Project No 308329

ADVANCE
Advanced Model Development and Validation for Improved Analysis of Costs and Impacts of Mitigation Policies

FP7-Cooperation-ENV
Collaborative project

DELIVERABLE No 1.4
Report on open-access data sets on new IAM scenarios based on improved models

Due date of deliverable: December 2016
Actual submission date: December 2016

Start date of project: 01/01/2013 Duration: 48

Organisation name of lead contractor for this deliverable: PIK

Revision: 0

Project co-funded by the European Commission within the Seventh Framework Programme		
Dissemination level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No. 308329 (ADVANCE)

Open access database on ADVANCE synthesis modeling exercise

The Paris Agreement negotiated by the latest Conference of Parties in Paris in 2015 (COP21) is a fundamental milestone in international climate policy. It reinforces the objective of keeping global temperature rise well below 2°C, and of pursuing efforts to limit the temperature increase even further to 1.5°C above pre-industrial levels. Also, it provides a "bottom up" approach to climate change mitigation through the submission of Intended Nationally Determined Contributions (INDC) by each individual party. ADVANCE used the models that were methodologically enhanced in the course of the four-year project to produce new mitigation scenarios reflecting this novel post-Paris policy framework and established a valuable scenario database for further climate policy consulting.

ADVANCE produced a number of important and highly relevant model improvements, in particular with regards to (i) modeling of energy demand in the industry, transportation and buildings sectors, and the potential contribution of these sectors to climate change mitigation, (ii) the role of consumer behavior, (iii) the representation of taxes and subsidies in the energy sectors, (iv) the variability of wind and solar-based electricities, and options to overcome related integration challenges, and (v) the dynamics of technological change in the energy demand and supply sectors.

The goal of the ADVANCE synthesis modeling exercise was to apply the new and improved models to the analysis of climate change mitigation scenarios in the context of the recent developments in international climate policy. Specifically, the consortium explored post-Paris climate change mitigation pathways with a focus on the aggregate effect of the intended nationally determined contributions (INDCs), and the efforts required to achieve climate stabilization below the 2°C and 1.5°C levels.
To this end, it considered the set of scenarios along the two axis of (i) near-term policies and (ii) long-term stabilization targets, as presented in Table 1.

2030 Policy dimension		CO2 budget (2011-2050 cumulated)		
	Extended (no long-term target	Medium 2°C budget (1600 GtCO2 for 2011-2100)	Well below 2°C budget (1000 GtCO2 for 2011-2100)	1.5°C budget (400 GtCO2 for 2011-2100)
No-policy	NoPolicy			
Reference policies, not accounting for the effect of the INDCs	Reference	Ref2020_1600	Ref2020_1000	Ref2020_400
Intended nationally determined contributions	INDC	INDC2030_1600	INDC2030_1000	INDC2030_400

Table 1: Overview of scenarios considered for the ADVANCE Synthesis exercise.

For near-term policies, we considered the following cases:

- ***No Policy:*** counterfactual scenarios without any climate policies;
- ***Reference:*** pre-existing climate and energy policies, not accounting for the additional effect of the INDCs;
- ***INDC:*** scenario accounting for the effect of the INDCs until 2030 and extrapolating their effort beyond 2030) presented in Table 1.

To explore differential mitigation challenges in pathways with alternative long-term stabilization targets in the 1.5-2°C range, we considered three different target stringencies using varying constraints on cumulative long-term (2011-2100) CO2 emission levels:

- ***Medium 2°C:*** Long-term cumulative CO2 emissions budget (time horizon 2011-2100) of 1600 GtCO2, resulting in a more likely than not chance of keeping global warming to below 2°C
- ***Well below 2°C:*** Long-term cumulative CO2 emissions budget (time horizon 2011-2100) of 1000 GtCO2, resulting in a likely chance of keeping global warming to below 2°C, with best-guess end-of-century estimates of warming of around 1.7°C
- ***1.5°C by 2100***: Long-term cumulative CO2 emissions budget (time horizon 2011-2100) of 400 GtCO2, resulting in a likely chance of returning global warming to below 1.5°C, with best-guess end-of-century estimates of warming of around 1.4°C. Most of these pathways result in a temporary overshoot of the 1.5°C level, typically to a level of around 1.6°C.

A total of eight integrated energy-economy-climate modeling systems participated in this exercise, as listed in Table 2 below. All these are well established in the field of climate and energy policy analysis. A detailed and comparative description of the models can be found at the ADVANCE model documentation wiki http://themasites.pbl.nl/models/advance/index.php/ADVANCE_wiki

Model	Model type	Disaggregated economic sectors	Land use emissions	GHG coverage
POLES	Energy system-PE[1] model	No	Yes	All
MESSAGE	Energy system – GE growth model	No	Yes	All
GEM-E3-ICCS	Computable GE model	Yes	No	All
IMACLIM	Computable GE model	Yes	No	Only CO2
REMIND	Energy system – GE growth model	No	Yes	All
IMAGE	Energy-Land PE model	No	Yes	All
WITCH	Energy system – GE growth model	No	Yes	All
AIM/CGE	Computable GE model	Yes	Yes	All

Table 1: Overview of integrated energy-economy-climate modeling systems that participated in the scenario exercise. PE: partial equilibrium models, GE: general equilibrium models.

Disclaimer
A preliminary and password-protected version of the scenario database is available at https://tntcat.iiasa.ac.at/ADVANCEWP6DB/dsd?Action=htmlpage&page=welcome. As of December 2016 the scenario database is project-internal as scenario results are still under review for publication in scientific journals. Once these results are published, the final version of the scenario database will be made available via the ADVANCE project website at http://www.fp7-advance.eu/.