

Setting a 1000 GtCO₂ carbon budget in GAMS DICE 2023 model

Loïs Miraux

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This document outlines the modifications made on the GAMS DICE 2023 model to set a constraint on the carbon budget (2020-2100) at 1000 GtCO₂. The constraint was set on CO₂ emissions without including other greenhouse gases (not CO₂ equivalent).

Modifications

Modification description	File	Lines
Modification of the simulation period to 80 years (17x5 steps)	DICE2023-b-4-3-10.gms	7
Added CCO2TOT variable for total CO ₂ emissions (GtCO ₂)	DICE2023-b-4-3-10.gms	127
Added CCO2TOTEQ equation definition for cumulative total CO ₂ emissions	DICE2023-b-4-3-10.gms	142
Added cco2toteq equation	DICE2023-b-4-3-10.gms	176
Added initial condition for CCO2TOT	DICE2023-b-4-3-10.gms	211
Created new file defining scenario with carbon budget constraint	def-cco2tot1000-b-3-2-1.gms	-
Created new file for generating outputs for the newly defined scenario	put-cco2tot1000-b-3-2-1.gms	-
Added specifications of outputs to generate for the newly defined scenario	put_list_module-b-4-3-10.gms	97-98
Added calls to relevant files in scenario manager	Putlong-4-3-10.gms	18-21

Results

The following figures show the cumulative CO₂ emissions and average temperature increase for the simulation with a 1000 Gt constraint on the carbon budget, along with those of the reference 2°C and 1.5°C scenarios. It can be clearly seen that the model effectively respects the set constraint.

