Modelling Decision Adaption Pathways for the Integration of Societal Demands for Ecosystem Services and their Impacts on SDGs in Agricultural Landscapes

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| Introduction & Goals

- Agricultural ecosystems provide a wide range of biotic and abiotic services that are highly demanded by the society.

- We introduce a conceptual model that integrate participatory GIS, agent-based modelling (ABM) and Bayesian Belief Networks (BBN) to address supply-demand mismatches of ecosystem services (ESS) on a landscape scale.

- The objective of this model is to investigate the drivers, obstacles and impacts that could inform multi-level governance to satisfy the demands for ESS in a cooperative manner, within the boundaries of the relevant SDGs.
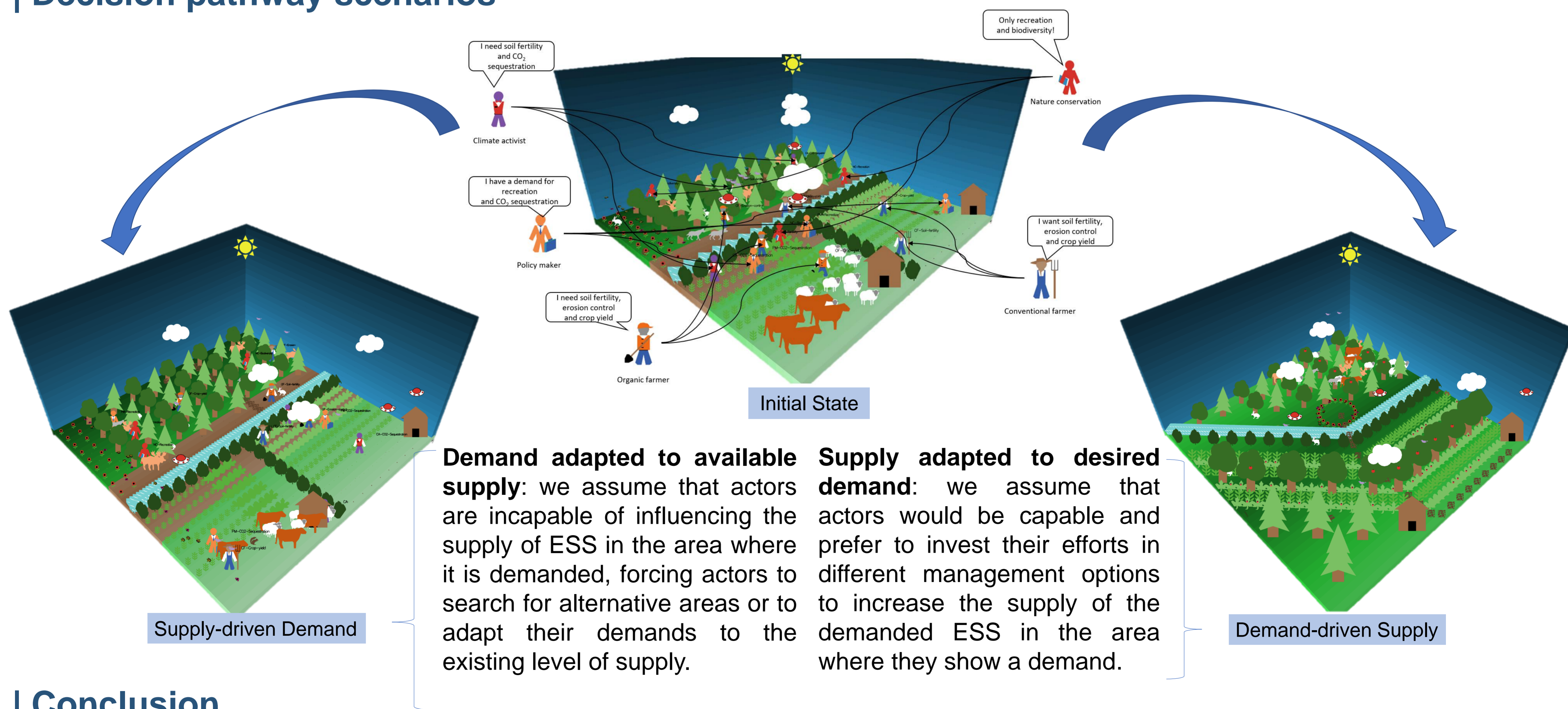
| A Novel Integrated Conceptual Model

- We **collect data** about specific parameters of the social-ecological system.
    - The social system: demands for ESS, perceived supply of ESS, and socio-economic demographics of the stakeholders.
    - The ecological system: the case study areas, the ESSs and potential and status quo supply maps of ESS
- We feed these data into the ABM to run a **simulation** depicting the emergence of the social-ecological system.
- We assess the **impacts** of the system on indicators representing the relevant SDGs through applying a stakeholder workshop.
- We analyze the **uncertainty** of the impact assessment by applying a BBN approach which ultimately gives a recommendation of which scenario would reduce supply–demand gaps, avoid conflicts and support SDGs.
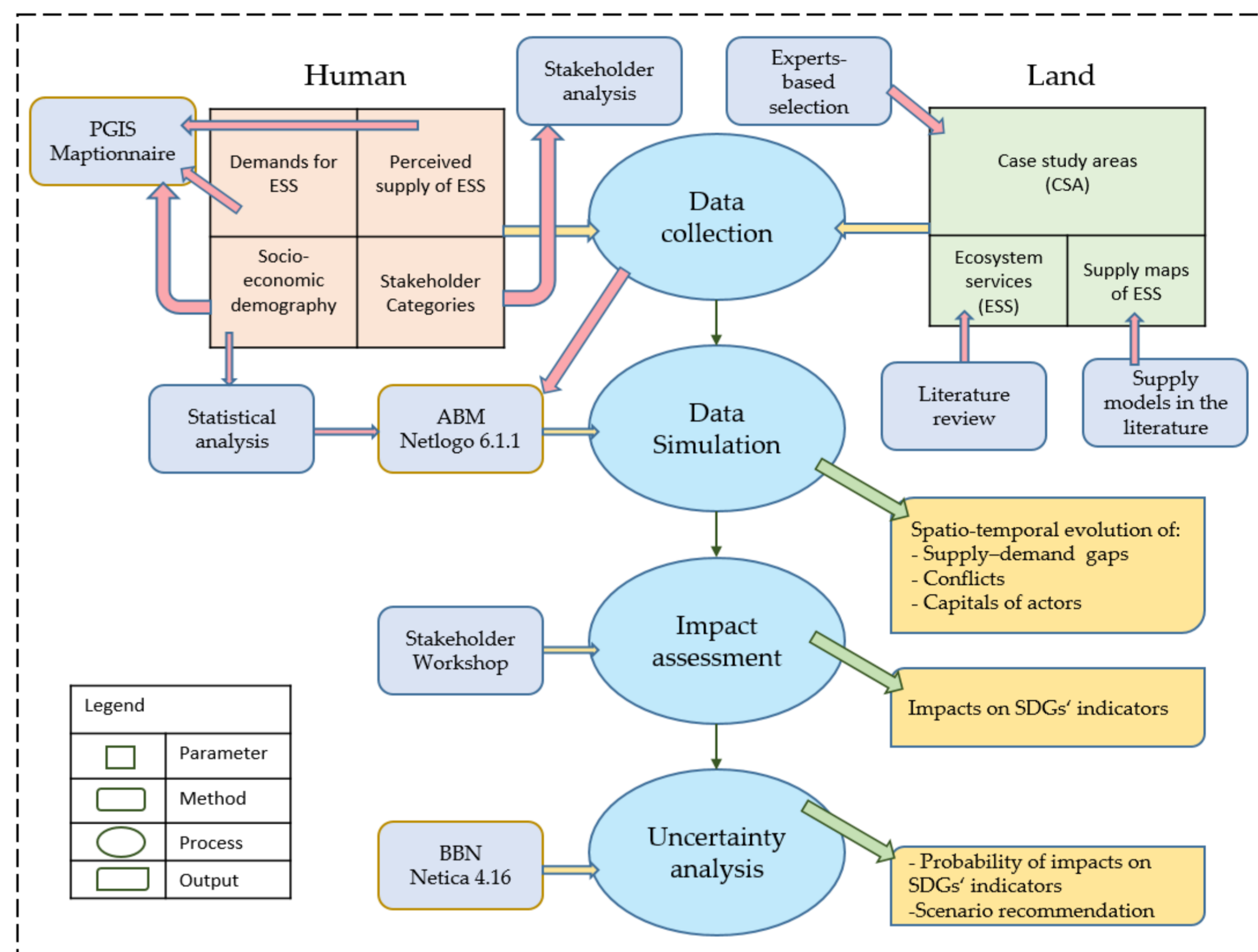
Conceptual Integrated Model Framework (PGIS = Participatory geographic information system, ABM = Agent-based modelling, BBN = Bayesian belief network, ESS = Ecosystem services, SDG = Sustainable Development Goals)

| Decision pathway scenarios

Demand adapted to available supply: we assume that actors are incapable of influencing the supply of ESS in the area where it is demanded, forcing actors to search for alternative areas or to adapt their demands to the existing level of supply.

Supply adapted to desired demand: we assume that actors would be capable and prefer to invest their efforts in different management options to increase the supply of the demanded ESS in the area where they show a demand.

| Conclusion

Our integrated modelling approach represents a promising tool to provide decision support for shifting the decision behavior into the direction of satisfying the demands for ESS of all involved actors in a landscape from one that is competitive and individualistic to one that is cooperative and collaborative, while adhering to the SDGs targets.

| References

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Video link