

Description of the Excel files required to calculate the time-differentiated climate impacts associated with direct biogenic carbon dioxide and indirect greenhouse gas emissions from the bark conversion pathways

Excel file “*carbon_content.xlsx*”:

The file contains data on the carbon content of the bark-based fractions in the stand-alone and integrated biorefinery, as well as the combustion scenario. In addition, it includes the years in which end-of-life emissions occur.

Excel file “*dynamic_characterisation_factors_Levasseur100.xlsx*”:

The file contains the dynamic characterisation factors for CO₂, CH₄, and N₂O extracted from Levasseur et al. (2010) and used in the ALIGNED guidelines. See manuscript for references.

Excel file “*lci_data.xlsx*”:

The file contains the life cycle inventory data for the biorefinery and combustion scenarios as well as the consequential ecoinvent v.3.9 datasets used in the modelling.

Excel file “*indirect_GHG_emissions_bg_complete.xlsx*”:

The file contains inventory data extracted from the Activity Browser for all scenarios, comparing the influence of different background databases. The data were obtained for both the biorefinery and combustion scenarios using the following consequential databases:

- Conventional ecoinvent v.3.9 (ei39)
- REMIND-SSP2-Base-2045 (R2B)
- REMIND-SSP2-PkBudg500-2045 (R2Pk)
- REMIND-SSP1-PkBudg500-2045 (R1Pk)
- IMAGE-SSP2-Base-2045 (I2B)

First, the inventories were imported into the sheets “data_ei39”, “data_R2B”, “data_R2Pk”, “data_R1Pk”, and “data_I2B”. These sheets contain a comprehensive list (2,420–2,430 rows) of all substances emitted to or absorbed from the environment as a result of bark conversion (biorefinery or combustion), considering only indirect emissions from the supply chain.

Next, the inventories were filtered to extract only CO₂, CH₄, and N₂O emission flows, which are relevant for the time-dependent climate impact assessment. The extracted values were compiled in the sheets “summary_ei39”, “summary_R2B”, “summary_R2Pk”, “summary_R1Pk”, and “summary_I2B”.

Finally, the values were arranged for each greenhouse gas (GHG) in a format compatible with the Jupyter Notebook NB2-part2, which is used to calculate time-dependent climate impacts. The separation of the three GHGs ensures that the appropriate dynamic characterization factors can be applied to each emission type.

The Excel file “*indirect_GHG_emissions_bg.xlsx*” corresponds to a simplified version containing the final values per GHG, formatted for import in the Jupyter Notebook NB2-part2 (to reduce the size of the file to be opened in NB2).

Excel file “indirect_GHG_emissions_geoloc_complete.xlsx”:

Similar to the description above, the file contains the raw inventory data extracted using the Activity Browser, a summarised version for CO₂, CH₄, and N₂O emissions only, and a final version per GHG, formatted to be easily imported in the Jupyter Notebook NB2-part2 for the calculation of time-dependent climate impacts.

The file contains the data for all the geographical locations compared in the sensitivity analysis, namely: ei39 (baseline considering SE and RER as geographical locations for the processes and waste treatment processes, respectively), SE, NO, FI, DK, FR, DE, BE, LU, NL, AT, and RER.

The Excel file “indirect_GHG_emissions_geoloc.xlsx” corresponds to a simplified version containing the final values per GHG, formatted for import in the Jupyter Notebook NB2-part2 (to reduce the size of the file to be opened in NB2).

Excel file “indirect_GHG_emissions_losses_complete.xlsx”:

Similar to the description above, the file contains the raw inventory data extracted using the Activity Browser, a summarised version for CO₂, CH₄, and N₂O emissions only, and a final version per GHG, formatted to be easily imported in the Jupyter Notebook NB2-part2 for the calculation of time-dependent climate impacts.

The file contains the data for the percentage of change in biomass losses tested in the sensitivity analysis, namely: 0%, 20%, 40%, 60%, and 80%.

The Excel file “indirect_GHG_emissions_losses.xlsx” corresponds to a simplified version containing the final values per GHG, formatted for import in the Jupyter Notebook NB2-part2 (to reduce the size of the file to be opened in NB2).

Note: The inventory data files were generated using the Activity Browser, with the foreground databases created using the Jupyter Notebook NB2-part1. The same directory can be used to work with both the Notebooks and the Activity Browser.

Excel file “electricity_production.xlsx”:

The file contains the datasets used to model electricity production in Sweden in three different prospective background databases, namely REMIND-SSP2-Base-2045 (R2B), REMIND-SSP2-PkBudg500-2045 (R2Pk), and IMAGE-SSP2-Base-2045 (I2B). This information is complementary to the Supplementary Material 1 of the main article.

Excel file “sensitivity_biomass_losses.xlsx”:

The file contains the scaling factors used for the sensitivity analysis on biomass loss percentage changes in the biorefinery scenarios.