

# Review

## Background

Integrated assessment models (IAMs) and energy-economy models have become central tools for informing decision makers and society at large about the choices for long-term global and regional climate mitigation strategies. There is an increasing demand for improved representations of complex energy, climate and land-use system interactions and thorough validation of model behavior in order to increase user confidence in climate policy assessments.

The ADVANCE project, sponsored by the European Commission under its 7<sup>th</sup> Framework Programme, responds to this demand by facilitating the development of a new generation of IAMs. In the past, methodological innovations and improvements in IAMs and their application to policy making were hindered by the difficulties in communicating complexities in modeling and data approaches. The ADVANCE project is trying to make a coordinated effort on improving model transparency, model validation, and data handling.

A central objective of ADVANCE is to provide harmonized documentation that elucidates the structure, assumptions, limitations and input data of all participating IAMs in the ADVANCE project. To make this effort useful beyond the immediate project participants it was decided to start a review process that involves both the broader modeling community as well as stakeholders interested in model results. Beyond the review process, it is planned to invite other modeling teams to also provide their model documentation in the harmonized format developed by the ADVANCE project consortium. So far, documentation for eight models is available and listed in Table 1 below.

## Objectives

As part of a consultation process with stakeholders involved in the ADVANCE project, it was decided as a first step to develop documentation at two levels of aggregation. It was envisaged that this approach would be particularly helpful for policy makers and other users of model results in understanding key differences between modeling approaches and the representation of different sectors in IAMs. It thus needs to be emphasized that this documentation was not designed to provide information at a level that would enable other researchers to rebuild models and reproduce the results of existing scenarios. However in principle, the current structure of the harmonized model documentation allows for providing extra information as part of appendices describing a model's mathematical formulation and input data, although no effort has been made to harmonize the extent or format to which such information is provided. Developing a documentation standard that would include model code as well as input datasets is a potential follow-up activity.

The two levels of aggregation for model documentation are described as:

- "Reference cards" which are designed to provide a quick overview of the most important model characteristics, in the form of bulleted lists and tables. The structure of these 2-page reference cards is identical for all participating models to facilitate an easy comparison of main features across models. The key aim of the reference cards was for an accessible document to provide insight for decision makers.
- More comprehensive documentation (some 30 pages) that use a standardized but flexible template, to describe the models' specificities. This documentation elucidates model structure, mathematical formulations, and to some extent relevant input data sets. In addition, there is the possibility to include appendices with more detailed information on, for example, mathematical formulations and data sets used. The audience for the documentation is energy-land-climate modelers, technical staff in government and firms, and PhD students and postdoctoral researchers new to the field.

The initial implementation of the documentation is based on a Wiki format (hosted by the ADVANCE partner University College London, UCL at <https://wiki.ucl.ac.uk/display/ADVIAM/Models>). The Wiki format was chosen so that changes can be made continuously to reflect model development beyond its current state. Figure 1 provides an overview of the Wiki's layout and hierarchical structure.

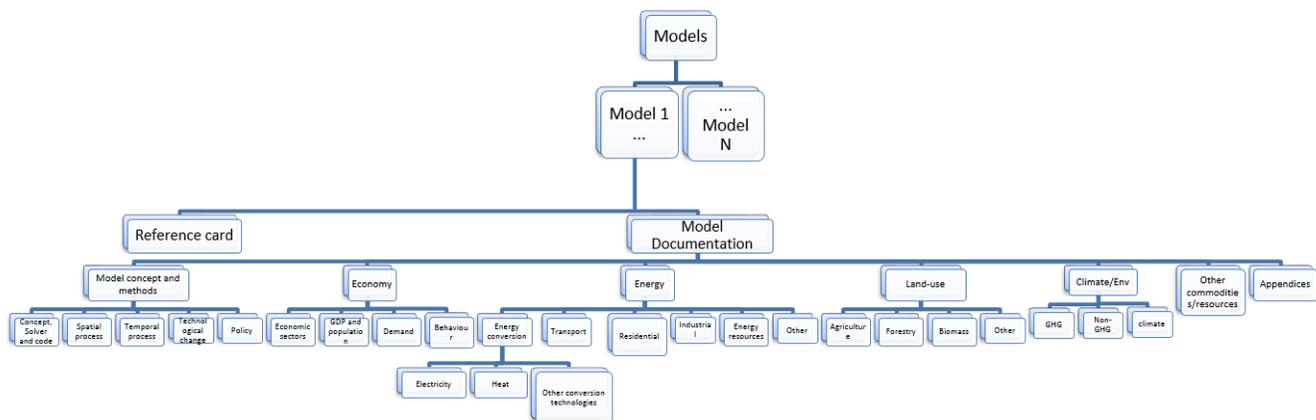


Figure 1: Layout of ADVANCE model documentation Wiki ( <https://wiki.ucl.ac.uk/display/ADVIAM/Models> ).

Table 1 below lists the models for which the harmonized Wiki documentation is currently available. Several other modeling teams associated with the ADVANCE project have also expressed an interest to provide model documentation in the some structure so the Wiki page has been set up to facilitate additional model descriptions.

Table 1: Existing harmonized model documentation by ADVANCE project partners in the Wiki.

Model	Institution	Country
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AIM/CGE	National Institute for Environmental Studies (NIES)	Japan
DNE21+	Research Institute of Innovative Technology for the Earth (RITE)	Japan
GEM-E3	Institute of Communication And Computer Systems (ICCS)	Greece
IMACLIM	Centre international de recherche sur l'environnement et le développement (CIRED)/Societe De Mathematiques Appliquees Et De Sciences Humaines (SMASH)	France
IMAGE	Ministerie Van Infrastructuur En Milieu (PBL)	Netherlands
MESSAGE	International Institute for Applied Systems Analysis (IIASA)	Austria
POLES	JRC - Joint Research Centre - European Commission (IPTS)	Belgium
REMIND	Potsdam Institut für Klimafolgenforschung (PIK)	Germany
TIAM-UCL	University College London (UCL)	UK
WITCH	Fondazione Eni Enrico Mattei (FEEM)	Italy

## Review Process

The review covers the documents that describe the structure of the harmonized model documentation for the reference cards and the 30-page documentation as well as the sample implementations by individual modeling teams. With this in mind the ADVANCE consortium seeks input on the following points:

- Is the overall structure of the reference cards and the 30-page documentation adequate for the target audience? (see also overview of Wiki structure in [PDF file](#))
- Are there any important topics and lists that are key for interpreting model behavior from a high level perspective that are missing in the reference cards?
- Are there any important sections/subsections missing in the 30-page documentation?
- In the sample implementations, should some topics be expanded or reduced in scope given the length limitations? If a sample implementation by a modeling team (overall or in a specific section) seems particularly well laid-out/put together, please highlight this.
- Is it useful to further harmonize/standardize the content of the 30-page documentation under additional headings, keeping in mind that model paradigms and structures are very heterogeneous?
- Is the Wiki format appropriate for providing model documentation of this sort or are reports, manuals or still other ways of publication preferred?

The comments directly relevant to the harmonized Wiki documentation will be used to inform a revision of the documentation structure, implementation and publication medium (Wiki vs. other options) in 2016. ADVANCE will also offer modeling teams that are non-consortium partners to include their harmonized model documentation in the ADVANCE Wiki. Beyond specific comments on the existing documentation within the scope it was designed for, comments on developing the area of harmonized model documentation further are also welcome. The latter will be used to inform further discussions on the topic of harmonized model documentation, but will not be able to be directly reflected in the revision of the harmonized model documentation within ADVANCE.

Review comments should be sent via e-mail to [advance-review@pik-potsdam.de](mailto:advance-review@pik-potsdam.de) by **15 October 2015**.

The ADVANCE Consortium.

## Downloads

- This description of the review process can also be downloaded ([PDF file](#)).
- Overview of ADVANCE model documentation Wiki structure ([PDF file](#)).