

## sDiv working group meeting report

### sIntESE - Integrating ecosystem services into economic models

#### ***Aims of the meeting***

The first official working group meeting of sIntESE took place between 5<sup>th</sup> and 8<sup>th</sup> December 2022. The goals of this meeting were to synthesize the state of the art and identify the way forward regarding the integration of ecosystem services and economic models, to work together towards a draft of a perspective paper where our findings will be shared, and to identify a pilot case study to be carried out in the second stage of our project.

#### ***Meeting set-up and structure***

The meeting was hybrid with 9 participants at iDiv in Leipzig and 3 participants online. On the first meeting day, the core team prepared the other three days by assembling and categorizing literature regarding the integration of ecosystem services into macroeconomic models. This served as a starting point for identifying and describing the state of the art during the rest of the meeting. The three meeting days with the full group consisted of a mix of presentations (summarized below), plenary discussions and break-out group work (a.o. writing and figure design). Online participants joined the plenary discussions and break-out groups as much as their other obligations allowed them to.

#### ***Presentations***

Various members of the working group presented recent research relevant to sIntESE:

**Onil Banerjee** (RMGEO Consultants Inc.) presented a preliminary analysis of India's Nationally Determined Contributions (NDCs) and Land Degradation Neutrality Targets. The study implemented the Integrated Economic-Environmental Modeling (IEEM) framework linked with spatial Land Use Land Cover (LULC) change and Ecosystem Services (ES) modeling to demonstrate impacts on economic, wealth, distributional, natural capital and ecosystem service indicators. The study is cutting-edge in its integration of dynamic endogenous feedbacks between each of the three modeling components thus enabling estimation of the marginal value of non-market ES all in a manner consistent with a country's System of National Accounts.

**Willem-Jan van Zeist** (Wageningen Economic Research) introduced the MAGNET model and presented the three main approaches that are currently developed to extend the model towards the incorporation of natural capital and ecosystem service impacts. These are 1) "Account, update & show", which has a focus of adding ES valuations at country level to MAGNET and update the values based on simple variable connections (aka the "Gross Ecosystem Product" Module); 2) "Analyse impacts", which looks at various ways to introduce impacts of ES changes (e.g. pollination loss) as economic shocks; and 3) "Embed", which

contemplates adding natural capital as core element to MAGNET with good data (ee-SAM + elasticities).

**Tobias Heimann** (Kiel Institut for the World Economy) presented the BioSDG project, which aims at evaluating how transformation towards a bioeconomy can contribute to the achievement of the UN Sustainable Development Goals (SDGs). Thereby it analyses synergies and trade-offs between bioeconomy and climate policies, and evaluates their interaction with the SDGs. In the project, the CGE model DART, the biophysical model PROMET, and the PE model GFPM are linked, and running on a global scale. To analyze effects of land use, land-use change, deforestation and intensification on biodiversity, results of the model linkage are mapped to a Biodiversity Intactness Index.

**Justin Johnson** (Minnesota University) presented the state of current work on GTAP-InVEST. This included summarizing the key parts of existing model implementations, including how land-use change is endogenized via supply curves and calibrated on spatial data and extension to more ecosystem services. Justin summarized the key findings from an upcoming publication, which echo existing findings (but with more detail), namely that failing to protect ecosystem services hurts low-income countries most, that policies to conserve ecosystem services benefits these countries most, and that investing in nature does provide some win-wins, but this is not always the case. Justin concluded by talking about new research endeavors that have started or are close to starting, which center on how we can make the model a recursive-dynamic model rather than comparative static, and how we can embed country-specific models in the global framework.

**Nynke Schulp** (Vrije Universiteit Amsterdam) summarized the recently completed sTelebES and ongoing sTradES working groups, focused on interregional flows of ES and embedded ecosystem services. The presentation highlighted the similarities (linking ecosystem services to trade in order to generate a better basis for decision making) and differences (focus on accounting rather than economic modelling) between the sTelebES and sTradES working groups versus sIntESE.

**Lukas Eggert** (sDiv) presented the progress made in collecting and categorizing publications aimed at the integration of ecosystem services into economic modelling, in particular computable general equilibrium (CGE) models and partial equilibrium (PE) models. He explained the search strategy for identifying relevant publications and the attributes used to categorize the studies in terms of ecosystem services covered and connections made to the CGE and PE models.

### ***Progress made and next steps***

During the meeting the working group made huge progress in creating a common understanding of terminology between CGE and ES modelers, describing the state of the art of integrated ecological-economic modelling based on a novel typology of possible connections between ES and CGE models, and identifying the frontiers of the field. Based on this, the group has agreed on the structure, outline and key messages of the perspective paper (first deliverable of sIntESE) as well as the timeline for finishing this. In addition, the group discussed the options for the pilot study (the second deliverable of the working group), with a focus on the frontier(s) that we would like to explore together, and the ecosystem

service to focus on. The group agreed to meet virtually early 2023 to take concrete decisions towards the pilot study. To finalize the group also agreed on the dates of the second workshop.

### ***Working atmosphere***

Throughout the week, sIntESE members put themselves out of their comfort zone and worked hard to find a common understanding between two distinct disciplines (ecology and economy). Thanks to the open and constructive discussions and interactions and the joyful side events (including an unforgettable visit to the Christmas market and an interesting guided city tour), sIntESE has developed as a supportive, inspiring and collaborative working group and we are looking forward to continue our work together. It is important to notice that this was only possible due to the support of sDiv, first by fostering interdisciplinary working groups, second by allowing us to come to Leipzig and last but not least by supporting us with a flawless organization, which enabled us to focus fully on the science!