



Economic modeling of freshwater resources

Jason Levin-Koopman

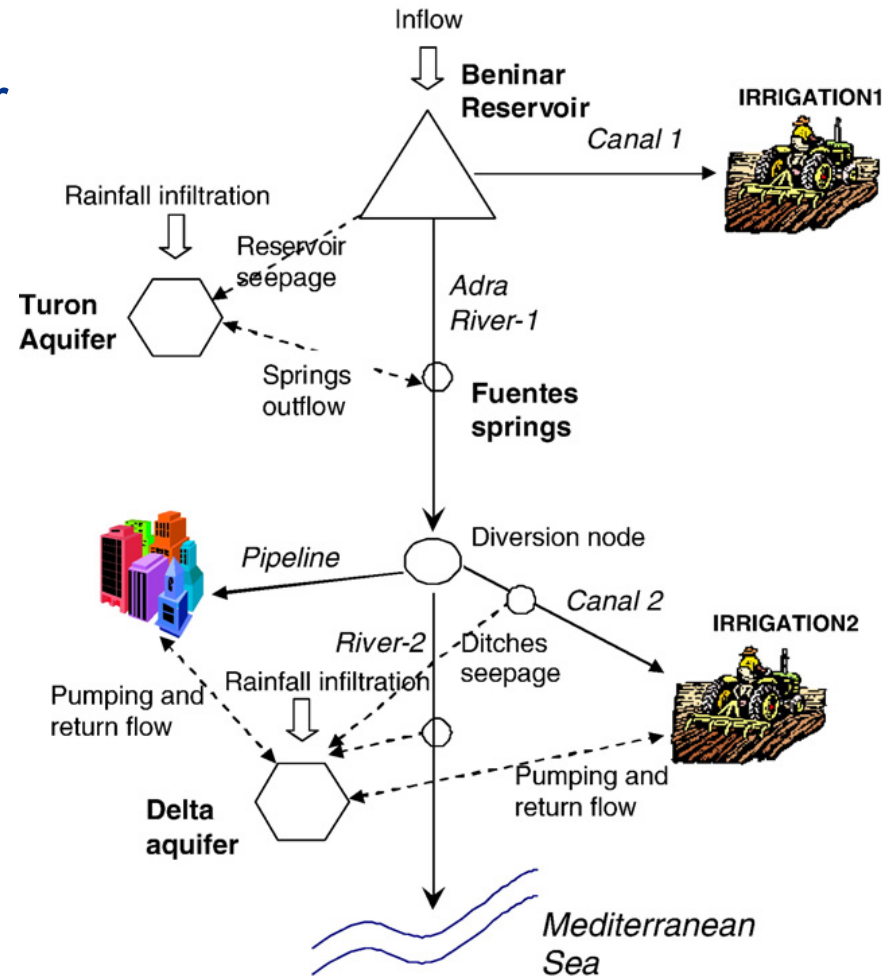
Advisors: Roy Brouwer, Richard Tol, Onno Kuik

Contents

- The initial steps we have made in the past year and a half and why.
- A vision for the rest of the project
- Next steps and possible places for collaboration

Hydro-economic perspective

- Easy structure for determine the dependence of the water users on each other
- Simplification of water demand
- One river basin objective function
- Water is seen as part of the river-basin system

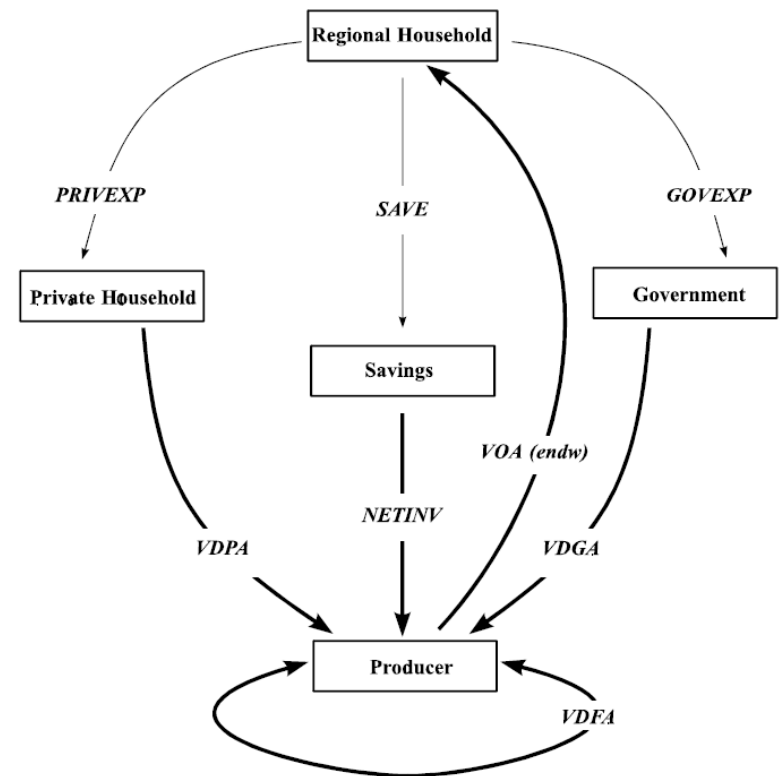


How will drought affect the economy?

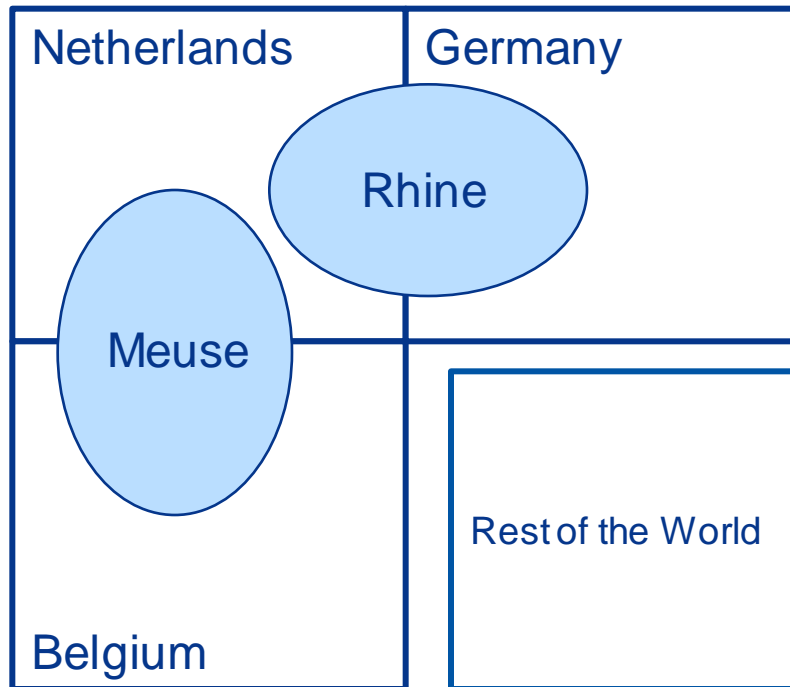
- Drought implies not only reduction in water supplies but also an increase in the cost of producing water related products and a corresponding price rise in those products
- Water related products are traded on global markets
- As imports, exports, prices for goods and factors adjust in response to the drought what is the real economic effect for the people in the drought region?
- **What is happening outside of the river basin? How much of an effect does that have on the situation in the river basin?**

Regional focus and CGE

- We use a computable general equilibrium model on the Rhine and Meuse river basin countries



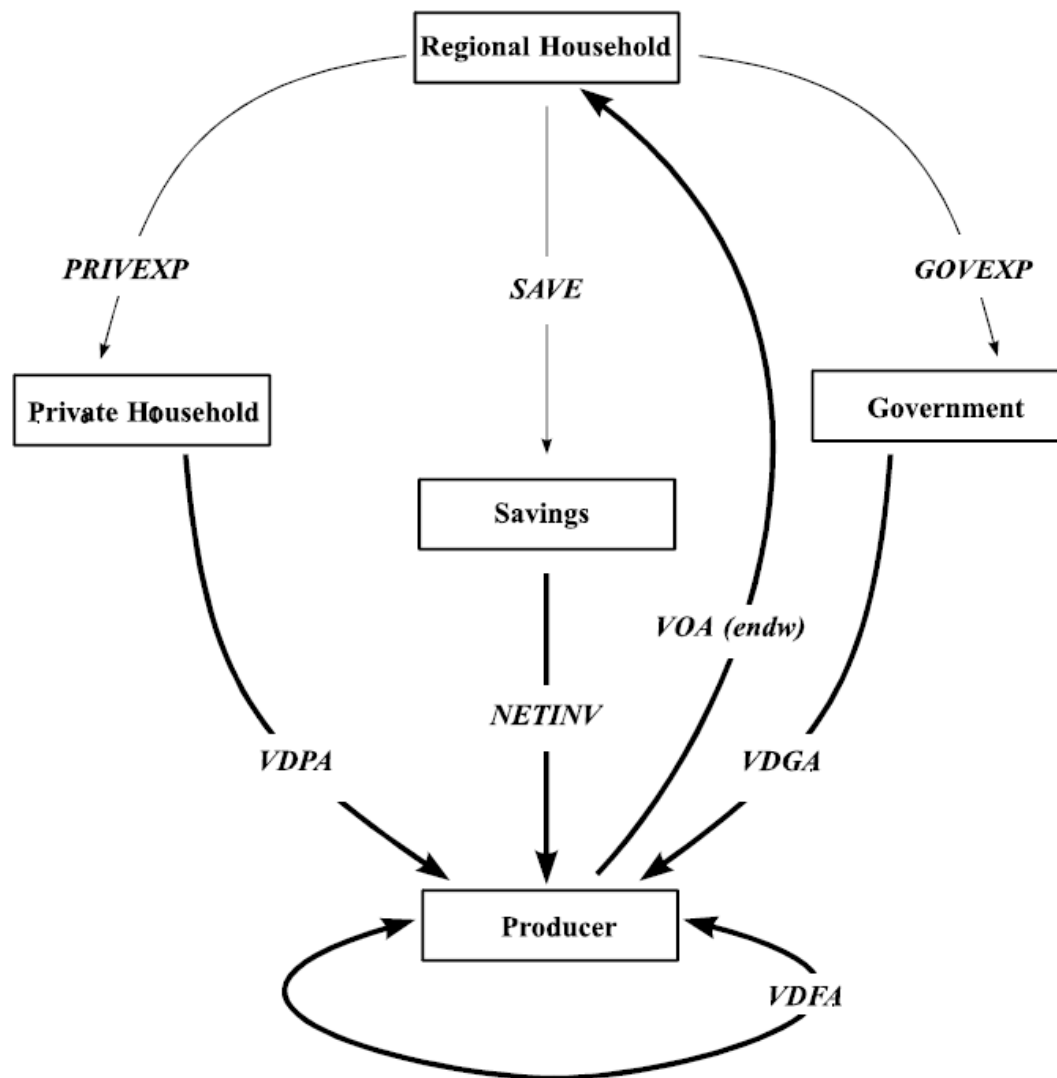
Goal for the study



- a multi-country, trans-boundary, multi-basin framework
- Different rivers basins have different economic and environmental constraints attached to them.
- Climate change will increase the frequency and severity of drought. Countries may (re)negotiate water agreements and allow for exchanges.

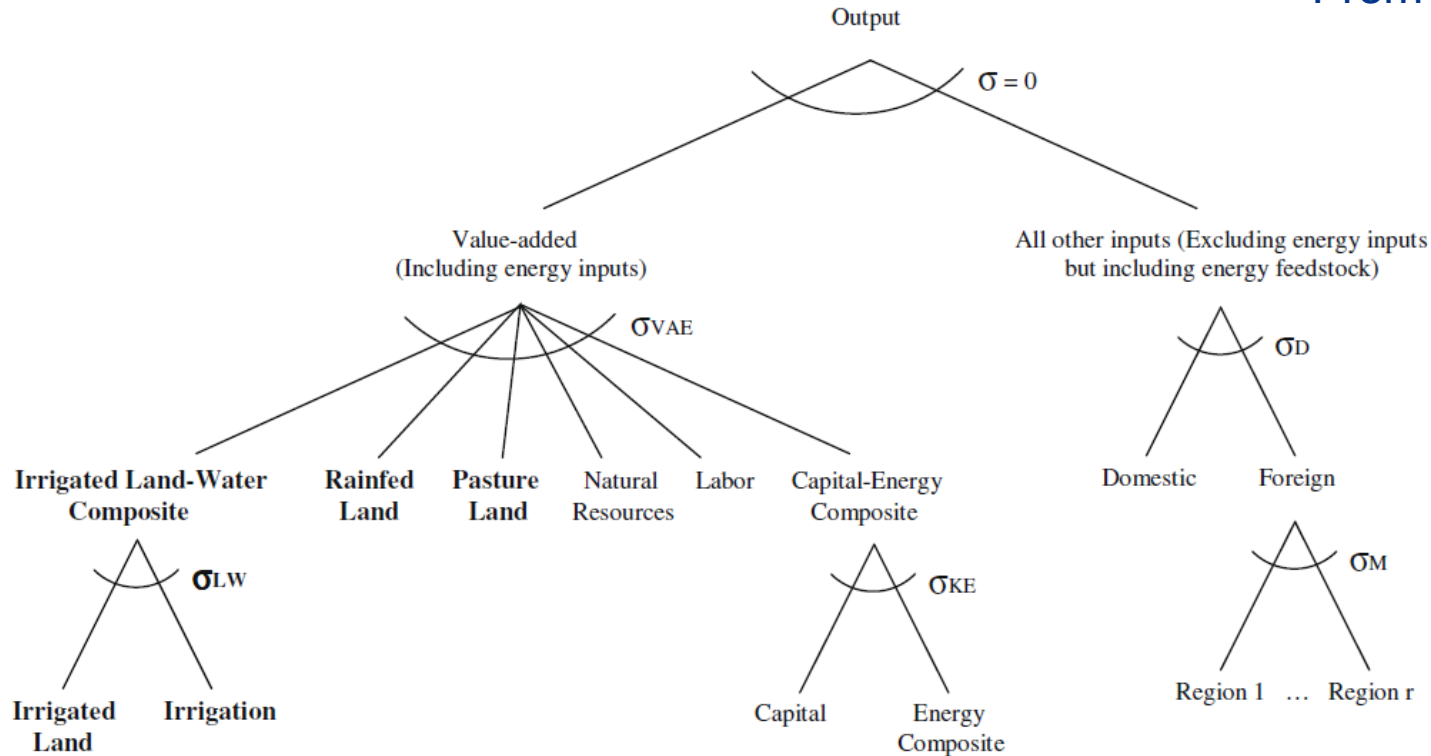
GTAP-Water

- GTAP-Water is an adjustment of GTAP, a global CGE model with a focus on world trade
- GTAP-W adds in physical water for agriculture.
- Other sectors use water services

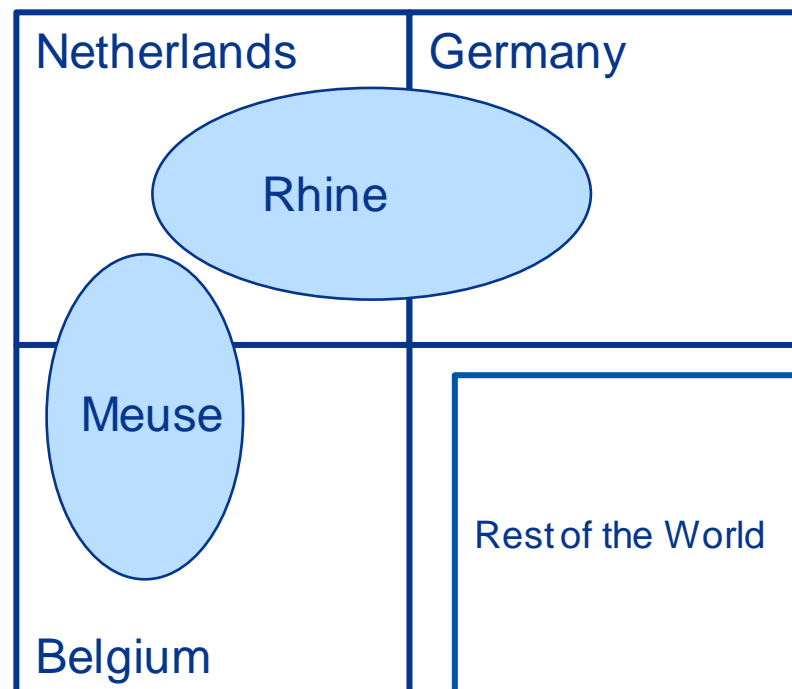
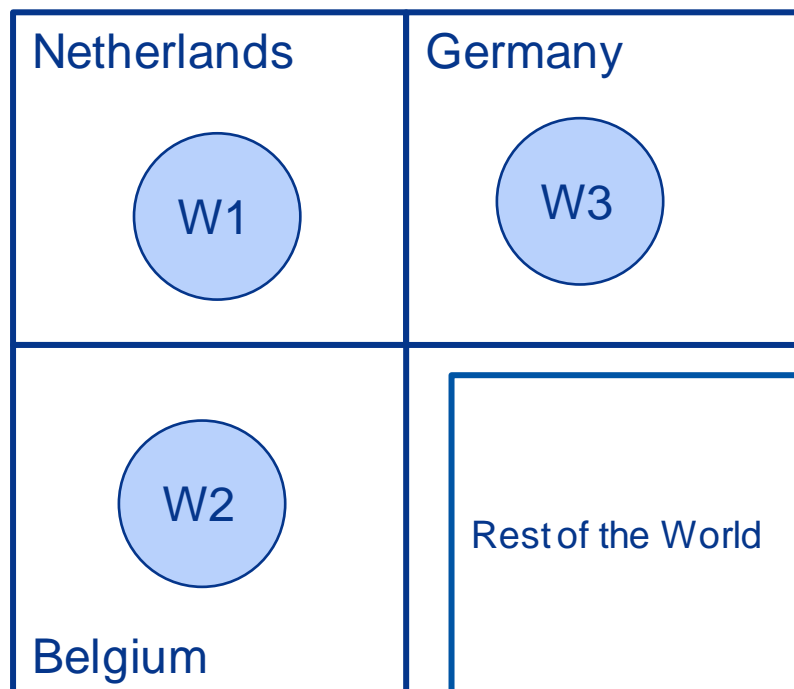
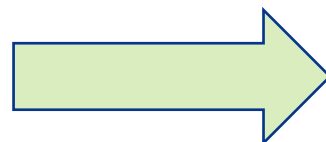


GTAP-Water production structure

From Calzadilla et al.



Adjusting the water factor within the CGE framework



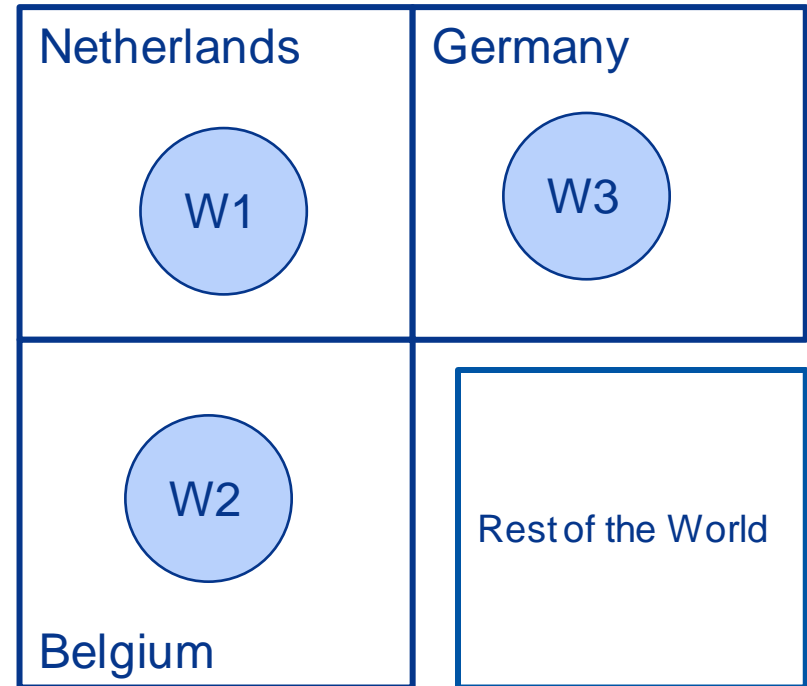
End result is a model which:

- Provides a framework for the question: How does drought reallocate resources between river basins?
- And: what consequences do the neighbors' water policy have for the Netherlands?
- Allow for the coupling with river basin optimization models providing the correct background. **What situation will the water users in the basin actually face?**
- The model will **not be "policy ready"**, it will show the main relationships but with a low level of detail.

Action Steps and points of possible collaboration

Action steps: 1

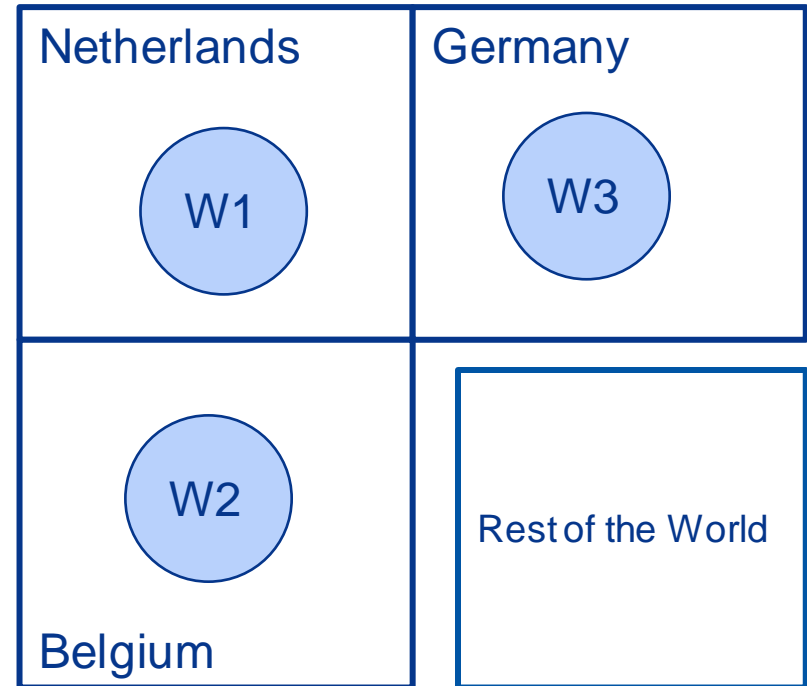
- Change aggregation of GTAP-W from 16 region world model to our regional focus. (Done)
- Simulate various levels of drought collectively or individually.
- Keep the price of water separate, or equate it between countries (water markets)



- Deltaris: Realistic drought scenario (67, 03)
- Possible comparing of these results with other models (Agricom).

Action steps: 2

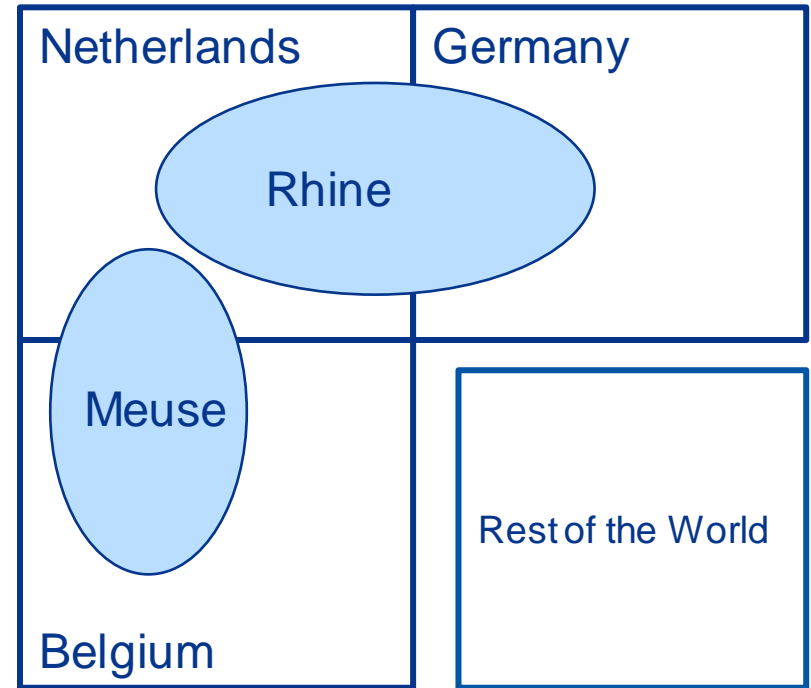
- Same as step one but add in non-agricultural water use: transport, power generation, industry.
- The road we take depends a lot on available data. Possibly need other models and data for calibration.



- Confirmation of our results with other models will be more important here as we are changing the model.

Action steps: 3

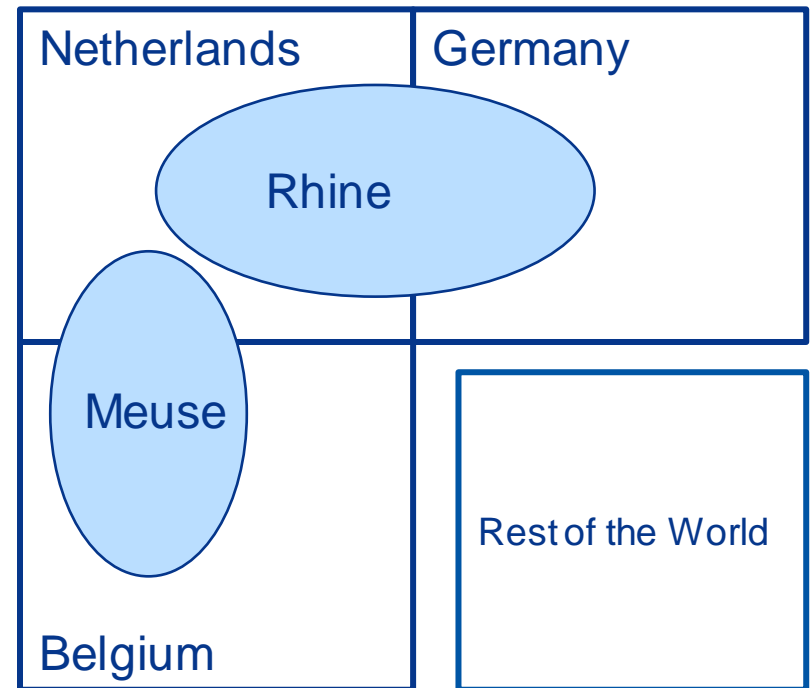
- Split the water resources into different river basins. Split the sectors as well.
- Compare water prices between river basins in the same country and the same river basin in different countries.
- How important is international cooperation?



- This will be done as a rough sketch but data and calibration/confirmation of the model is even more important in this stage.

Action steps: 4

- More scenarios, specifically targeting international cooperation on shared water sources.



Thanks for Your Attention