

AIM Model Validation: Documentation & Availability

Model Name: Asia-Pacific Integrated Model (AIM)

Model type: Integrated Assessment Model (coupled economy, energy, land, climate system)

Model documentation: Full formulas can be found in the following free document or a book chapter.

https://www.researchgate.net/publication/303382176_AIMCGE_basic_manual

https://link.springer.com/chapter/10.1007/978-981-10-3869-3_13

Model availability: Upon request. We basically do training workshops for the users.

Model data availability: Same as above.

Community listserv: No

AIM Model Validation: Techniques

- **Hindcasting/cross-validation**
 - Energy model : Fujimori, et al. (2016)
- **Model intercomparisons:** Participation in EMF (for the current version since EMF30) as well as other model intercomparisons, e.g. CD-LINKS, AME, ADVANCE, LIMITS, AR5 and 1.5SR database.
- **Forecast trend comparison to history/“stylized facts”**

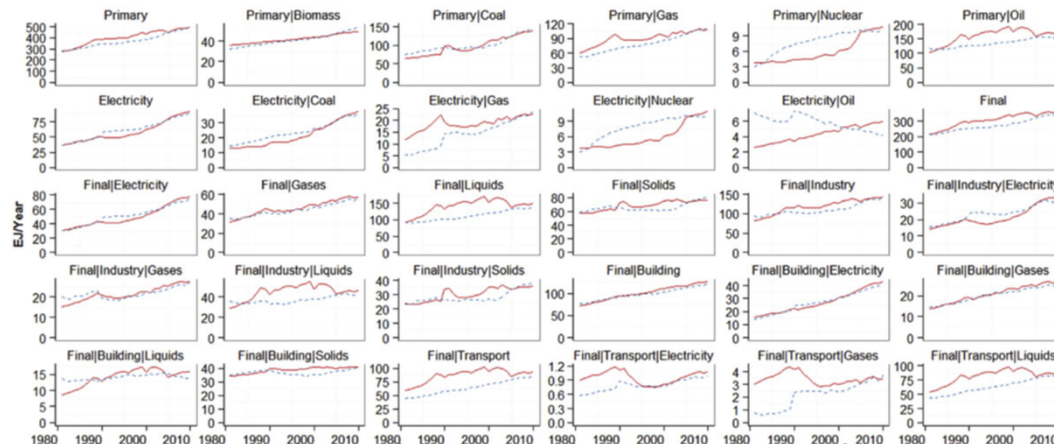


Fig. 1. World regional aggregated variables. Simulation and the observation are shown. The definition of the figure title is shown in Supporting Information in Fujimori et al. (2016).

GCAM Model Validation: Documentation & Availability

Model Name: Global Change Assessment Model (GCAM)

Model type: Integrated Assessment Model (coupled economy, energy, water, land, climate system)

Model documentation: <https://jgcri.github.io/gcam-doc/>; Peer reviewed publication: Calvin K.V., et al. 2018. "GCAM v5.1: Representing the linkages between energy, water, land, climate, and economic systems." *Geoscientific Model Development*.

Model availability: Open source.

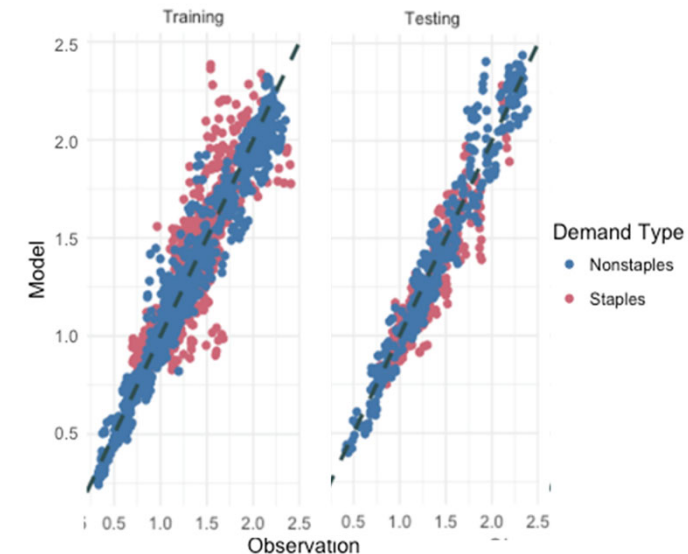
<http://www.globalchange.umd.edu/gcam/download/>

Model data availability: Open source.

Community listserv: <https://listserv.umd.edu/archives/gcam-community.html>

GCAM Model Validation: Techniques

- **Hindcasting/cross-validation**
 - GCAM consumer demand function: Edmonds, et al. (2017)
 - Yield impacts: (Waldhoff, et al. (2019)
 - Land-use model “hindcast”: Calvin, et al. (2017).
- **Model intercomparisons:** Participation in EMF since EMF12 as well as other model intercomparisons, e.g. CD-LINKS, AME, LAMP, AR5 database.
- **Forecast trend comparison to history/“stylized facts”**



Training and Testing Results for Consumer Demand Equations from Edmonds, et al. (2017).

REMIND: Availability and Documentation

Model name: Regionalized **M**odel of **I**nvestments and **D**evelopment (REMIND)

Model type: Integrated Assessment Model (coupled economy, energy, climate system)

Model documentation: <https://www.pik-potsdam.de/research/transformation-pathways/models/remind>;

https://www.iamcdocumentation.eu/index.php/Model_Documentation_-_REMIND

Model availability: Transparent source code - for the sole purpose of reading:

<https://www.pik-potsdam.de/research/transformation-pathways/models/remind/remind-source-code-registration>;

MAGPIE: Availability and Documentation



Model name: Model of **A**gricultural **P**roduction and its **I**mpact on the **E**nvironment (MAGPIE)

Model type: Integrated Assessment Model (land-use-system)

Model documentation: <https://doi.org/10.5281/zenodo.1471526>;

Peer reviewed publication: Dietrich JP, et al. (2019) *MAGPIE 4 - a modular open-source framework for modeling global land systems*. In: *Geoscientific Model Development*, 12 , 4. 1299-1317 p.

Model availability: Open Source at GitHub:
<https://github.com/magpiemodel/magpie>

REMIND-MAgPIE: Validation of coupled system

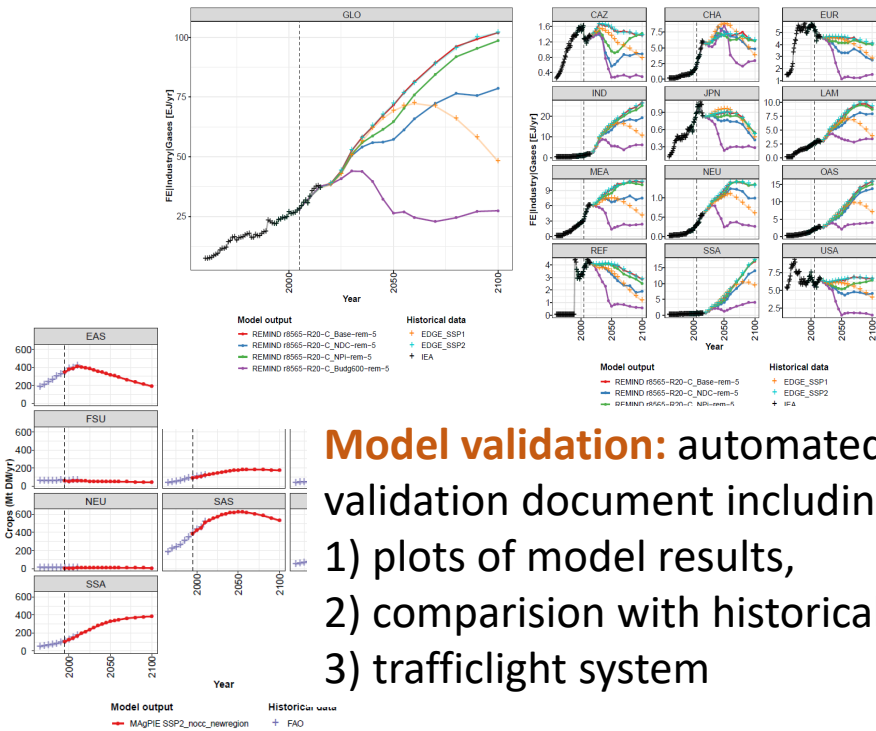
Model intercomparisons: Participation in model intercomparisons, e.g. CD-LINKS, AR5 database, ADVANCE (VRE integration, 1.5-2°C mitigation), EMF-27, EMF30, EMF33, [LIMITS / AMPERE / RoSE]

Model parts: sensitivity analysis for different parts of the model:

- **Economics:** Luderer, G. et al. “Economic Mitigation Challenges: How Further Delay Closes the Door for Achieving Climate Targets.” *Environmental Research Letters* 8, no. 3 (September 1, 2013)
- **Fossil sector:** Bauer, N. et al. “Global Fossil Energy Markets and Climate Change Mitigation – an Analysis with REMIND.” *Climatic Change* 136, no. 1 (May 2016)
- **Renewables:** Ueckerdt, F. et al. “Decarbonizing Global Power Supply under Region-Specific Consideration of Challenges and Options of Integrating Variable Renewables in the REMIND Model.” *Energy Economics* 64, no. Supplement C (May 1, 2017)

REMIND-MAgPIE: Validation of coupled system

Model calibration: calibrate REMIND to match GDP and final energy trajectories



Model validation: automated generation of validation document including

- 1) plots of model results,
- 2) comparison with historical data and trends and
- 3) trafficlght system

