# SUPREMA GLOBIOM-MAGNET training

As part of the SUPREMA project, IIASA and Wageningen Economic Research organize a training on the GLOBIOM and MAGNET models. The training will be held virtually on Friday Dec. 4th.

| Session | Content | Time schedule | Chair |
|---|---|---|---|
| 0 | Welcoming round | 8.15 - 8.30 | Petr Havlík |
| 1 | Introduction to GLOBIOM<br>- general GLOBIOM & global applications (Petr Havlík)<br>- regional applications (Amanda Palazzo) | 8.30 - 9.15 | Petr Havlík |
| 2 | Introduction to MAGNET<br>- general MAGNET philosophy and characteristics CGE models (Hans van Meijl) | 9.15 - 10.00 | Willem-Jan van Zeist |
| | Break | 10.00 - 10.15 | |
| 3 | GLOBIOM - Equations and scenarios<br>- Equations (Stefan Frank)<br>- Scenarios (Hugo Valin) | 10.15 - 11.15 | Hugo Valin |
| 4 | MAGNET - Equations and scenarios<br>- Equations (Hans van Meijl)<br>- Scenarios (Willem-Jan van Zeist) | 11.15 - 12.15 | Hans van Meijl |
| | Break | 12.15 - 12.30 | |
| 5 | Closure | 12.30 - 13.00 | Hans van Meijl |

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# Registration

Please register to leclere@iiasa.ac.at by Dec 4th, 7 am CET. Meeting access will be provided through zoom. Access details will be shared upon registration.

The Horizon 2020 **SUPREMA** (Support for Policy Relevant Modelling of Agriculture) project has four coherent objectives:

- SUPREMA roadmap of future directions for modelling will be developed.
- An enhanced and strengthened SUPREMA model family will be created.
- Future directions of modelling in agriculture will be explored and tested.
- A SUPREMA meta-platform will be established, to share and discuss the findings of the work with existing model platforms, research communities, and policy makers.

For more info see: www.suprema-project.eu

**GLOBIOM**

The Global Biosphere Management Model (GLOBIOM) (Havlík et al. 2014) is a global recursive dynamic partial equilibrium model of the forest and agricultural sectors, where economic optimization is based on the spatial equilibrium modelling approach (Takayama and Judge 1971). The supply side of the model is based on a bottom-up approach (from land cover, land use, and management systems to production and markets). The agricultural and forest productivity is modeled at the level of grid cells of 5x5 to 30x30 arc-minutes, using biophysical models, such as EPIC , while the demand and international trade occur at the regional level (from 30 to 53 regions covering the world, depending on the model version and research question). Besides primary products, the model has several final and by-products, for which the processing activities are defined.

The model computes market equilibrium for agricultural and forest products by allocating land use among production activities to maximize the sum of producer and consumer surplus, subject to resource, technological and policy constraints. The level of production in a given area is determined by the agricultural or forestry productivity in that area (dependent on suitability and management), by market prices (reflecting the level of demand), and by the conditions and cost associated to conversion of the land, to expansion of the production and, when relevant, to international market access. Trade flows are balanced out between different specific geographical regions. Trade is furthermore based purely on cost competitiveness as goods are assumed to be homogenous. This allows tracing of bilateral trade flows between individual regions.

By including not only the bioenergy sector but also forestry, cropland and grassland management, and livestock management, the model allows for a full account of all agriculture and forestry GHG sources. GLOBIOM accounts for ten sources of GHG emissions, including crop cultivation N2O emissions from fertilizer use, CH4 from rice cultivation, livestock CH4 emissions, CH4 and N2O emissions from manure management, N2O from manure applied on pasture, and above and below ground biomass CO2 emissions from biomass removal after converting forest and natural land to cropland.

**MAGNET**

The Modular Applied GeNeral Equilibrium Tool (MAGNET) model is a multi-regional, multi-sectoral, applied general equilibrium model based on neo-classical microeconomic theory (Nowicki at al. 2007; Nowicki at al. 2009; van Meijl et al. 2006; Woltjer et al. 2014). It is an extended version of the standard GTAP model (Hertel 1997). The core of MAGNET is an input–output model, which links industries in value added chains from primary goods, over continuously higher stages of intermediate processing, to the final assembly of goods and services for consumption. Primary production factors are employed within each economic region, and hence returns to land and capital are endogenously determined at equilibrium, i.e., the aggregate supply of each factor equals its demand. On the consumption side, the regional household is assumed to distribute income across savings and (government and private) consumption expenditures according to fixed budget shares. Private consumption expenditures are allocated across commodities according to a non-homothetic CDE expenditure function and the government consumption according to Cobb-Douglas expenditure function.

The MAGNET model, in comparison to GTAP, uses a more general multilevel sector specific nested CES (constant elasticity of substitution) production function, allowing for substitution between primary production factors and (land, labor, capital and natural resources) and intermediate production factors and for substitution between different intermediate input components (e.g. energy sources, and animal feed components). MAGNET includes an improved treatment of agricultural sectors (like various imperfectly substitutable types of land, the land use allocation structure, a land supply function, substitution between various animal feed components, agricultural policy (like production quotas and different land related payments) and biofuel policy (capital-energy substitution, fossil fuels-biofuels substitution). On the consumption side, a dynamic CDE expenditure function is implemented which allows for changes in income elasticities when purchasing power parity (PPP)-corrected real GDP per capita changes. Segmentation and imperfect mobility between agriculture and non-agriculture labor and capital are introduced in the modelling of factors markets,
For more info: https://www.magnet-model.org/