

Assessing the impacts of endogenous behavioural change on food demand in a feedback-based global integrated assessment model

Supplementary Information

Documentation of the system of ordinary differential equations used to operationalize the endogenous behavioural change framework, as well as the EMB ensemble baseline simulations (without any future policy interventions) for key system indicators, are provided in:

Rajah, J.K., Blanz, B., Kopainsky, B., Schoenberg, W., 2025. An endogenous modelling framework of dietary behavioural change in the fully coupled human-climate FRIDA v2.1 model. *Geosci. Model Dev.* 18, 5997–6022. <https://doi.org/10.5194/gmd-18-5997-2025>

The FRIDA v2.1 model can be obtained from the following Github repository:

<https://github.com/metno/WorldTransFRIDA>

Policy multipliers introduced to the model in this study are located in the Behavior Change Policy submodule within the Behavioral Change top-level module:

Behavior_Change_Policy:
APD_climate_attribution_policy[Run] = IF climate_attribution_policy_switch AND TIME > climate_attribution_policy_start_year THEN 1 + SMTH3(STEP(APD_climate_attribution_policy_effect_multiplier, climate_attribution_policy_start_year), climate_attribution_policy_time_to_fully_take_effect) ELSE 1 UNITS: dmn1
APD_climate_attribution_policy_effect_multiplier[Run] = 0.2 UNITS: dmn1
APD_consumption_risk_policy[Run] = IF consumption_risk_policy_switch AND TIME > consumption_risk_policy_start_year THEN 1 + SMTH3(STEP(APD_consumption_risk_policy_effect_multiplier, consumption_risk_policy_start_year), consumption_risk_policy_time_to_fully_take_effect) ELSE 1 UNITS: dmn1
APD_consumption_risk_policy_effect_multiplier[Run] = 0.3 UNITS: dmn1
APD_cultural_revaluation_policy[Run] = IF cultural_revaluation_policy_switch AND TIME > cultural_revaluation_policy_start_year THEN 1 - SMTH3(STEP(APD_cultural_revaluation_policy_effect_multiplier, cultural_revaluation_policy_start_year), cultural_revaluation_policy_time_to_fully_take_effect) ELSE 1 UNITS: dmn1
APD_cultural_revaluation_policy_effect_multiplier[Run] = 0.2 UNITS: dmn1
APD_value_shift_policy[Run] = IF value_shift_policy_switch AND TIME > value_shift_policy_start_year THEN 1 - SMTH3(STEP(APD_value_shift_policy_effect_multiplier, value_shift_policy_start_year), value_shift_policy_time_to_fully_take_effect) ELSE 1 UNITS: dmn1
APD_value_shift_policy_effect_multiplier[Run] = 0.3 UNITS: dmn1
climate_attribution_policy_start_year = 2030 UNITS: year

climate_attribution_policy_switch = 0 UNITS: dmn1
climate_attribution_policy_time_to_fully_take_effect[Run] = 10 UNITS: years
consumption_risk_policy_start_year = 2030 UNITS: year
consumption_risk_policy_switch = 0 UNITS: dmn1
consumption_risk_policy_time_to_fully_take_effect[Run] = 10 UNITS: years
CRP_climate_attribution_policy[Run] = IF climate_attribution_policy_switch AND TIME > climate_attribution_policy_start_year THEN 1 + SMTH3(STEP(CRP_climate_attribution_policy_effect_multiplier, climate_attribution_policy_start_year), climate_attribution_policy_time_to_fully_take_effect) ELSE 1 UNITS: dmn1
CRP_climate_attribution_policy_effect_multiplier[Run] = 0.2 UNITS: dmn1
cultural_revaluation_policy_start_year = 2030 UNITS: year
cultural_revaluation_policy_switch = 0 UNITS: dmn1
cultural_revaluation_policy_time_to_fully_take_effect[Run] = 20 UNITS: years
TFD_climate_attribution_policy[Run] = IF climate_attribution_policy_switch AND TIME > climate_attribution_policy_start_year THEN 1 + SMTH3(STEP(TFD_climate_attribution_policy_effect_multiplier, climate_attribution_policy_start_year), climate_attribution_policy_time_to_fully_take_effect) ELSE 1 UNITS: dmn1
TFD_climate_attribution_policy_effect_multiplier[Run] = 0.2 UNITS: dmn1
TFD_consumption_risk_policy[Run] = IF consumption_risk_policy_switch AND TIME > consumption_risk_policy_start_year THEN 1 + SMTH3(STEP(TFD_consumption_risk_policy_effect_multiplier, consumption_risk_policy_start_year), consumption_risk_policy_time_to_fully_take_effect) ELSE 1 UNITS: dmn1
TFD_consumption_risk_policy_effect_multiplier[Run] = 0.3 UNITS: dmn1
TFD_cultural_revaluation_policy[Run] = IF cultural_revaluation_policy_switch AND TIME > cultural_revaluation_policy_start_year THEN 1 - SMTH3(STEP(TFD_cultural_revaluation_policy_effect_multiplier, cultural_revaluation_policy_start_year), cultural_revaluation_policy_time_to_fully_take_effect) ELSE 1 UNITS: dmn1
TFD_cultural_revaluation_policy_effect_multiplier[Run] = 0.2 UNITS: dmn1
TFD_value_shift_policy[Run] = IF value_shift_policy_switch AND TIME > value_shift_policy_start_year THEN 1 - SMTH3(STEP(TFD_value_shift_policy_effect_multiplier, value_shift_policy_start_year), value_shift_policy_time_to_fully_take_effect) ELSE 1 UNITS: dmn1
TFD_value_shift_policy_effect_multiplier[Run] = 0.15 UNITS: dmn1
value_shift_policy_start_year = 2030 UNITS: year
value_shift_policy_switch = 0 UNITS: dmn1
value_shift_policy_time_to_fully_take_effect[Run] = 10 UNITS: years