Universiteit van Amsterdam
Instituut voor Interdisciplinaire Studies

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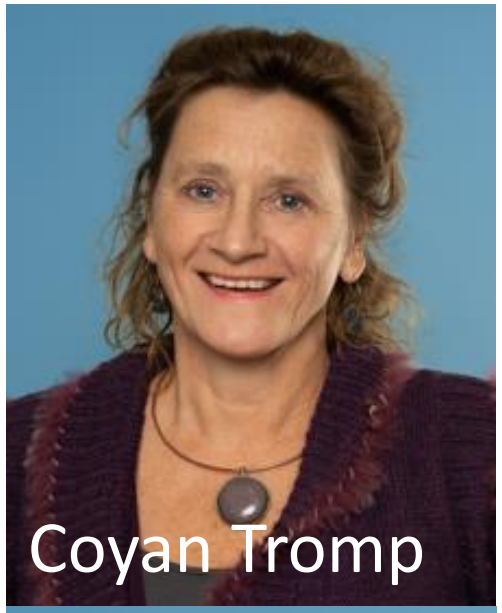
Joint System Analysis & Scenario Development as valuable tools to integrate knowledge

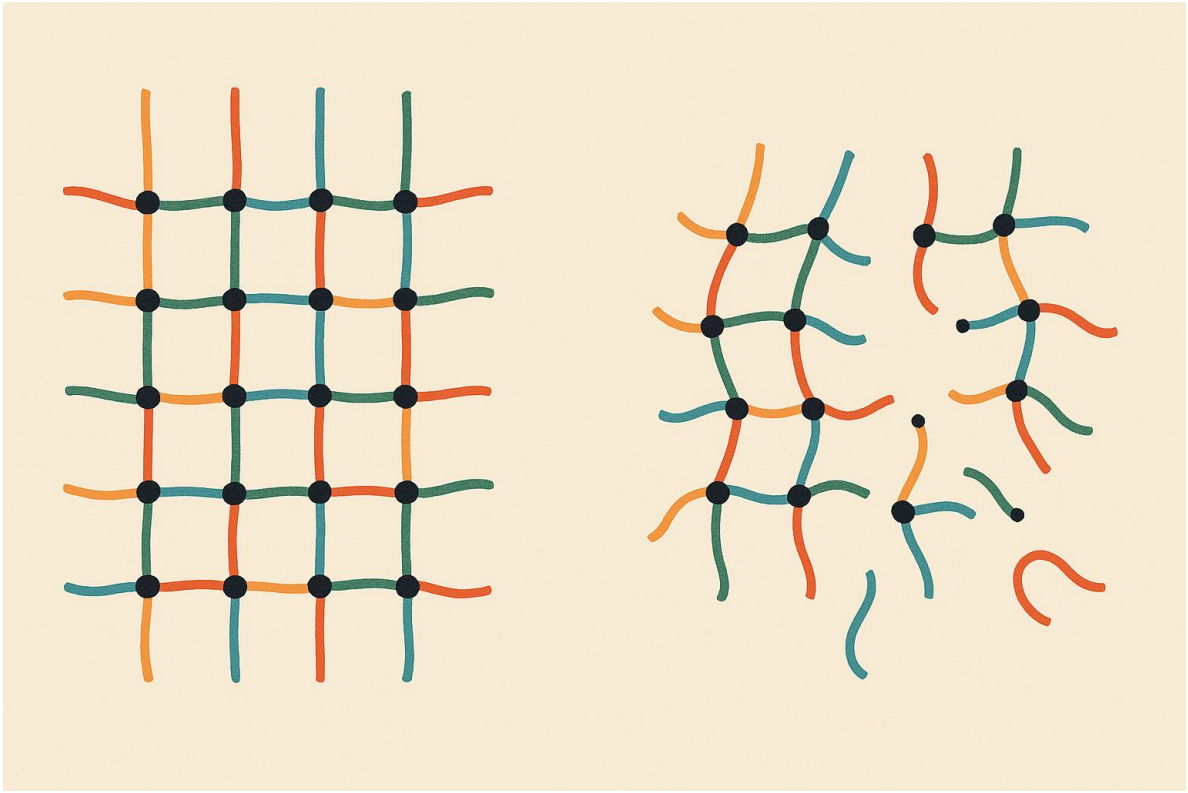


Who are we?

- Innovative course and curriculum developers for the Institute of Interdisciplinary Studies and teachers within the BSc Future Planet Studies.
- **Future Planet Studies** is an interdisciplinary program, with a focus on sustainability.
- It combines relevant natural scientific disciplines with social scientific disciplines.

Why we teach system thinking

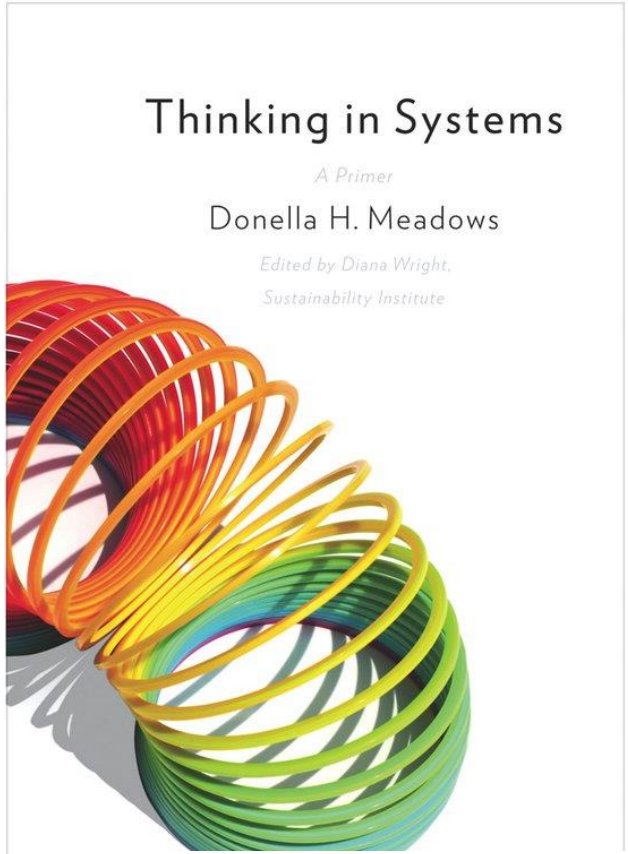
- Sustainability challenges are **wicked problems**
- Inherently interdisciplinary
- Need a holistic approach
- Focus on interconnectedness of perspectives



You need different threads to make a net, but without the knots they fall apart

How do we teach systems thinking?

- Year 1: Foundation
  - Understanding systems maps and building simple models
    (both quantitative and qualitative)
- Year 2: Group Model Building in capstone projects
  - Building a qualitative model for a case study
  - Building a qualitative model for possible future scenarios



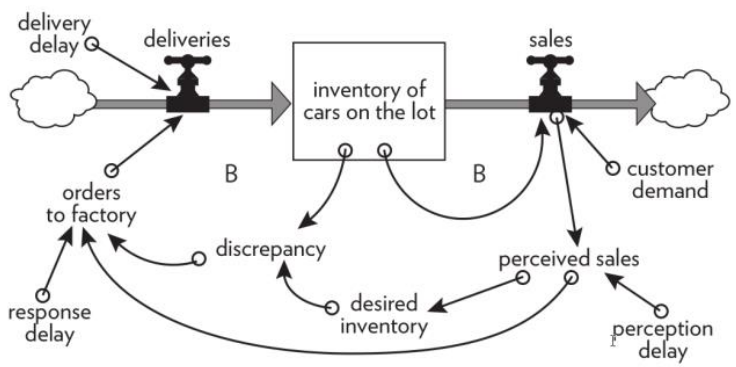


Figure 31. Inventory at a car dealership with three common delays now included in the picture—a perception delay, a response delay, and a delivery delay.

Interdisciplinary integration…

…It's hard, for them and for us!

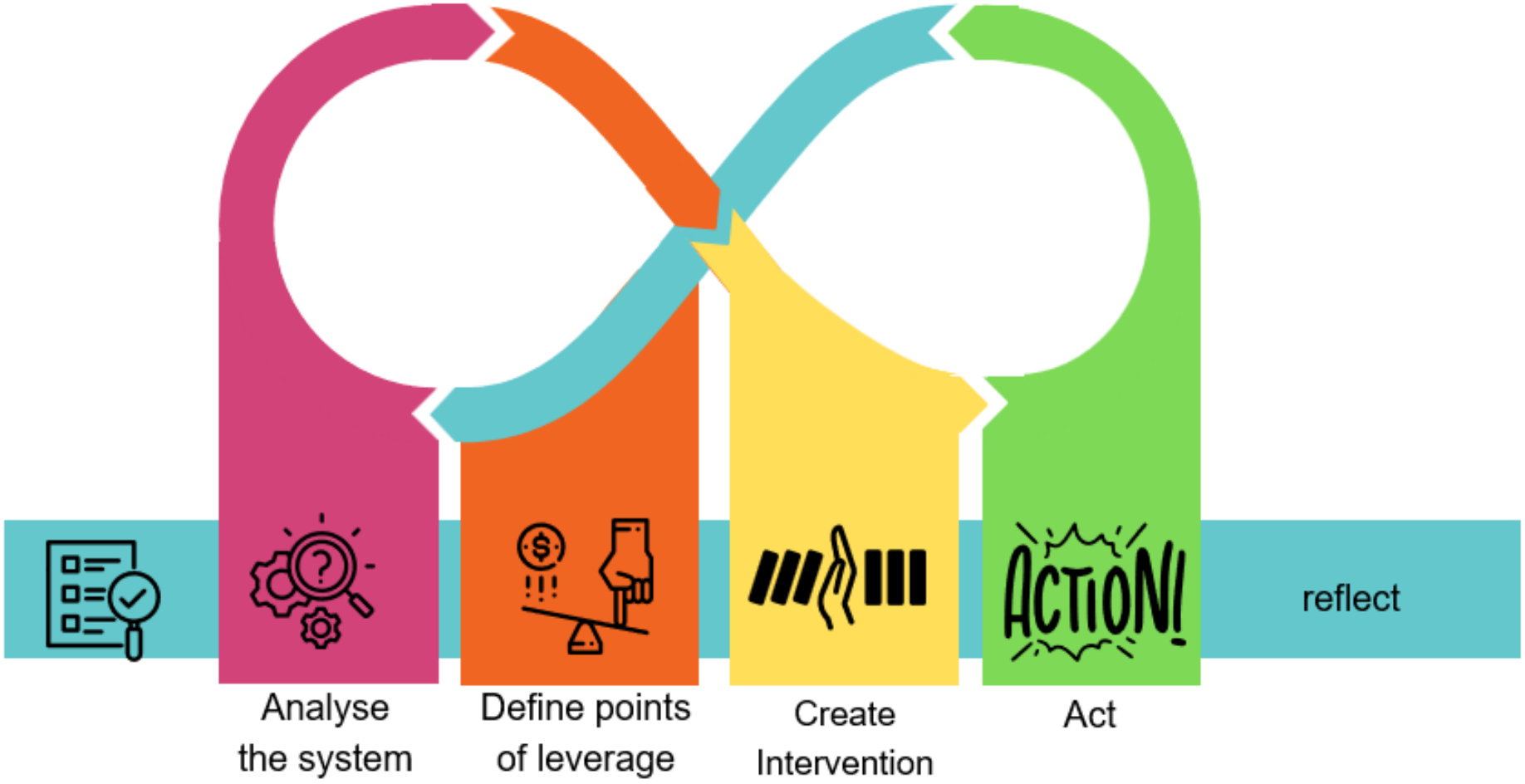
Group Model Building

- Participatory process
  - Collaborative dialogue
  - 'Roleplaying' to represent stakeholders and experts

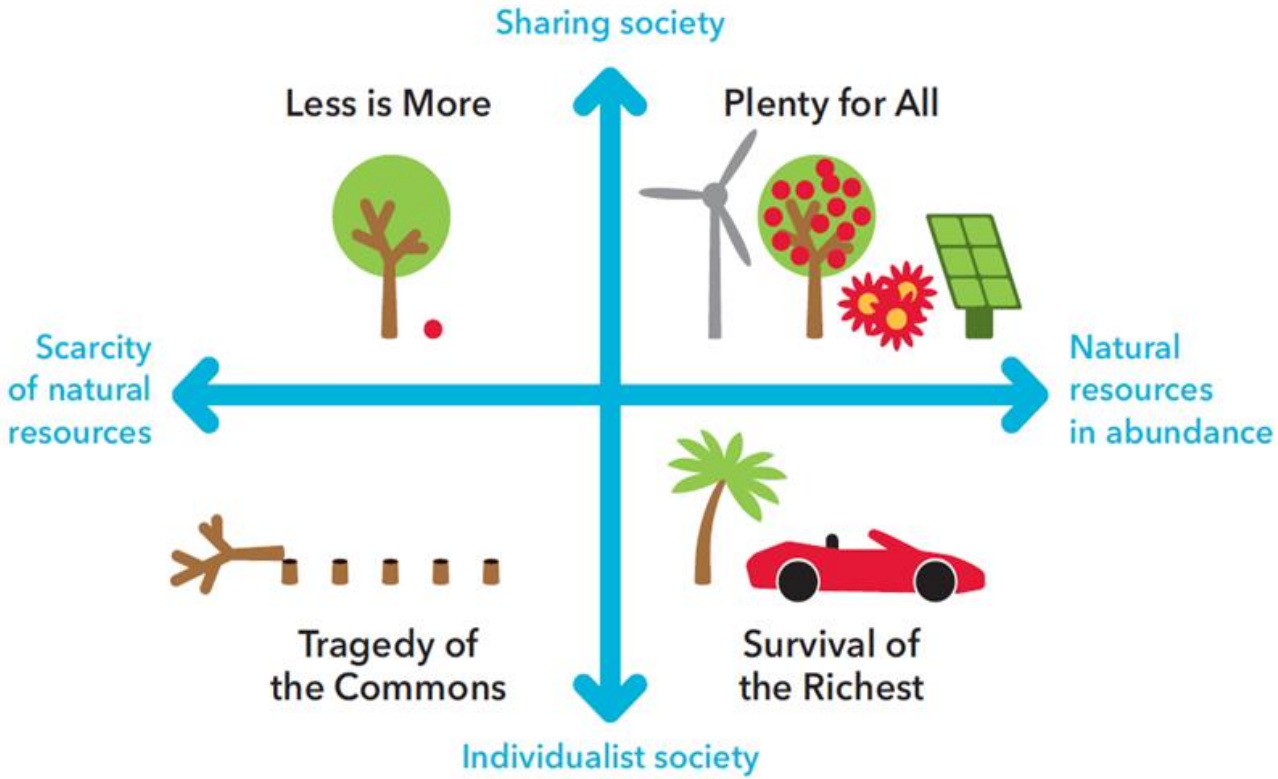
- Visual representation
  - Either CLD or Stock-Flow
  - Qualitative model

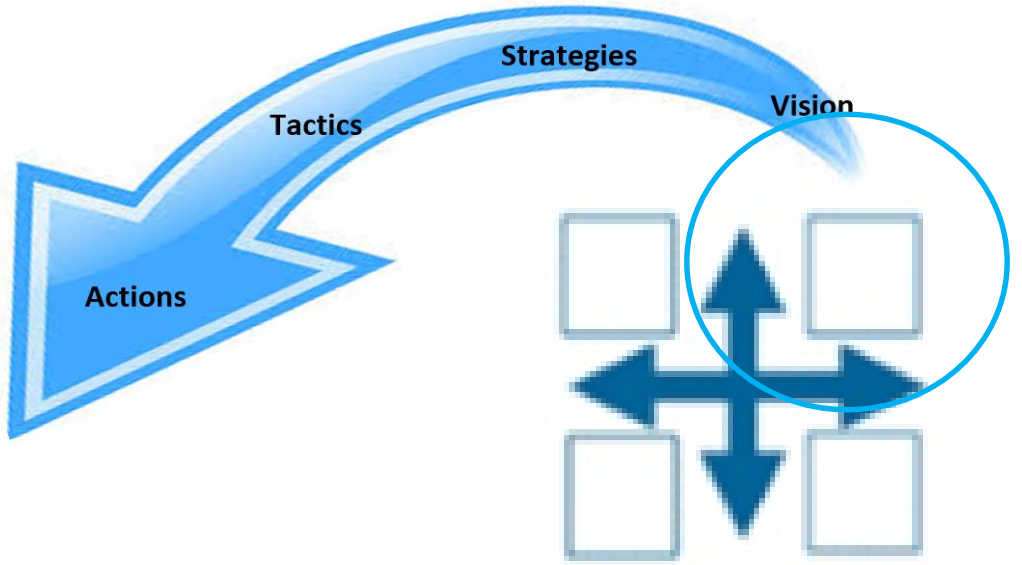
- Goal: developing shared understanding

Reflexive Design Project



Scenario Planning





In: Science and Futures Thinking & Vision-Based Science and Science-Based Visions (Tromp 2018, p. 142-153)

Group Model Building

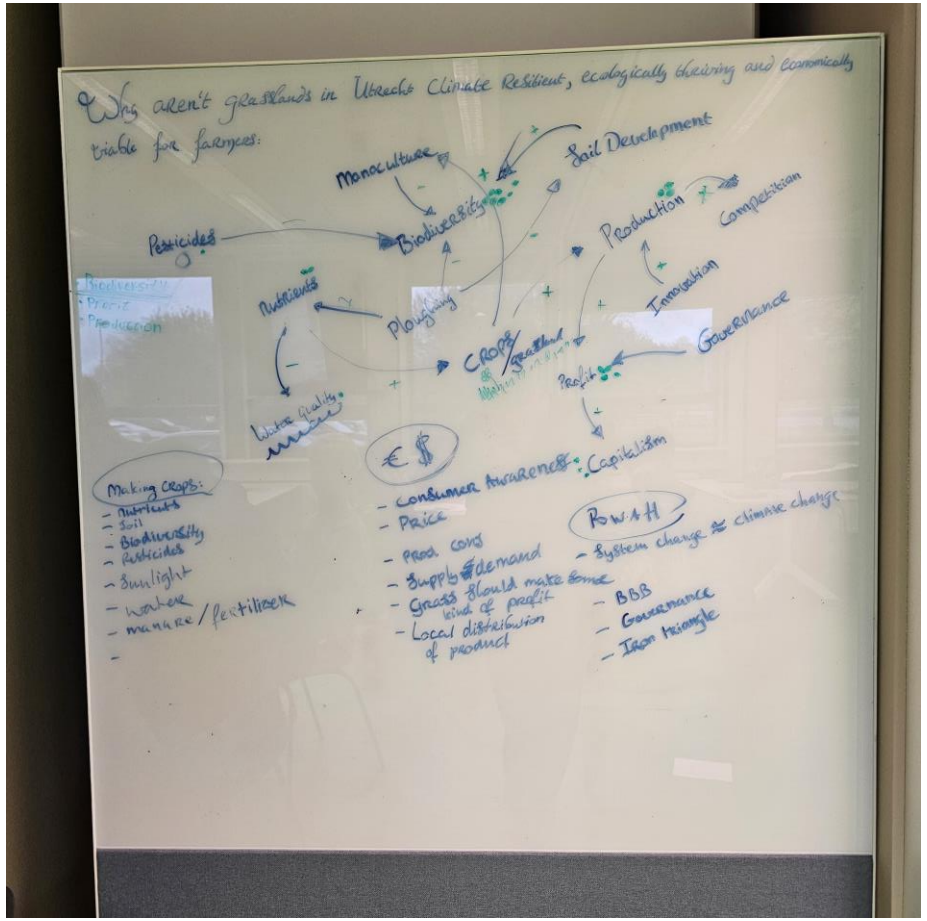
3 Roles:

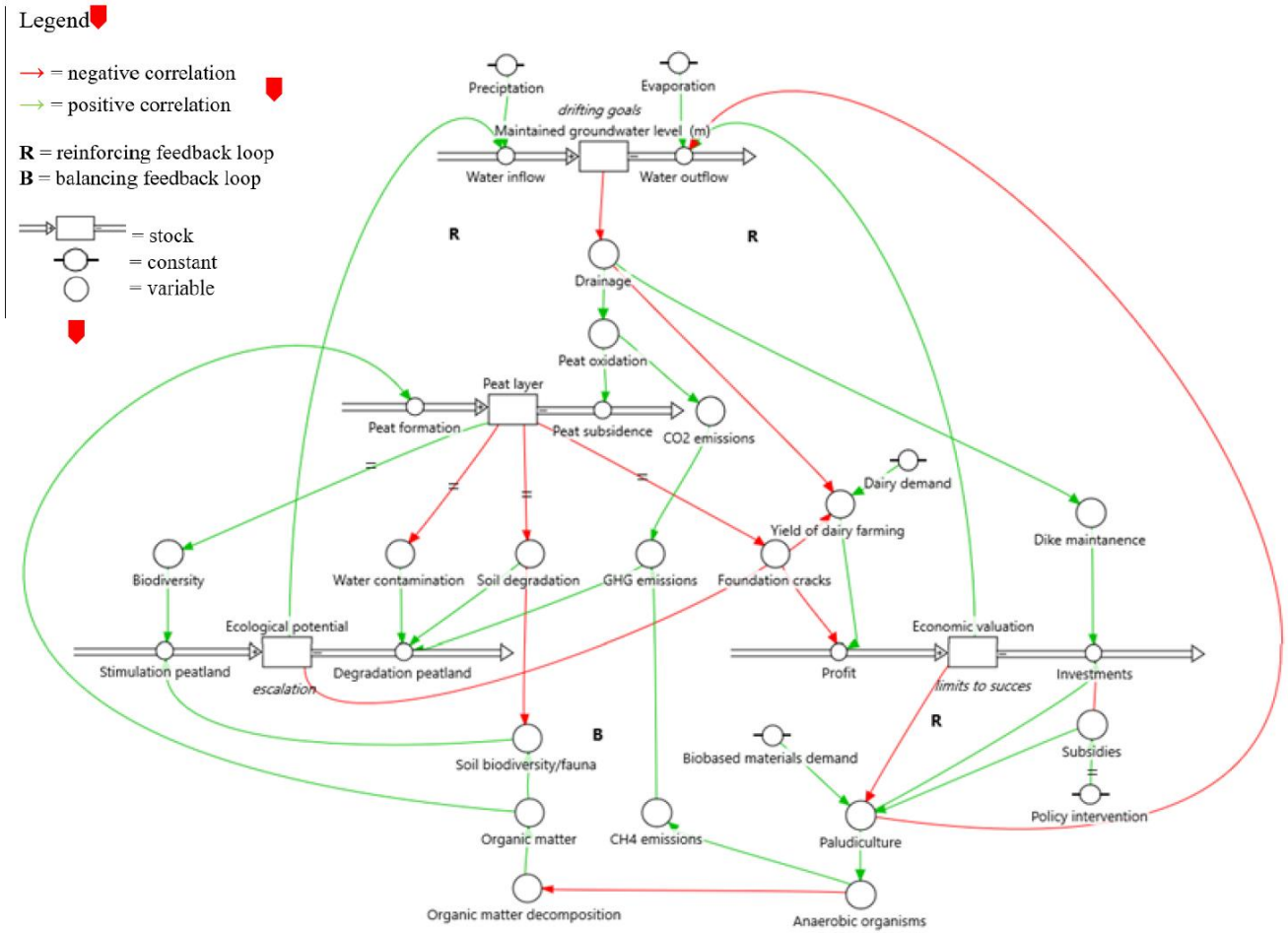
1x Process Manager

1x Modeler

Participants
(students represent experts or stakeholders)

Example

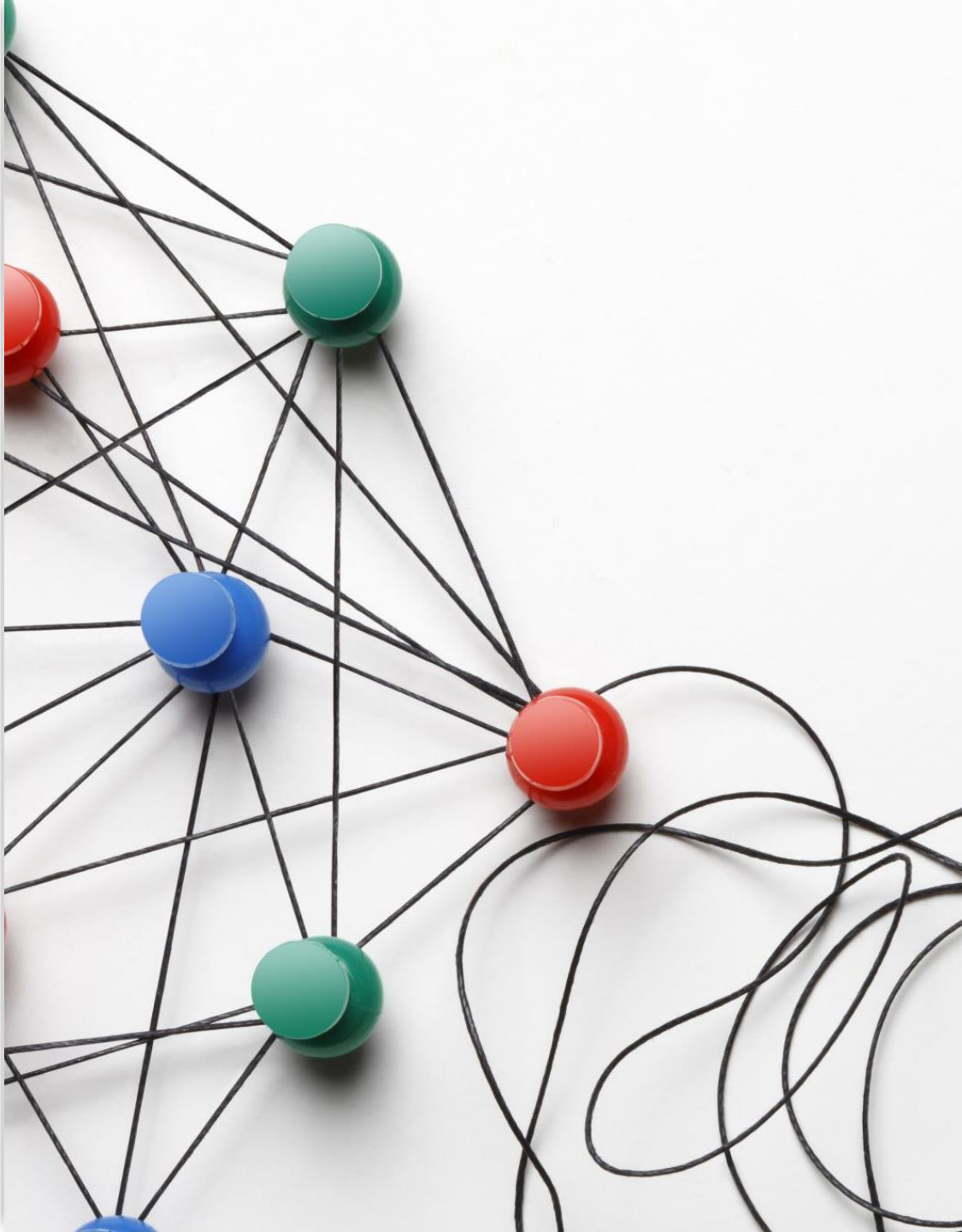

Why aren't grasslands in Utrecht Climate Resilient, ecologically thriving and economically viable for farmers?
Monoculture
Soil Development
Pesticides
Biodiversity
Production
Competition
Nutrients
Ploughing
Innovation
Crops
Grassland
Profit
Governance
Water quality
Capitalism
Making Crops:
- Nutrients
- Soil
- Biodiversity
- Pesticides
- Sunlight
- Water
- manure / fertiliser
- consumer awareness
- Price
- Prod. cons
- Supply & demand
- Grass should make some kind of profit
- Local distribution of product
Growth
- System change ≠ climate change
- BBB
- Governance
- Iron triangle


Legend
→ = negative correlation
→ = positive correlation
R = reinforcing feedback loop
B = balancing feedback loop
= stock
= constant
= variable
Preciptation
Evaporation
drifting goals
Maintained groundwater level (m)
Water inflow
Water outflow
R
R
Drainage
Peat oxidation
Peat layer
Peat formation
Peat subsidence
CO2 emissions
Dairy demand
Yield of dairy farming
Dike maintanence
Biodiversity
Water contamination
Soil degradation
GHG emissions
Foundation cracks
Ecological potential
Economic valuation
Stimulation peatland
Degradation peatland
escalation
Profit
limits to succes
Investments
B
R
Soil biodiversity/fauna
Biobased materials demand
Subsidies
Policy intervention
Organic matter
CH4 emissions
Paludiculture
Organic matter decomposition
Anaerobic organisms

How does GMB* facilitate interdisciplinary integration?

- Encourages open dialogue between students with different disciplinary backgrounds.
- Visual representations help bridge language barriers across fields.
- Supports the identification of integrated solutions and systemic leverage points.

*GMB: Group Model Building
Wilkerson & Trevellik (2021)



What do we see?

Patchwork of subsystems

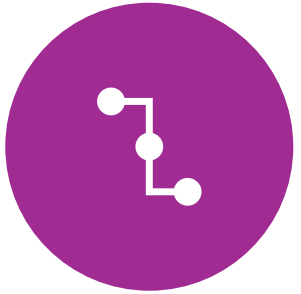
Students start by accurately modeling their own perspective→

Starting point for discussion

Initial connections are often shallow and based on (personal) assumptions

Research and Common ground

Through research and dialogue, some groups discard their first map→ rebuild with shared focus and agreed definitions



Integration?

typically evolves

addition → adjustment or extension→ sometimes reframing key concepts

What do students say about it?

At the start of the Group Model Building resistance came up. We really didn't know where to start. But when we dared to write down factors from our own problem analysis and look further from there and communication provided an increasingly better overview.

Personally, I experienced that system mapping is useful but also difficult. It's much easier to stay within your own discipline than to step back and pull yourself and your team toward a shared, bird's eye view.

Some members made the system so complicated it became unfollowable for others. That actually helped our communication, though, we had to simplify it together.

It made us realize that, even though we are looking at the same picture, interpretations may be different.

Key challenges and lessons learned

- It helps communication

- Oversimplification and false sense of completeness
- Overfocus on structure over meaning

- It takes time (and lots of iterations)
- Reflection is key (but don't call it reflection)

References

References

Tromp, C. 20218. *Wicked Philosophy. Philosophy of Science and Vision Development for Complex Problems.* Amsterdam: Amsterdam University Press.

Wilkersson & Trevellik. 2021.