

GAMS Model File Oriented Documentation for the Lignocellulosic Supply Chain Model

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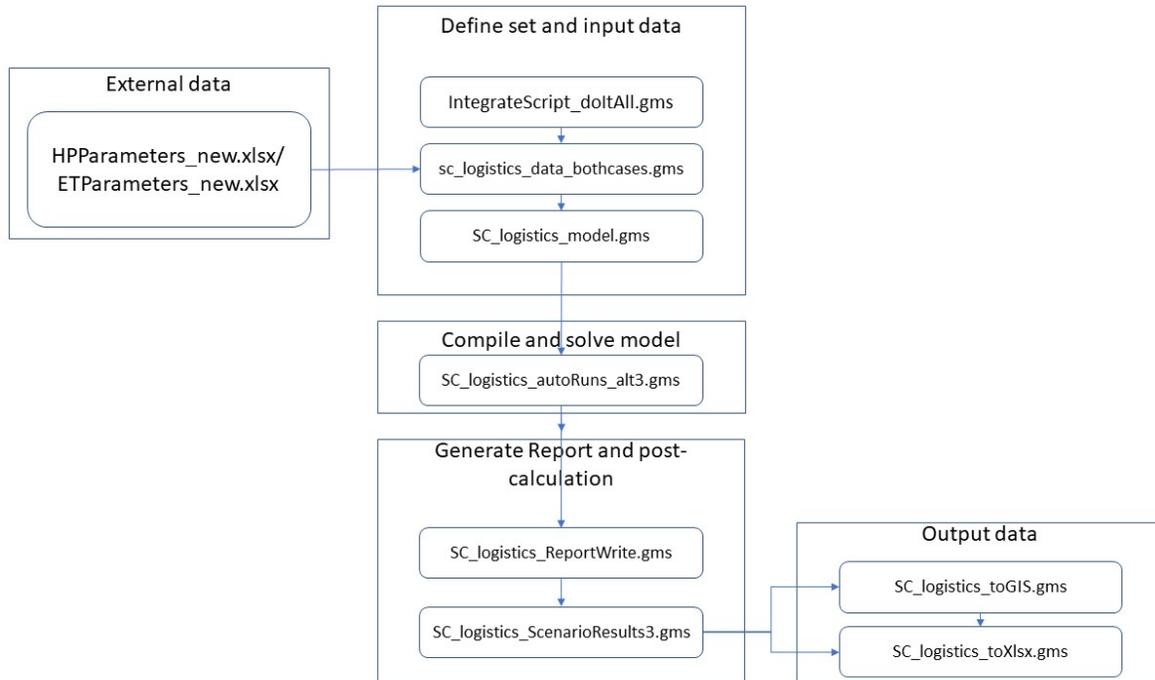
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In the course of a project sponsored by Central Sun Grant Center a model was built for the movement of lignocellulosic feedstocks from point of production to a refinery or electrical generating facility. The project under which this was developed was entitled Modeling and Analysis of the Logistical Challenge of Supplying Biomass for Biofuel and Biopower. The model was coded in the GAMS optimization language. This short document gives a discussion of the file structure employed in the model and is located on the webpage where there is also a zip file of the model as implemented in the High Plains of Texas and in East Texas. This model was developed largely in the context of the PhD thesis by Yuan-Yao Lee the reference to which is Yuan-Yao Stanley Lee. Studies on Cost Minimizing Cellulosic Biofuel Supply Chain Design, unpublished PhD dissertation, Department of Agricultural Economics, Texas A&M University, 2019. This dissertation is also located on the website where this document appears.

As stated above the purpose of this document is to give potential users insight into how the files that compose the GAMS model is structured. This document does not attempt to lay out the conceptual structure or discuss the characteristics of the data needed. For that one should refer to the dissertation by Lee where there is a chapter explicitly on the structure and two chapters on model application, one in the High Plains of Texas and one in East Texas.

1 File Structure of the supply chain model

The lignocellulosic supply chain model is programmed in GAMS and includes files that fall into four major groupings. These are files that contain 1) data and the definition of sets and input parameters, 2) code which defines the variables and equations that compose the optimization model; 3) code that runs scenarios; 4) code that generates generating reports and code that passes the results to a spreadsheet and GIS software. The figure below displays the basic nature of the files utilized.



Basic components of the model

The whole model is run by the file `IntegrateScript_doitAll.gms`. This file addresses the other files that will be discussed below. It also contains control variables that tell him up the model which of the two case studies to run, whether to use stochastics and whether to use storage.

- **Case specific data files**
The data component contains regional specific data which are imported into the model through the command lines in the file “`sc_logistics_data_bothcases.gms`”. This file defines some sets which are generic to the model is somewhat regardless of the region in which it is applied and it includes regional specific files like “`sc_logistics_east_texas.gms`” that need to be customized for a particular case study.
- **Model definition file**
The code within the module “`sc_logisitics_model.gms`” names the variables and equations that compose the optimization model and then presents the exact makeup of that model and how data are included in algebraic form. This file is generic and works with both data sets.
- **Scenario run file**
The file “`sc_logisitics_autoRuns_alt3.gms`” specifies the scenarios that need to be solved and employs GAMS looping to solve and store the results from those scenarios. It also defines the parameters needed for reporting and saves some data in GDX files. While much of this code is generic the scenario related data must be specified so a different version is likely used for different model contexts.
- **Report writing files**

The files “sc_logisitics_reportWrite.gms” and “sc_logisitics_scenarioResults3.gms” calculates report on the scenarios that are run. The first file does report writing for a single solution and the second file sets up to do cross scenario report writing. This report writing code is designed to be used under circumstances where multiple scenarios have been solved. As they stand this code is not case specific but rather is generic.

- Results passage files

The files “SC_logistics_toGIS.gms” and “sc_logisyitics_toXlsx.gms” export results results need to be exported and the path these data will be exported.

To execute the model, one will first run the “interateScript_doItAll.gms” script which will also execute the scripts which import regional specific data and defines the model. Then using a restart file from the integrate file run execute the “sc_logisitics_autoRuns_alt3.gms” script to run the scenarios. Finally, user can form the reports or export the data through executing files “sc_logisitics_reportWrite.gms” or sc_logisitics_toXlsx.gms.