MAgPIE Workshop 2025

First steps: Update model settings

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Last tutorial…

… you learned how to start a default MAgPIE run

But what are the default settings and how can you change them?

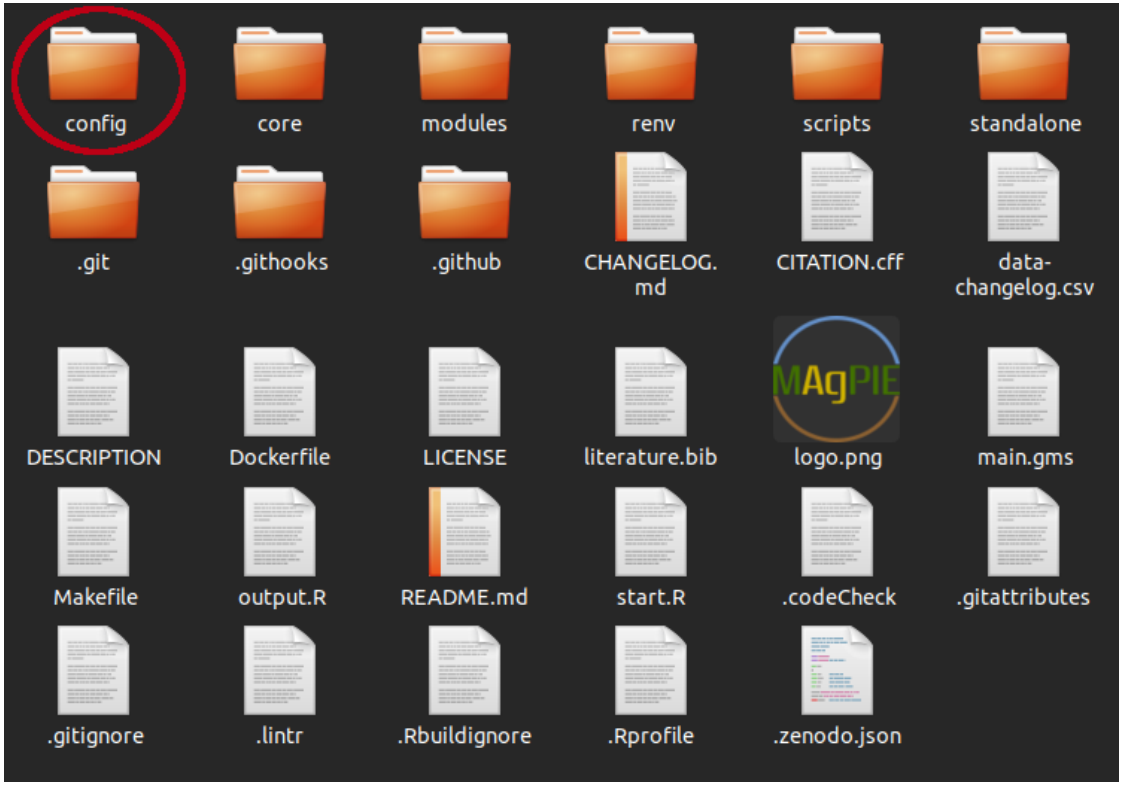
➡ The MAgPIE configuration file *(default.cfg)*

In this tutorial…

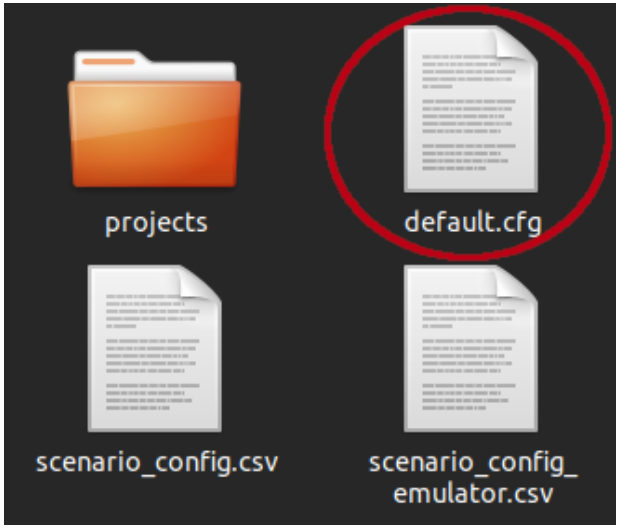
… you will learn

- where to find the MAgPIE configuration file
- how the MAgPIE configuration file is structured
- how to update model settings using the MAgPIE configuration file
- how to start a model run using the updated settings

Where is the MAgPIE config file?



Main folder of the MAgPIE model



The MAgPIE config folder

First lines of the MAgPIE config file:

```
# |  (C) 2008-2025 Potsdam Institute for Climate Impact Research (PIK)
# |  authors, and contributors see CITATION.cff file. This file is part
# |  of MAgPIE and licensed under AGPL-3.0-or-later. Under Section 7 of
# |  AGPL-3.0, you are granted additional permissions described in the
# |  MAgPIE License Exception, version 1.0 (see LICENSE file).
# |  Contact: magpie@pik-potsdam.de

##################
#### SETTINGS ####
##################

cfg <- list()

#### Main settings ####

# short description of the actual run
cfg$title <- "default"

# path to the submodel to be used relative to main model folder
cfg$model <- "main.gms"   #def = "main.gms"

#### input settings ####

# which input data sets should be used?
cfg$input <- c(regional    = "rev4.118_h12_magpie.tgz",
               cellular    = "rev4.118_h12_1b5c3817_cellularmagpie_c200_MRI-ESM2-0-ssp245_lpjml-8e6c5eb1.tgz",
               validation  = "rev4.118_h12_validation.tgz",
               additional  = "additional_data_rev4.62.tgz",
               calibration = "calibration_H12_FAO_13Mar25.tgz")
```

Content and structure of the MAgPIE config file

The config file contains all MAgPIE settings that are not fixed in the model

- **metadata settings** (e.g. the title of the model run, *cfg$title*)
- **technical settings** (e.g. the maximum number of iterations if precision goal is not met, *cfg$calib_maxiter*)
- **module settings** (e.g. which SSP scenario should be used for population projections, *cfggmsc09_pop_scenario*)
- **output and model reporting settings** (e.g. which output-scripts should be run, *cfg$output*)

Core components of the MAgPIE config file

cfg$title	Model run title	X
cfg$model	Path to the submodel (relative to main model folder)	
cfg$input	Input data source	
cfg$repositories	Repository containing input data	
cfg$force_download	Should data be downloaded even if inputs didn't change?	
cfg$force_replace	Should existing output folder be replaced if a new run with the same name is started?	
cfg$recalibrate	Should yields be recalibrated?	
cfg$calib_cropland	Switch for cropland calibration	
cfg$recalibrate_landconversion_cost	Should land conversion cost be calibrated	
cfg$recalc_npi_ndc	Settings for NPI/NDC recalculation	
cfg$policyregions	National or sub-national mapping	

cfg$gms	List of module settings	X
cfg$magicc_emis_scen	Scenario for coupling with MAGICC for emissions outside the food system	
cfg$sequential	Should runs be made sequentially or in parallel?	
cfg$logoption	Log information	
cfg$output	Output scripts that should be used	X
cfg$results_folder	Results folder name	
cfg$files2export	Files copied to output folder	
cfg$runstatistics	Folder run statistics location	
cfg$model_name	Name of the overall model	
cfg$info	List of additional information characterizing the run	
cfg$developer_mode	Developer mode	
cfg$debug	Debugging mode	

Changing the run title

- the title of the run is defined by the setting *cfg$title*, which can be found on line 17 of the default.cfg file

```
15
16  # short description of the actual run
17  cfg$title <- "default"
18
```

- you can change the run title by replacing “default” with a title of your choice, e.g.

```
15
16  # short description of the actual run
17  cfg$title <- "magpieWorkshopPIK"
18
```

Changing the module settings cfg$gms

- a few settings are relevant to all modules, e.g. which time steps should be used, *cfggmsc_timesteps*

```
131
132  # Set number of time steps (1-16) or type "less_TS" for remind time steps
133  cfg$gms$c_timesteps <- "coup2100"
134
```

  - coup2100 refers to a set defined in the GAMS code, you can find it's definition by opening the file **core/sets.gms** (from the main MAgPIE model folder), and searching for "coup2100"

```
181  set t(t_all) Simulated time periods
182  $If "%c_timesteps%"== "less_TS" /y1995,y2000,y2005,y2010,y2015,y2020,y2025,y2030,y2035,y2040,y2045,y2050,y2055,y2060,y2070,y2080,y2090,y2100,y2110,y2130,y2150/;
183  $If "%c_timesteps%"== "coup2100" /y1995,y2000,y2005,y2010,y2015,y2020,y2025,y2030,y2035,y2040,y2045,y2050,y2055,y2060,y2070,y2080,y2090,y2100/;
184  $If "%c_timesteps%"== "test_TS" /y1995,y2000,y2005,y2010,y2020,y2030,y2040,y2050,y2070,y2090,y2110,y2130,y2150/;
185  $If "%c_timesteps%"== "TS_benni" /y1995,y2000,y2005,y2010,y2020,y2030,y2040,y2050/;
186  $If "%c_timesteps%"== "TS_WB" /y1995,y2000,y2005,y2010,y2020,y2030,y2040,y2050,y2060,y2070,y2080/;
187  $If "%c_timesteps%"== "5year" /y1995,y2000,y2005,y2010,y2015,y2020,y2025,y2030,y2035,y2040,y2045,y2050,y2055,y2060,y2065,y2070,y2075,y2080,y2085,y2090,y2095,y2100/;
188  $If "%c_timesteps%"== "5year2050" /y1995,y2000,y2005,y2010,y2015,y2020,y2025,y2030,y2035,y2040,y2045,y2050/;
189  $If "%c_timesteps%"== "5year2070" /y1995,y2000,y2005,y2010,y2015,y2020,y2025,y2030,y2035,y2040,y2045,y2050,y2055,y2060,y2065,y2070/;
190  $If "%c_timesteps%"== "quicktest" /y1995,y2010,y2025/;
191  $If "%c_timesteps%"== "quicktest2" /y1995,y2020,y2050,y2100/;
192  $If "%c_timesteps%"== "calib" /y1995,y2000,y2005,y2010,y2015/;
```

Changing the module settings cfg$gms

- a few settings are relevant to all modules, e.g. which time steps should be used, *cfggmsc_timesteps*
- then, each module has its own section in the config file, where the module realization is chosen, and (if necessary) additional module parameters are set

```
# ***--------------------    13_tc    ----------------------------------------
# * (endo_jan22): endogenous technological change with full cost accounting and
# *               stepwise updated crop and managed pastures area information
# * (exo): exogenous technological change (removes non-linearities from the model);
# *     requires an existing model run with endo tc for generating the input file
# *     f13_tau_scenario.csv
cfg$gms$tc <- "endo_jan22"              # def = endo_jan22

# * tc cost scenario crops: low, medium or high
cfg$gms$c13_tccost <- "medium"    # def = medium

# * ignore historical tau (1) or use it as lower bound (0)
cfg$gms$s13_ignore_tau_historical <- 1    # def = 1

# * Maximum regional tech cost expressed as share of regional GDP
# *   A meaningful value would be 0.002. However, this bound causes infeasibilities in some cases.
# *   Therefore, this bound is not used in the current model version.
cfg$gms$s13_max_gdp_shr <- Inf # def = Inf
```

description of module realizations

realization setting

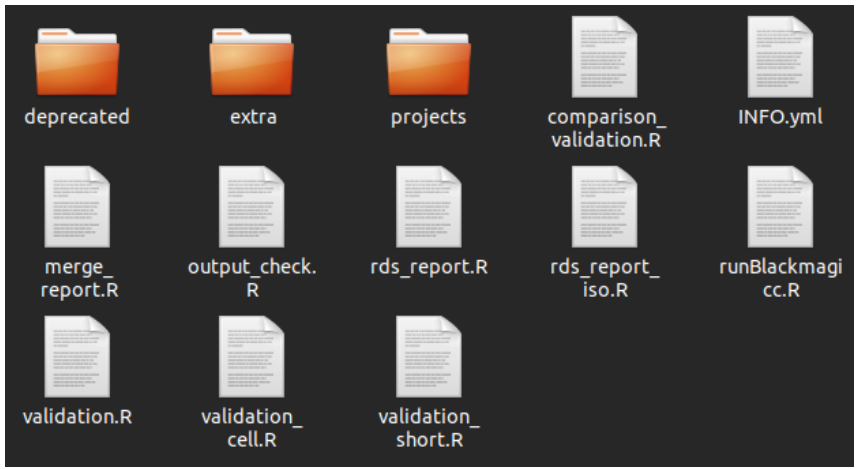
additional module parameters

Changing which output scripts should be run

- *cfg$output* defines which output script should be run:

```
2226  # Should output.R generate output?
2227  # List of output scripts that should be used
2228  # Available scripts can be found in scripts/output/
2229  cfg$output <- c("output_check", "extra/disaggregation", "rds_report")
```

- available scripts can be found in scripts/output/:



- descriptions are included within the output script files, e.g. for output_check:

```
1  # |  (C) 2008-2025 Potsdam Institute for Climate Impact Research (PIK)
2  # |  authors, and contributors see CITATION.cff file. This file is part
3  # |  of MAgPIE and licensed under AGPL-3.0-or-later. Under Section 7 of
4  # |  AGPL-3.0, you are granted additional permissions described in the
5  # |  MAgPIE License Exception, version 1.0 (see LICENSE file).
6  # |  Contact: magpie@pik-potsdam.de
7
8  # ------------------------------------------------------------
9  # description: check output for known problems
10 # comparison script: FALSE
11 # position: 1
12 # ------------------------------------------------------------
13
14
15 library(magpie4,  quietly = TRUE)
16
17 ############################# BASIC CONFIGURATION ##############################
18 if(!exists("source_include")) {
19   outputdir <- ""
20   readArgs("outputdir")
21 }
22
23 gdx <- file.path(outputdir,"fulldata.gdx")
24 ################################################################################
25
26 magpie4::outputCheck(gdx)
27
```

Starting a run with updated settings

- in general, all settings in the MAgPIE config file are set to default values, therefore the name *default.cfg*
- settings can easily be changed by editing the configuration file, e.g. changing the title from `cfg$title <- "default"` to `cfg$title <- "magpieWorkshopPIK"` (line 17)
- once the *default.cfg* file is edited, starting the model using the default start script (as done in the last tutorial) will use the updated model settings
  - in the main model folder, execute Rscript start.R in a terminal or source("start.R") within R
  - type 1 and confirm via Enter to choose the *default start script*
  - again, type 1 and confirm via Enter to choose *direct execution*

Normally, the *default.cfg* file is not directly edited, but settings are changed using a start script, which will be explained in the next tutorial

Exercises

1) By editing the corresponding setting in the default.cfg file, change the title of the model run to contain your affiliation (e.g. "magWorkshop_PIK").

2) By editing the corresponding setting in the default.cfg file, change the model time steps to the set "quicktest". Additionally, find out which years are include in this set (without running the model).

3) By editing the corresponding setting in the default.cfg file, change the model configuration such that only the output script "output_check" is run.

4) Start a MAgPIE run using the updated model settings from exercises 1-3.