

THE ENVISAGE MODEL

Dominique van der Mensbrugghe The World Bank

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Key design characteristics

- Participating model: <u>ENVIRONMENTAL IMPACT AND SUSTAINABILITY APPLIED GENERAL EQUILIBRIUM (ENVISAGE) MODEL</u>
- Model type: Integrated Assessment Model (IAM)—multi-sector global CGE model with MERGE-based climate module
- Participating modelers: Jianwu He, Ken Itakura, Denis Medvedev, Dominique van der Mensbrugghe
- *Time frame*: (Standard) 2004-2015, 2015-2050 (Δ 5), 2050-2100 (Δ 10)
- Solution type: Dynamic recursive
- Equilibrium type: Market general equilibrium
- Computing Framework: GAMS/PATH with Excel interface

Inputs and outputs

<u>Inputs</u>

- Demographics: Population and labor force (15-64) by country
- Economic: Substitution, price and income elasticities, savings elasticity wrt to dependency ratios, labor productivity
- Resources: Depletable resources for oil and gas, logistic supply functions for land and hydro
- **Technology**: Calibrated nested CES functions with AEEI, exogenous assumptions for 'backstops'—1st and 2nd generation biofuels, coal and gas CCS in electricity

Outputs

- Economic: GDP, factor and goods prices, output and trade
- Emissions: CO₂, CH₄, N₂0, F-gases by driver
- Climate: GHG concentration, radiative forcing and global mean temperature

Model dimensions and other details

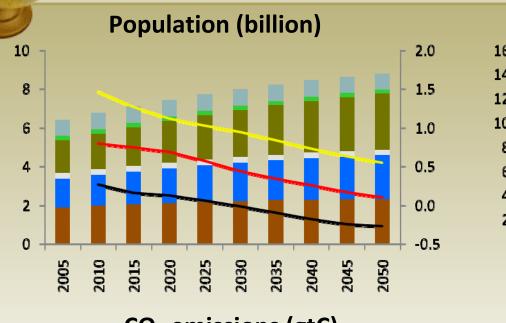
Model dimensions

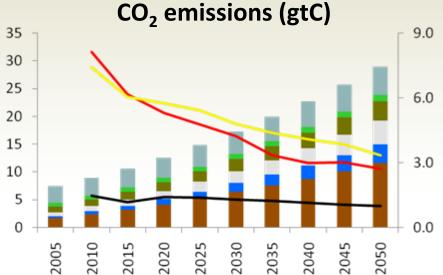
- Regional scope: Global with GTAP-based 'variable geometry' SASIA MODE INCLUDES CHN, IDN, MYS, PHL, THA, XEA, BGD, IND, PAK, XSA, RUS, XEC, JPN, KOR, RHA
- Sectoral scope: GTAP-based with supplemental electricity data (coal, oil & gas, hydro, nuclear, other)

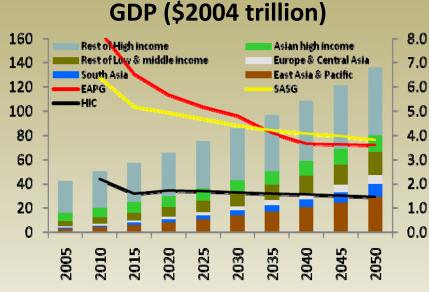
Other details

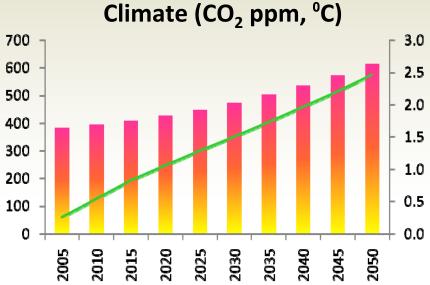
- Rigidities: Putty/semi-putty technology (vintage capital)
- Consumption: CDE/(E)LES/AIDADS
- Damages: Currently limited to agriculture (Cline estimates average of with- and without carbon fertilization)

Baseline assumptions









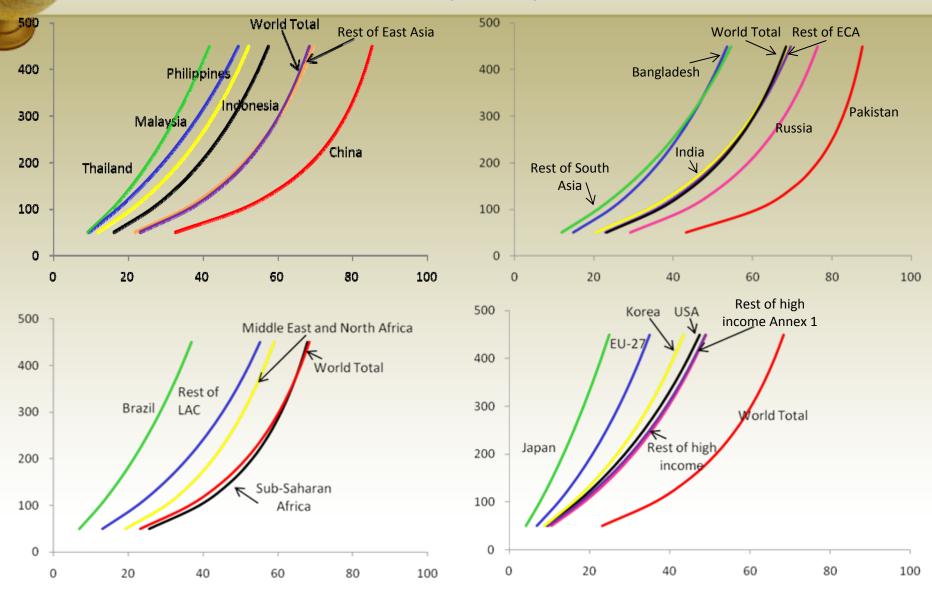
Agricultural damage impacts

Change in income in 2050 (%)

Change in agric. imports in 2050 (%)



MAC curve in 2050 (\$/tC)





Change in 2050 real income from uniform carbon tax

