Getting started with TNO – EXIOMOD 2.0

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THIS MODEL IS A CUSTOM-LICENSE MODEL.

EXIOMOD 2.0 shall not be used for commercial purposes until an exploitation agreement is signed, subject to similar conditions as for the underlying database (EXIOBASE). EXIOBASE limitations are based on open source license agreements to be found here:

http://exiobase.eu/index.php/terms-of-use

For information on a license, please contact: hettie.boonman@tno.nl

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| 1. **Install gams**  * Go to <https://www.gams.com/download/> and follow installation instructions. * For running EXIOMOD 2.0, a license is needed. Make sure that you have a license that includes solver PATH, used for mixed complementary problems (MCP). |

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| 1. **Clone TNO-ECO-MOD-CI repository to local computer**   The model EXIOMOD 2.0 can be found on the TNO-ECO-MOD-CI repository of TNO.  There are many ways to clone a repository to your computer, we describe one of them below.   * Install Github Desktop via <https://desktop.github.com/> and follow installation instructions.   After installation:   * In the taskbar of Github Desktop, go to ‘File’ 🡪 ‘Clone Repository’. You will see this screen:      * Go to tab ‘URL’. Here you have to copy the project link. This project link you can find at ci.tno.nl. You have to log in with your own gitlab username and password and open the TNO-ECO-MOD-CI repository. On the right side of the page, there is a blue button that says ‘Clone’. Copy the HTTPS link. Paste this link in the top bar that says ‘URL or username/repository’. * Create a folder on your own PC where you like to have the EXIOMOD documents. The link to this local folder you copy-paste in the bar that says ‘repository path’. * Click on ‘Clone’ and the cloning will start.   There are several branches. You are currently in the master branch. Via the bar below the taskbar in Github desktop you can switch branches.     * This example screen shot shows an example of another branch (‘Study\_CICERONE\_balanced\_table’) . The dropdown menu allows to switch the branch to another branch, however only when all changes made to the current branch are committed and pushes to the origin. * Pushing and pulling is done via the ‘Fetch origin’ button. * Creating a new branch can be done via the taskbar: ‘Branch’🡪 ‘New branch’. |

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| 1. Make your computer ready for running the EXIOMOD model  * Go to your local path where the EXIOMOD documents are cloned to. * Open GAMS. In the taskbar, go to ‘File’ 🡪 ‘Project’ 🡪 ‘New Project’. Create a file TNO-Eco-Mod.gpr. This will be your GAMS project file. It will be stored locally on your computer and it will not be synched. When you switch branches, it will still be in your local folder. * TNO-Eco-Mod.gpr will automatically be opened in GAMS. You know that the right project folder is opened in GAMS by looking at the project folder name right above the taskbar on the very top of the GAMS window. This project folder name should end with ‘.gpr’. |

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| 1. Getting to know the different files in EXIOMOD   (More explanation on the model can be found in the folder ‘**documentation**’. Below a brief overview of the model is given.)  **The file run\_EXIOMOD.gms**   * Open run\_EXIOMOD.gms. This is the main file from which you run the model. Only files that are placed in the same folder as the currently opened .gpr file can be runned via GAMS. This file calls several other files via the $include command.   + **Configuration.gms.** This file specifies several model options and specification of your project.     - For each project you should give your project folder a name. For example ‘project\_example’. Make sure that the name in configuration.gms matches the folder name on your computer. This folder is placed directly in the local path folder where you cloned the repository to.     - EXIOMOD is a modular model, it allows to switch on and off several modules. In configuration.gms you specify your model choices.   + **EXIOMOD\_base\_model/scr/00\_base\_model\_prepare.gms.** This file includes all the different files that are necessary to run the base model. This includes equations, variables, sets (e.g. dimensions of the database). All files that are called from 00\_base\_model\_prepare.gms are located in the folder EXIOMOD\_base\_model/scr.     - **01\_sets\_database.gms** Includes all sets that are used to upload the database EXIOBASE 3.0. For example, a set with 49 regions, a set with 200 products, a set with 163 industries etc.     - **02\_load\_database.gms** Once the dimensions of the database are defined, the database EXIOBASE 3.0 can be uploaded.     - **02A\_checks\_database.gms** In order to run the model without errors, all data checks should be fulfilled.     - **03\_sets\_model** The model EXIOMOD is never run on all products, industries and regions, this will take too much computational time. Dimensions of the aggregated database are defined in this gams file. This gams file explains the location of the text files that includes the sets for the model. These can be found in the project-specific folder (for example ‘project\_example’).     - **04\_aggregation\_database.gms** Aggregation of the database based on sets defined in 03\_sets\_model.     - **05\_module\_demand\_CES.gms** or **05\_module\_demand\_CES.gms** Depending on the choice that is made in configuration.gms, one of these files defines the demand module. This file includes equations, variables and model setup.     - **06\_module\_production\_KL.gms** or **06\_module\_production\_KL-E.gms** Depending on the choice that is made in configuration.gms, one of these files defines the production module. This file includes equations, variables and model setup.     - **07\_module\_trade.gms** The trade module.     - **08\_module\_closure.gms** Closure of the model, includes equations and variables that equate total demand to total supply.     - **09\_declare\_model.gms** Defines three models, two input-output-models and one extended input-output model.   + **%project%/00\_base\_model\_setup/scr/read\_extradata.gms**   This file includes all external data that is necessary for your model run. Not that %project% refers to the project name that you gave to your project in configuration.gms. The data, sets and scrips for the external data are placed in this project-specific folder under ‘01\_external\_data’.   * + **%project%/02\_project\_model\_setup/scr/simulation\_example.gms**   This file runs your simulation. It contains the solve statement for the model. This file also contains all the shocks that a user might like to add to its model. Also, it allows the user to add equations and or variables to the model. A user might decide to create different simulation files for different model scenarios.  **Folder structure**  The main folder contains of three folders:   * Documentation: Contains some templates and some README files. * EXIOMOD\_base\_model: Contains the base model with all equations, variables and model setup. Ideally, one should not make any changes to this folder. Unless you like to change the database for example. * Project\_example: this is the folder in which you place project specific files. This is the only folder in which you make changes.   EXIOMOD\_base\_model contains the following folders:   * Scr: Script files of the base model, explained above. * Sets: Contains text files with dimensions the database. These are uploaded in gams file 01\_sets\_database.gms under scr. * Utils: Additional script files that are used in the base model.   Project folder, for example ‘project\_example’, contains the following folders:   * 00\_base\_model\_setup : contains sets and scripts to adjust the dimensions of the large database EXIOBASE 3.0 to the needs of the user. * 01\_external\_data: Place all external data in this folder that is needed for you project. * 02\_project\_model\_setup: Includes all simulation files * 03\_simulation\_results: Includes result files   Each of these folders contains the following structure:   * Sets: folder with text documents with sets and aggregation of sets. * Scr: gams files. * Data: data that might be uploaded in one of the files in scr. |