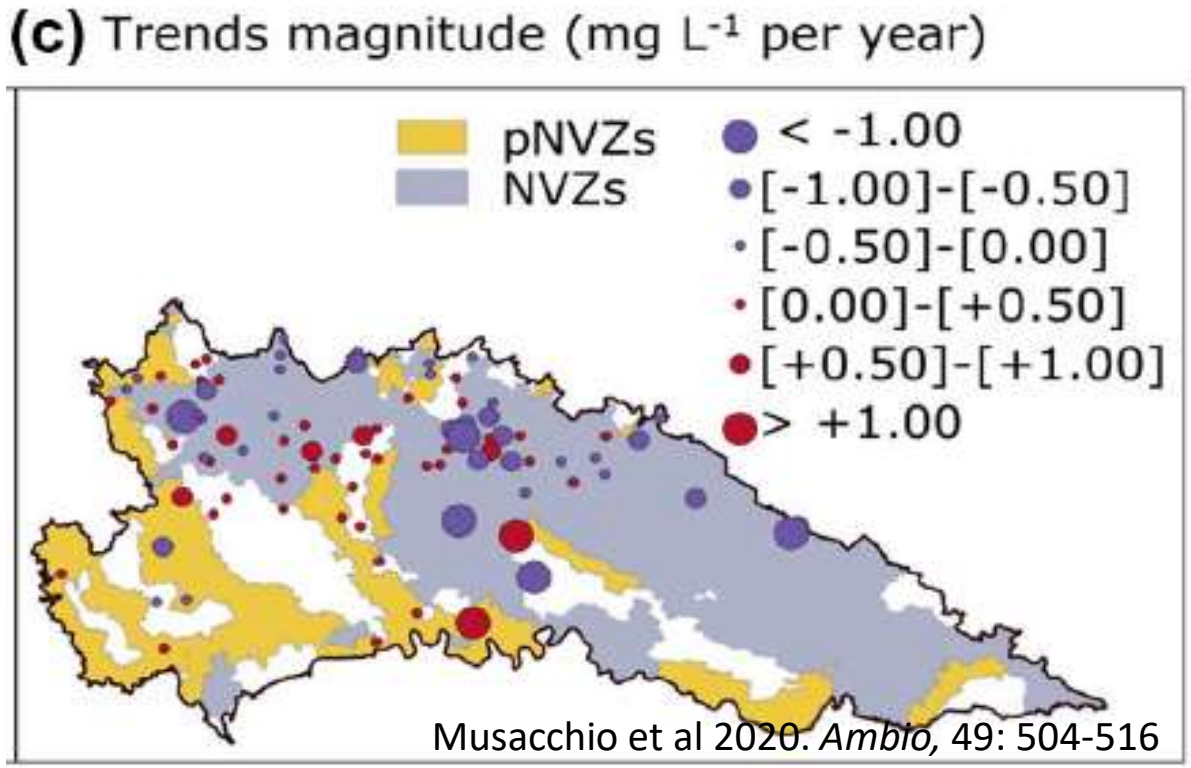
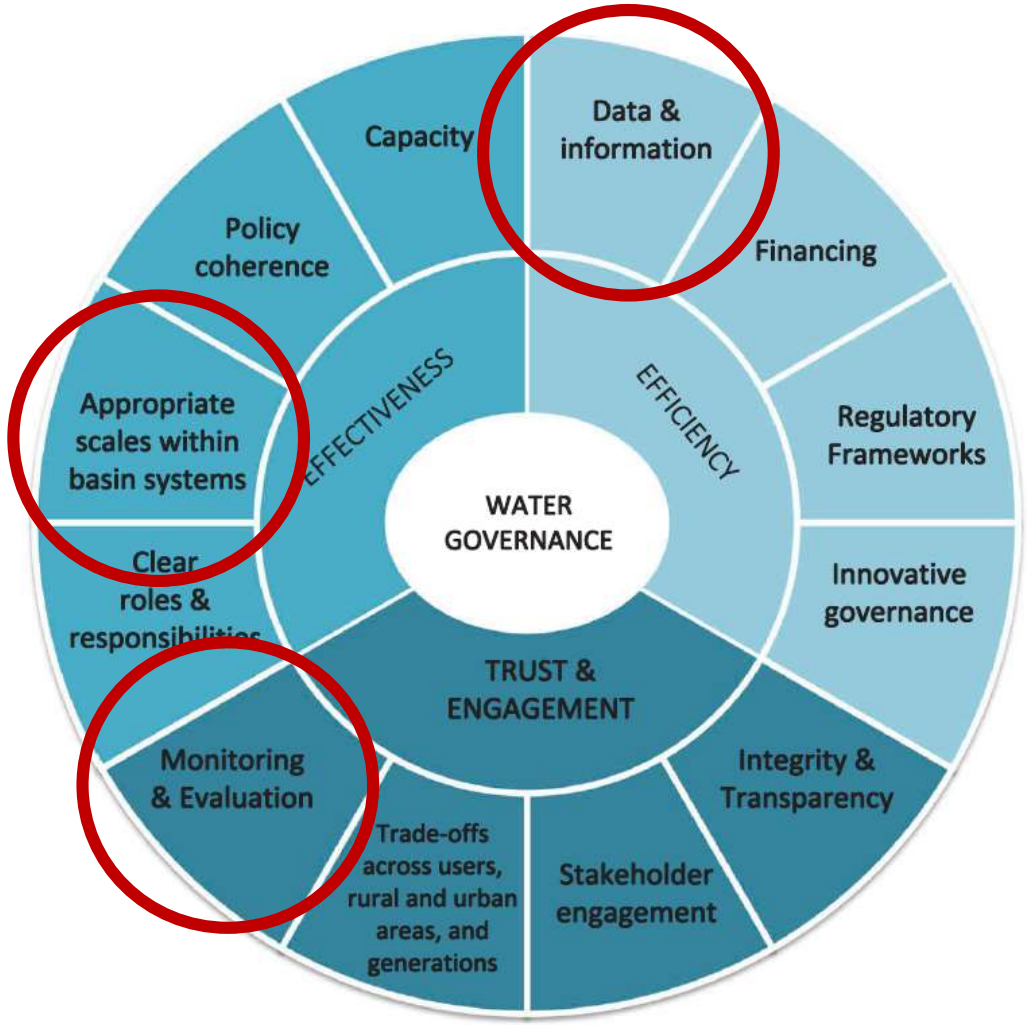
Introduction



Musacchio et al 2020. *Ambio,* 49: 504-516

Governance, as a proper process for water management, lays on multiple factors, sometimes impeding a fruitful debate within appropriate timeframes.



Overview of oecd principles on water governance (*Source*: OECD, 2015a).

Akhmouch et al 2017. *Water International*, 43:1, 5-12

Goal

This paper addresses how to support the mentioned governance principles and how to fill the information and capacity gaps, related to the achievement of adequate nitrate concentrations in aquifers by using groundwater flow and transport numerical models.

The main point is that such models permit including all factors that will be potentially affected by climate change.

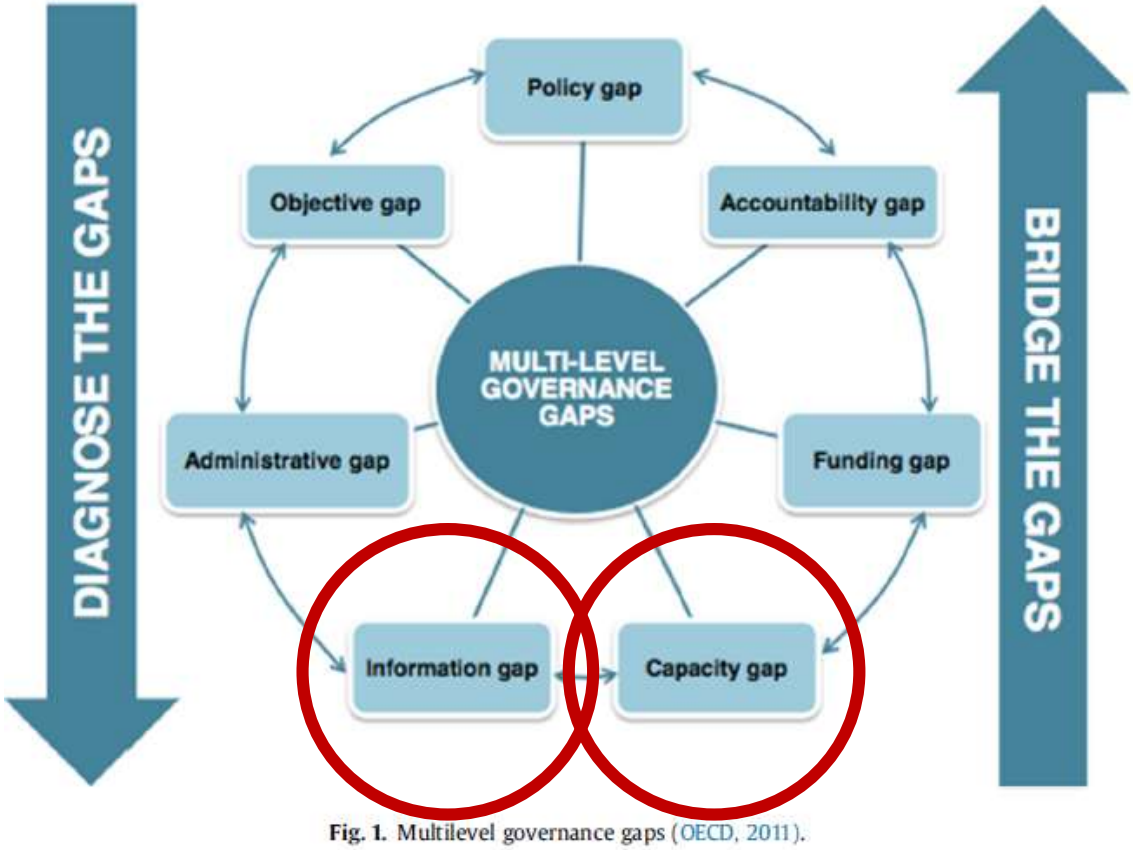
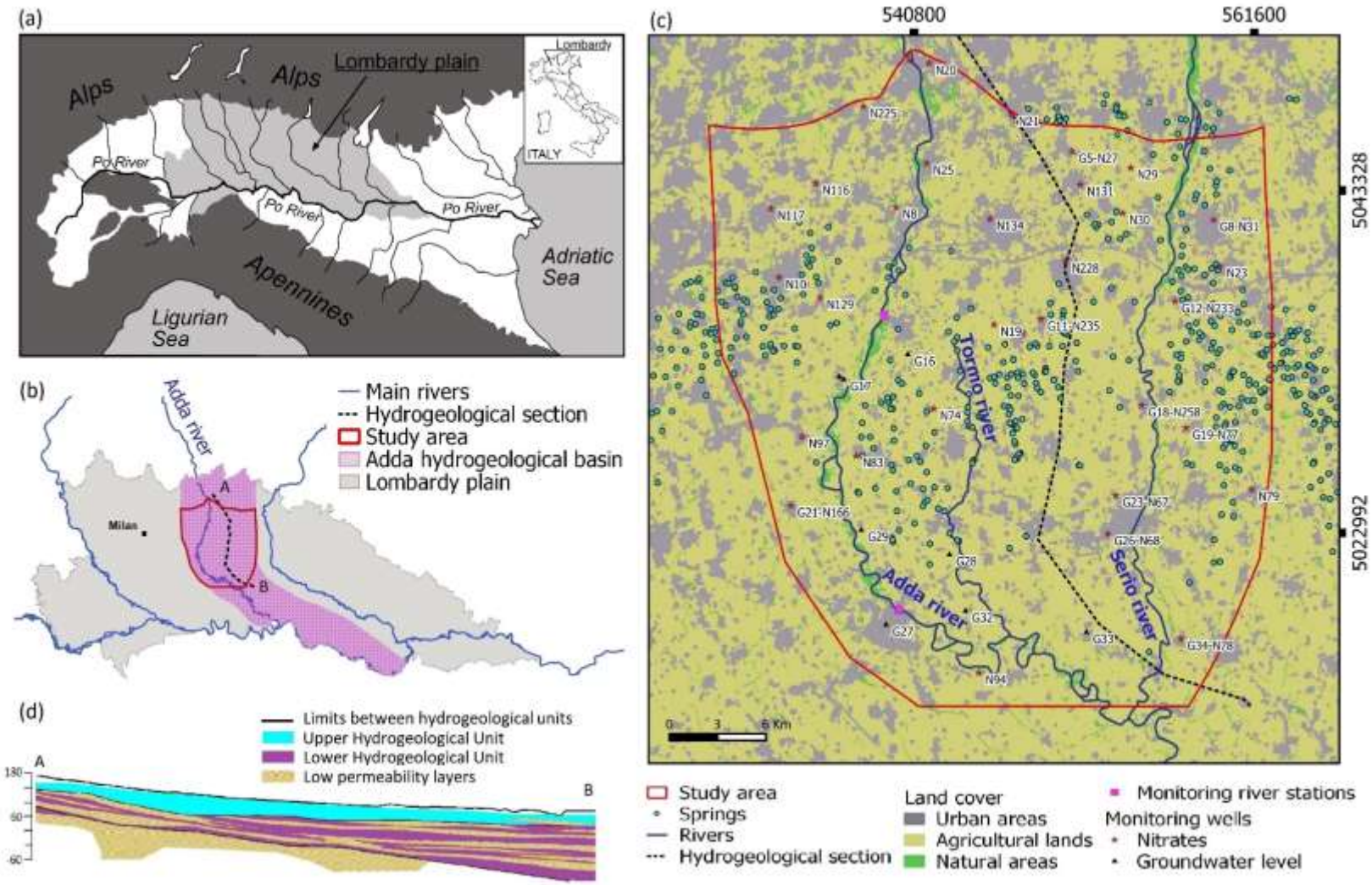


Fig. 1. Multilevel governance gaps (OECD, 2011).

Akhmouch et al 2016. *Utilities Policy,* 43: 14-20

The numerical model



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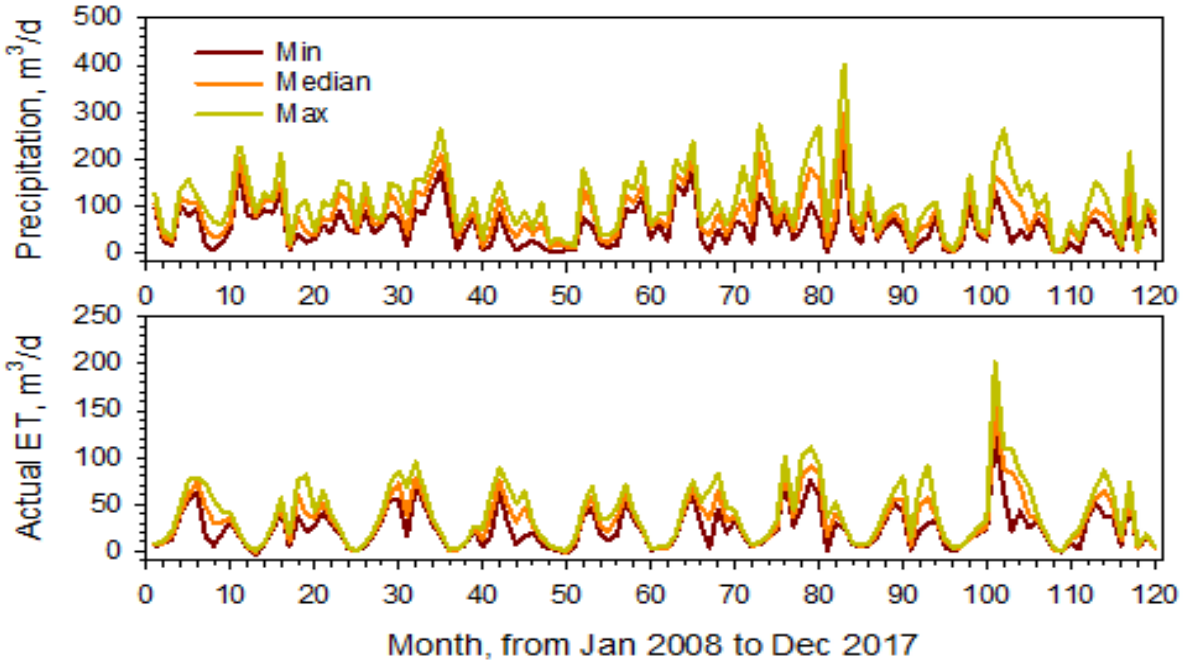
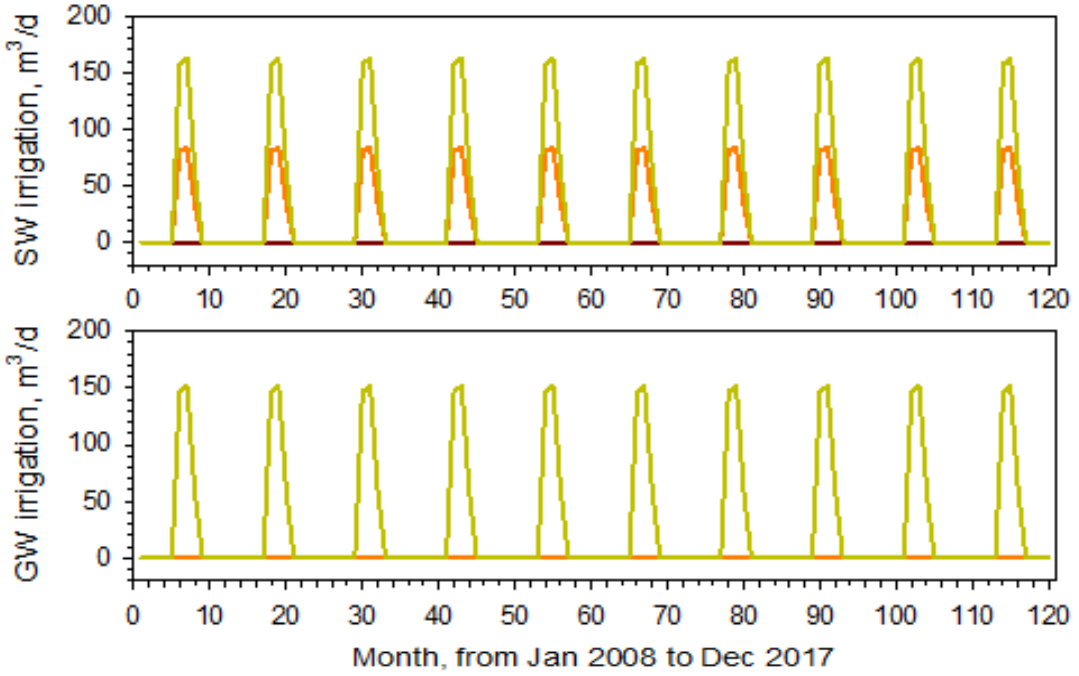
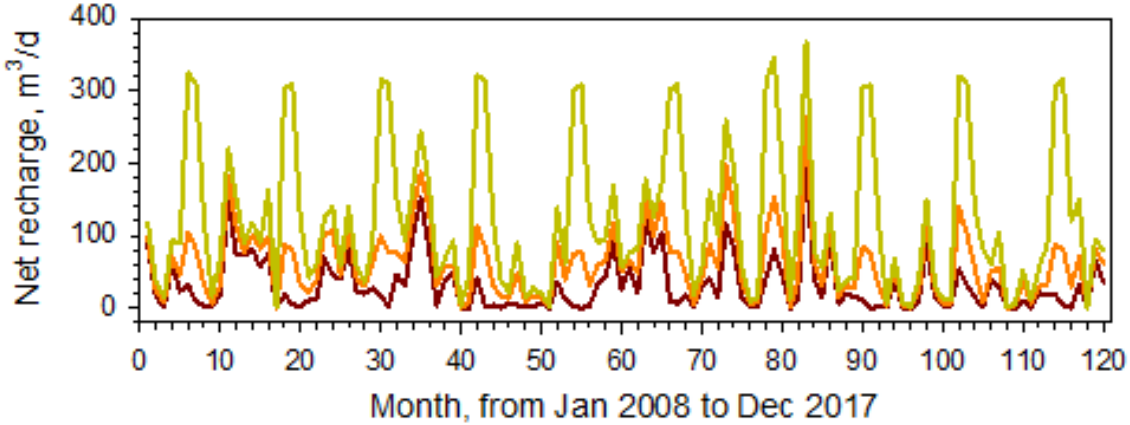
Main model terms: Natural vs human





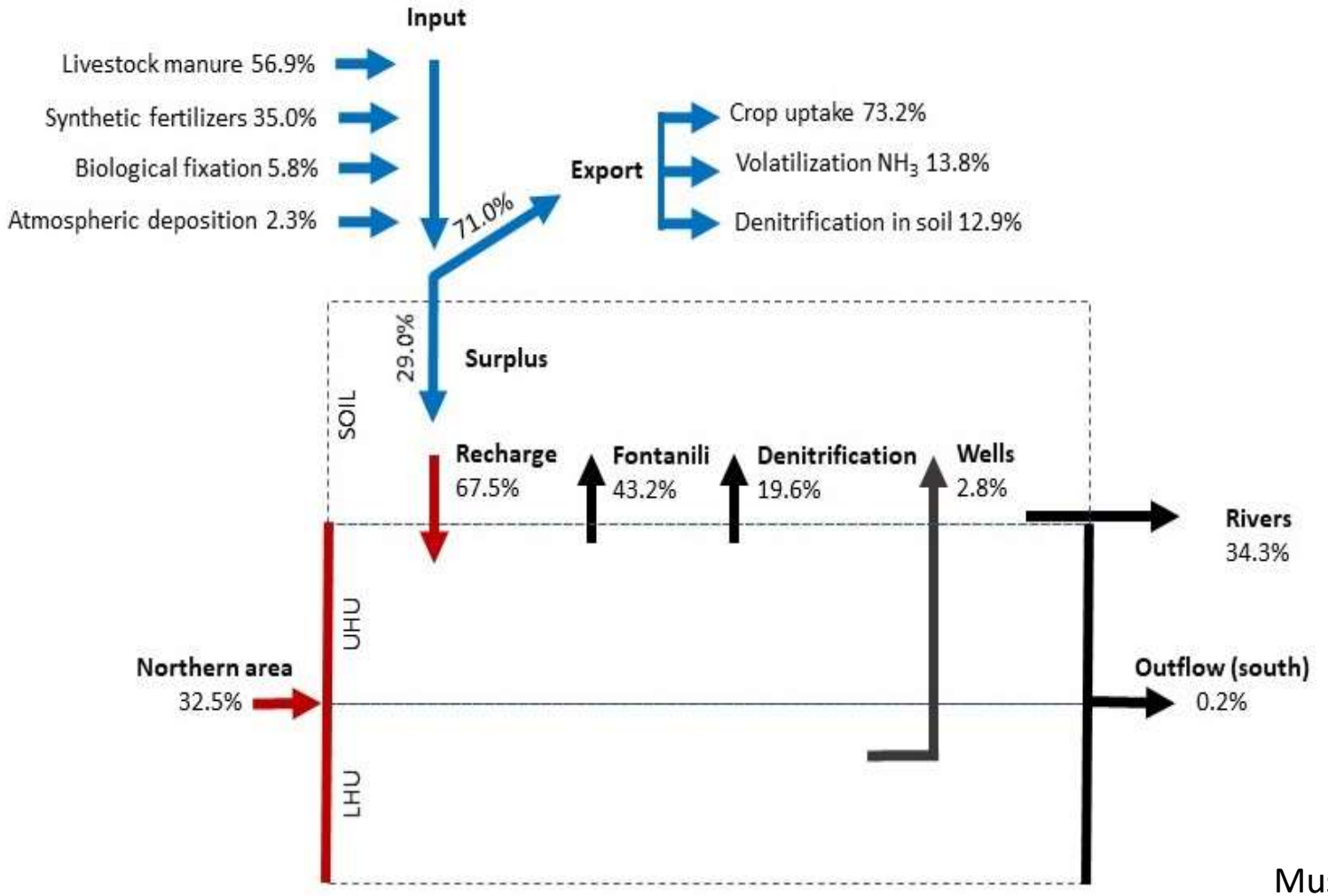
Natural

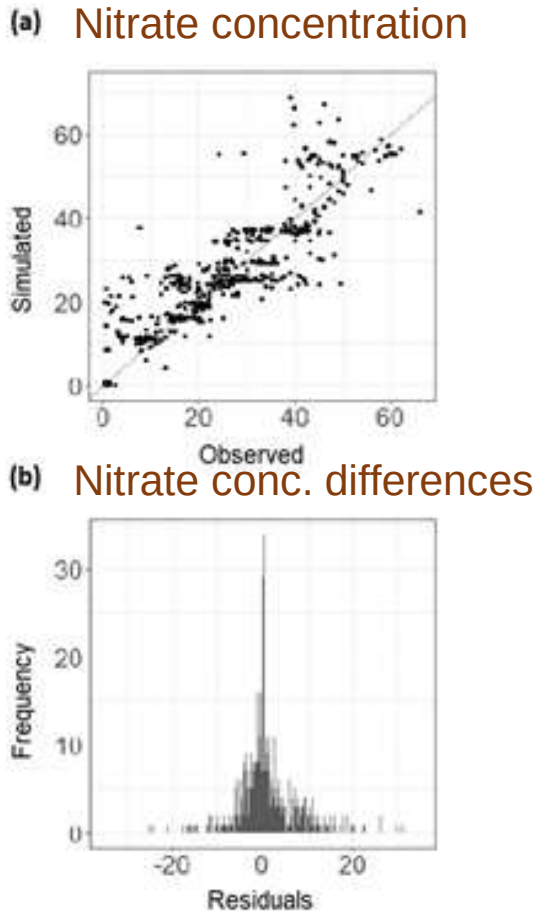


Human

The nitrogen mass balance

N mass balance. Input, export and surplus on crop soils (t y^{-1})





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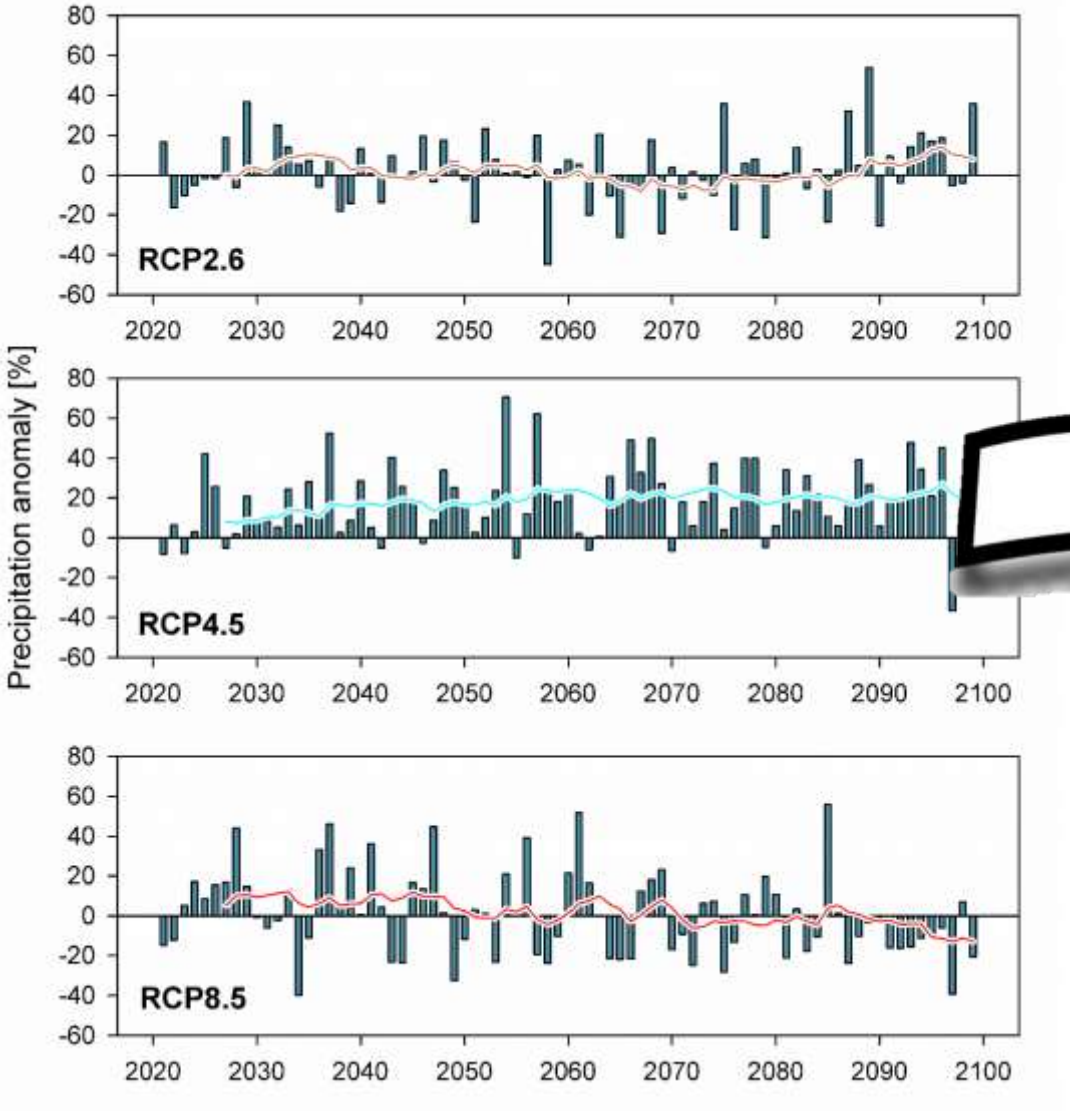
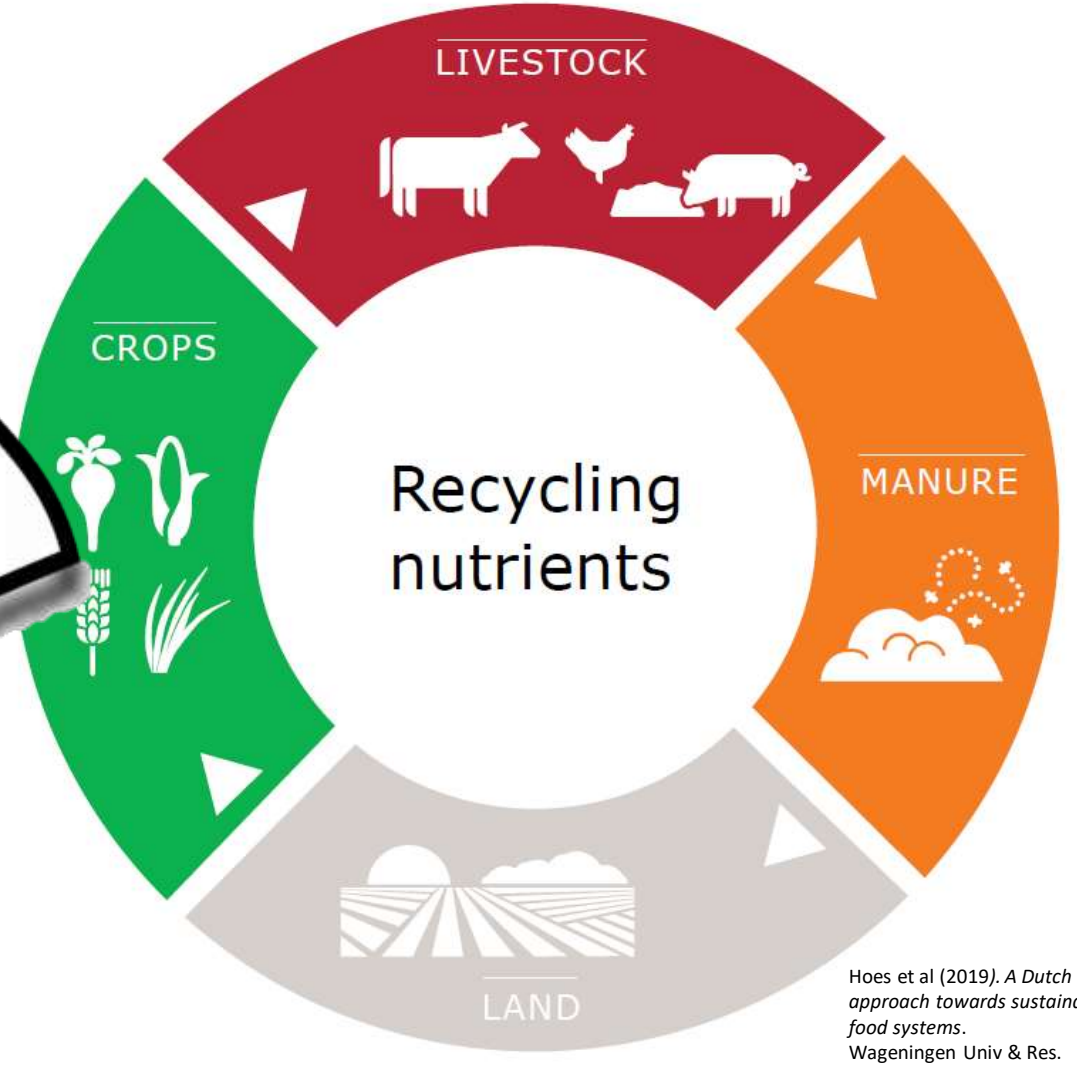
Climate change & governance





Hoes et al (2019). *A Dutch approach towards sustainable food systems*.
Wageningen Univ & Res.

Final remarks

1. The research points out the versatility and reliability of numerical flow and solute transport modeling, used as a backcasting exercise, as an accurate support tool to deal with the complexity of groundwater governance.

2. Groundwater resilience under changing climatic conditions could be properly addressed, overcoming the information and capacity gaps inherent to governance processes.

3. Modelling results provide decisive information in the path to achieve sustainability; for instance, in the application of the EU Nitrate Directive.

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THANK YOU !!!

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