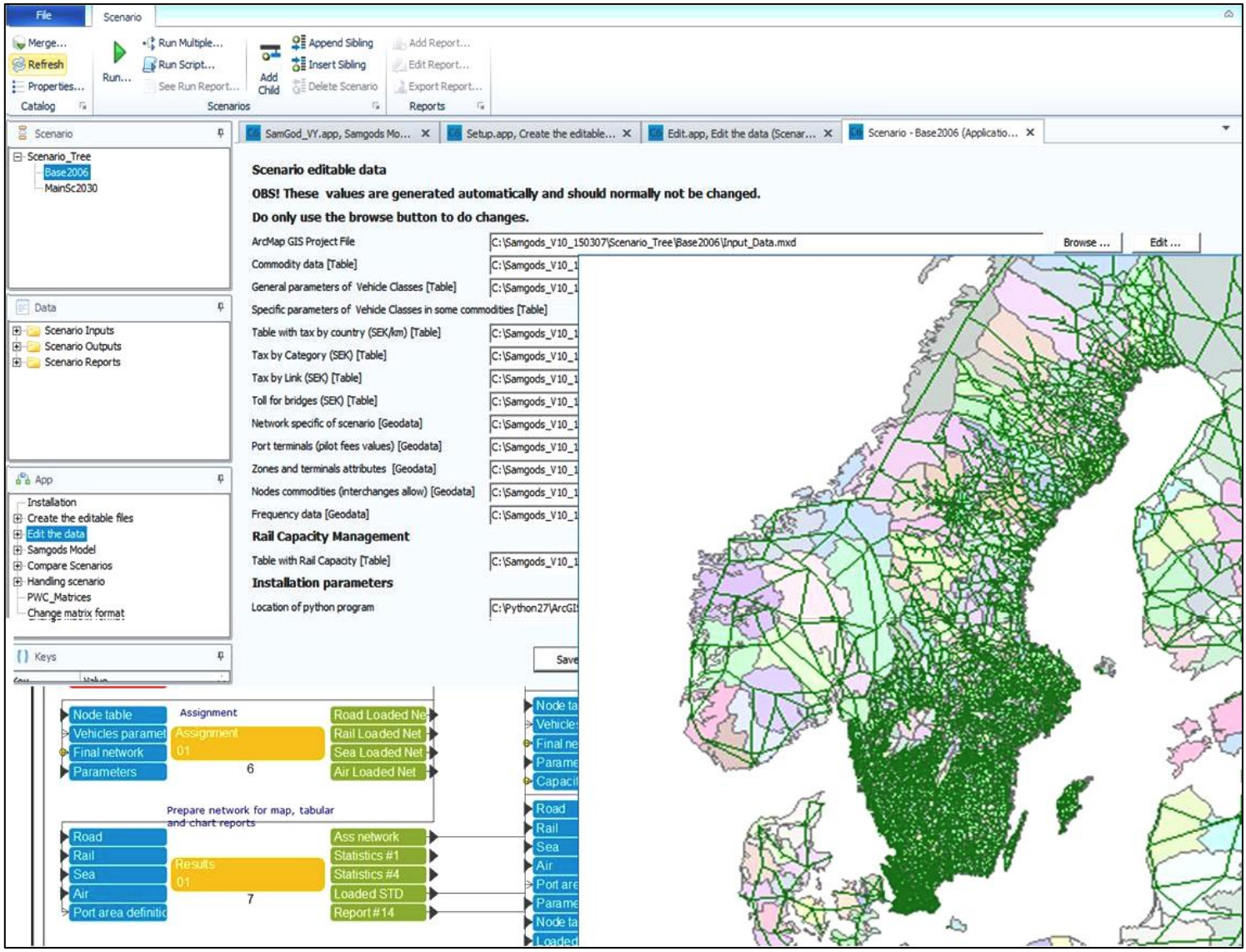
TRAFIKVERKET

REPORT

Samgods User Manual V1.0



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Content

Preface

The national model for freight transportation in Sweden is called Samgods and is aimed to provide a tool for forecasting and planning of the transport system in Sweden. Samgods can be used for forecasting of possible future scenarios, such as the evaluation of the effects of transport policies. Samgods consists of several parts, where the logistics module is the core of the model system. In the logistic module, different types of commodities are assigned to different types of transport chains based on minimization of the total logistics cost.

To make Samgods more user-friendly, a graphical user interface (GUI), incorporated in Cube, has been developed to facilitate the handling of the model.

This document is the manual for how to use the model system where Samgods has been implemented in Cube. For more information about the actual Samgods model, please refer to[1]:

- the method report for a description of the logistics module of the Samgods model
- the method report for a description of Railway Capacity Management
- the program documentation for the logistics module
- the program documentation for mps.jar
- the base matrices report.
- the program documentation for GUI interface
- the VTI report for a description of the representation of the Swedish transport and logistics system in the logistics module

Trafikverket has commissioned Citilabs to incorporate Samgods in Cube and produced the first version of the manual. Trafikverket and Sweco have carried out substantial part of testing and troubleshooting of the system. An extended version of the manual is produced in cooperation with Trafikverket. During 2014 added functionality has been included in the system to facilitate the handling of the rail capacity management procedures (RCM).

For questions regarding the system, please contact Petter Hill at Trafikverket
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[1] See Section 10 (References) for a full reference list

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Introduction

This document is the manual for how to use of the graphical user interface of the Samgods model in Cube. It describes how to setup input files to run the Logistics Module of the Samgods model, how to visualize the output (modal split, traffic work, etc.), and how to compare the output from different scenarios. Moreover, the manual aims to show how to use different tools developed to facilitate the handling of the large amounts of data produced by the model.

The system consists of a set of main software components:

- The Logistic module, which is the core of the system.
- The Rail Capacity module, which is a new feature to manage rail link flow constraints.
- Cube Base, where the graphical user interface of Samgods is incorporated.
- Cube Voyager, which is a transport modelling software used to implement supply and assignment models.
- Cube GIS, which is the geographical information system where the network of the model is implemented.

Below is the outline of the manual:

Chapter 1: Practical instructions for how to install the Samgods GUI in Cube, together with system requirements.

Chapter 2: General description of the structure of the GUI, the different windows and how to work with the applications. It also contains a table with all data that can be accessed via the Data Section window in the GUI.

Chapter 3: Detailed description of all applications, in terms of input data, possible actions and choices for how to use the different applications in the system and how to set up the results. This chapter should be used more as a look-up guide per application, rather than to be read from start to end.

Chapter 4: General instructions for how to use the graphical user interface, listed after the kind of action the user wants to do. A new user to the system is advised to start reading here, after having read Chapter 2.

Chapter 5: Instructions for how to make different kinds of scenario setups.

Chapter 6: Advanced user options

Chapter 7: Log reports from the Samgods GUI.

Chapter 8: Check-list when errors occur.

Chapter 9: Examples of maps on outputs

Chapter 10: References.

Chapter 11: Appendices.

For the reader who is interested in getting started quickly and who already has some knowledge of the Cube system, it is recommended to make sure that the system is properly installed (Chapter 1) and then jump to Chapter 4 and 5 for the specific analysis that he/she wants to carry out.

For the reader without previous knowledge of the Samgods GUI or Cube, it is recommended to start with Chapter 2 and then read Chapter 4 and 5 from the beginning and refer to Chapter 3 for more information on the specific applications. The appendix (Chapter 11) also contains explanations on some parts of the model.

The use of Cube Base and Cube Voyager is described in the reference guides RG_CubeBase.pdf and RG_CubeVoyager.pdf, which can be found where Cube is installed (under Citilabs\Cube folder).

Finally, a technical description of the Samgods GUI is available. See Chapter 10 References point 3.

Glossary

Below some important glossaries used in this manual are collected. Observe that for some glossaries the explanation is specific for this context.

Application – a group of programs

Assignment model – a model where the transport demand is assigned to the network. In this context, Voyager is used as an assignment model. The automobile and lorry assignments are based on generalized time for route choices and all-of-nothing solution.

Base scenario (or base) – the scenario that is used as reference scenario. See Scenario.

Commodity or Product group - commodity type in the model.

Catalog – the folder where the Samgods model and its set of scenarios are stored. Several catalogs, with their corresponding base scenarios, can be included in a project.

Demand model – a model of the transport demand in terms of OD matrices. In this context, the Logistics Module in the Samgods model is a demand model. The Logistics Module has the purpose to produce the OD matrices (demand for vehicle movements on legs) from the fixed transport demand provided in the PWC matrices (PWC = Production Warehouse Consumption).

Domestic – transport volumes between domestic zones.

EOQ - Economic Order Quantity

Feature class - used in ArcGIS. This is a collection of geographic features with the same geometric type (such as point, line or polygon), the same attributes and the same spatial reference. Feature classes can be stored in geodatabases, shape files, coverages or other data formats. Feature classes allow homogeneous features to be grouped into a single unit for data storage purposes.

Geodatabase (or short: gdb) – a database designed to store and handle geographic information and spatial data.

Keys – a varying input into an application (i.e., parameter settings). Catalog keys are used to specify settings for the applications etc.

MAT - extension for matrix file produced in Cube (binary format)

Layer – used in GIS. This is the visual representation of a geographic dataset in any digital map environment.

LOS (Level Of Service) matrix (or **skim matrix**) – a matrix where a particular measure, such as time, distance, cost, are summarized link-by-link along the minimum cost path for each OD pair (OD = Origin Destination). The distance, domestic distance, fee/toll, and extra cost LOS matrices (defined per vehicle type) are mandatory input to the Samgods model.

Program – a single task or an instance.

regional diff DT – Reference to regional differentiation by domestic and total domestic.

regional diff DTI – Reference to regional differentiation by domestic, total domestic and international.

RCM - Rail Capacity Management module.

S/A user - Standard User / Advance User.

Scenario – refers to a set of input files or values. A scenario can be a base scenario, or it can be an alternative scenario that is studied in relation to the base scenario, e.g., a child to the base scenario. An *existing scenario* means that the scenario-specific tables are included in the main geodatabase.

Scenario folder – the folder containing all the data for a specific scenario, located in the Scenario_Tree folder.

Skim matrix – see LOS matrix

Standard outputs/reports – the outputs/reports that the Samgods GUI always produces.

STAN group - aggregation of commodity groups

STD - STanDard Logistics module.

Supply model – In this context, a supply model (or network model) is the model of the network where the transport infrastructure, such as nodes and links (i.e., ports, railways, roads, etc.), are implemented. In this context, Voyager is used as supply models.

TOC – Table Of Content, see Section 4.15.

Total domestic (or Tdomestic) – same as domestic + domestic part of international transports

V/C – flow volume over capacity ratio for rail flows.

#LEA-vehicles – Reference to *loaded, empty and all vehicles respectively*.

1. Installation Instructions

This chapter describes the installation requirements, required programs for the Samgods GUI and their download locations and the installation procedures for each required program. It also describes how to setup the Samgods model in Cube.

1.1. Minimum system requirements

Cube Base will run on any Intel Pentium 4-compatible personal computer (including Pentium 4, Centrino, Xeon, AMD, and Cyrix chips) running the Windows XP/7/8 or Windows Server 2003/2008 operating system. The requirements for processor speed, amount of RAM and hard disk space are directly related to the operating system, the network, and other file sizes. At a minimum, Citilabs recommends:

- Intel Pentium 4, AMD Athlon
- 1 GB of RAM
- 10 GB for the application and supporting applications and data (like GIS); ATAPI IDE, 5,400 rpm
- 100+ GB for output files
- 24 bit capable graphics accelerator OpenGL version 2.0 runtime and Shader Model 3.0 or higher is recommended; ATI or Nvidia GPU is strongly recommended for any 3D GIS work or Cube Dynasim micro simulation
- 17-inch monitor, 1024 x 768 higher at Normal size (96dpi); 24 bit color depth
- Mouse or other pointing device
- Colour printer or plotter

A system with additional resources may be more appropriate for certain applications of this software.

Running the Samgods model at an acceptable performance puts a demand on the hardware as well as on the operating system. The hardware should preferably have several processors available for parallel executions and several GB of RAM to support the allocation of memory to each execution and must be based on 64-bit technology. The operating system needs to be able to allocate a certain amount of memory to the different processors, see the list below.

In tests, the Samgods group has lowered the total execution time from over 24 hours to 6 hours by using a server with 16 processors on a 64-bit Windows Server 2008 R2 Operating System, instead of a laptop with a single processor.

The graphical interface of the Samgods model allows the user to set the number of commodity groups to run simultaneously, in order to have an optimal performance of the system (note that this option is available only if Java runtime environment is installed see Section 1.4 below). The monitoring of the parallel executions is done by a Java program underneath the GUI, but the actual work of allocating memory and tasks to each processor is done by the operating system itself.

There is an upper limit on how many processors that may be used:

- It is strongly recommended never to use more parallel executions than the number of available processors
- Each processor should in average have at least 1.8 GB of RAM available, or the program may encounter out-of-memory problems
- it is mandatory to run the model on a 64-bit system for RCM procedure.

- The model has 34 commodity groups and this number constitutes the upper limit for the number of parallel processes for the main part of the logistics model (should the hardware allow it). One task involves construction of OD-matrices for 35 vehicle type, and this can in principle be parallelized into 35 parallel processes.

1.2. Cube Software

For the Samgods GUI to function, certain Cube software is required. They are:

- Cube Base: 6.1.0 service pack 1
- Cube Voyager: 6.1.0 service pack 1
- Cube GIS: ArcGIS 10.1 service pack 1

This software is available at ftp://citilabsftp.com/release/cube610SP1setup.exe.

For the above Cube software, Citilabs License 2013 is required (but newer software and license versions may be available later on). Please contact Citilabs for further information regarding this.

The installation also requires programs necessary for getting spanning tree data from a scenario. These programs may be downloaded from Trafikverket. Please contact the project manager Petter Hill.

1.3. Cube Installation

To install and run the model full administration rights are required on the PC, or more specifically on the model folder, the Citilabs program folder, the ArcGIS program folder and the user folder. Do the following steps to install Cube (observe that these steps can be slightly different depending on previous installations, newer software versions, etc.):

1) Attach the dongle to the back of the machine
2) Install Citilabs License 2013 (or later available license versions)
3) Install Cube Base (double-click on the cube610SP1setup.exe file)
4) When requested, install ArcGIS Runtime 10.1 and ArcGIS Runtime 10.1 Service pack 1
5) Restart the computer

After having installed standard Cube, you have to install additional new programs contained in the *Java_Voyager_programs.7z* file, following instructions:

- Files under *Voyager_131013* must be copied in the following directories:
  - File *Highway.rsc* in *C:\Program Files (x86)\Citilabs\CubeVoyager\resource*
  - File *hwyload.dll* in *C:\Program Files (x86)\Citilabs\CubeVoyager*
  - File *HWYLOAD.TDF* in *C:\Program Files (x86)\Citilabs\CubeVoyager*
  - File *tppdlibx.dll* in *C:\Program Files (x86)\Citilabs\CubeVoyager*
- File under *AppMan* must be copied in the following directory:
  - File *AppManager.exe* in *C:\Program Files (x86)\Citilabs\Cube*

Important Note: Update the above programs prior to open the model in Cube!

1.4. Other programs

If the user wishes to use the advanced options for the logistics module (please refer to Section 3.5.1 or 4.6 for details), it is also required to have:

- Java runtime environment (*jre-7-windows-x64.exe*). Platform: 1.6. Product: 1.6.0_17 (later program versions are also possible to use)

Location for the runtime environment: http://www.java.com/sv/download/

1.5. Samgods GUI installation

Unzip the zipped file Samgods.rar, and select a destination folder. The default folder is C:\, however, any other folder is working as well. It is recommended to select a folder name without any blank value neither special characters (å, ä ö). Moreover, an advice is to put the folder rather close to the root (e.g., E:\Samgods\Workfolder\Destination-of-folder).

The folder structure for the GUI is displayed in Table 1.

C:\Samgods\	Samgods.cat	Catalog file
	01_Programs	Folder
	02_Applications	Folder
	03_GIS_Data	Folder
	04_Media	Folder
	05_Input_Data	Folder
	06_Reports	Folder
	07_Python	Folder
	Scenario_Tree	Folder

Table 1 Folder structure.

The scenario folder for a specific scenario is located in the Scenario_Tree folder.

For the complete list of folders and files, see the technical documentation of the Samgods GUI. See Reference on Section 10, point 3.

To properly install all the programs connected to the model (GIS tools, user programs), do the following:

1) Open the catalog file (Samgods.cat) in Cube Base (double click on the catalog file or double click on the Cube icon on the desktop -> welcome screen -> open an existing catalog -> browse to Samgods.cat)
2) To update the paths for the application, double click on each application (in total 8 applications) under “Applications” window, and click “Yes” to the following question (8 times):

   “The base path of this Application has been moved from {Old folder} to {Selected folder}. Do you wish to update the path for all Application (.APP, .PRJ) and Control (.CTL) files in the Application structure? (Note the same subdirectory structure as in the original Applications will be assumed)”
3) To set the properties of the catalog file, go to “Scenario” menu on the toolbar and select “Properties”. On the Catalog Properties window, select the “Model User” tab, and set the Model User as “Model Applier”. Under Model Applier section select "Developer" as shown in Figure 2

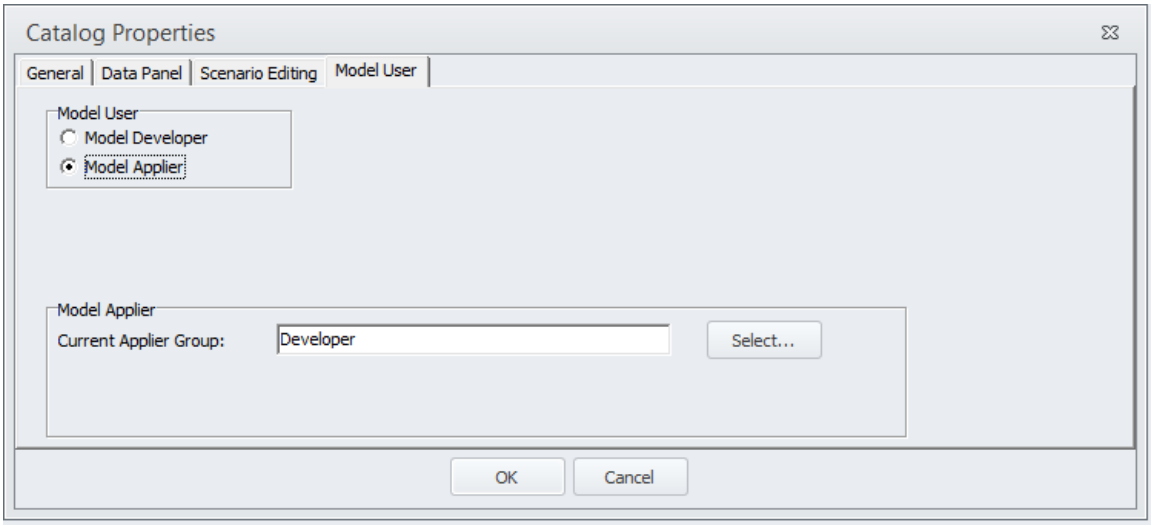


Figure 1 Right Setting of the catalog file.

4) Then, select the “Data Panel” tab, and set the values as in

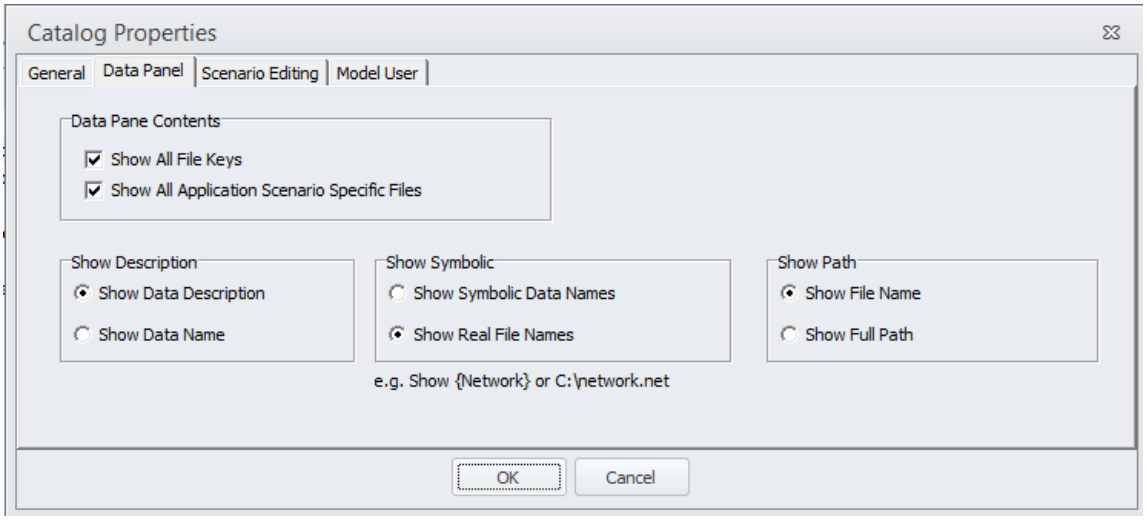


Figure 2 Setting of properties of the catalog file.

5) Click “OK” to continue
6) Modify the catalog keys (i.e., parameter settings) below from the interface in the following manner:
   a) Select Scenario_Tree scenario
   b) Select the *Installation* application
   c) Double-click on the Scenario_Tree scenario
   d) For the following catalog keys, change to its corresponding installed version if needed[2] (see Figure 3 for an example):

[2] If you are using Swedish Windows 7/8, the system name of the standard *Program* folder is *Program Files*. So in the keys in the *Installation* application, use “C:\Program Files\...”, not “C:\Program\...”.

i) “Cube Software” (pre-defined: version 6.1.0 Sp1)*

ii) “ArcGIS Software” (pre-defined: 10.1 Sp1)*

iii) “Python Software” (pre-defined: version 27)

iv) “Logistics Model Software” (pre-defined: 20140627)

v) For the catalog key “Location of Cube Program” change if needed the folder where Cube is installed (pre-defined: C:\Program Files (x86)\)*

vi) For the catalog key “Location of ArcGIS Program” change if needed the folder where ArcGIS is installed (pre-defined: C:\\Program Files (x86)\)*. Because this path is used by Python, it is important to use “/” or “\\” instead of “\” in this key, see Figure 3 below for an example

vii) For the catalog key “Location of Python program” change if needed the folder where Python 27 is installed (pre-defined: C:\Python27\ArcGIS10.1)

viii) For the catalog key “Location of Java program” change if needed the folder where Java is installed (pre-defined: C:\Windows\System32)

ix) For the catalog key “Scenario name for the BASE scenario” point to the scenario that should be used as base scenario (pre-defined: Base2006)

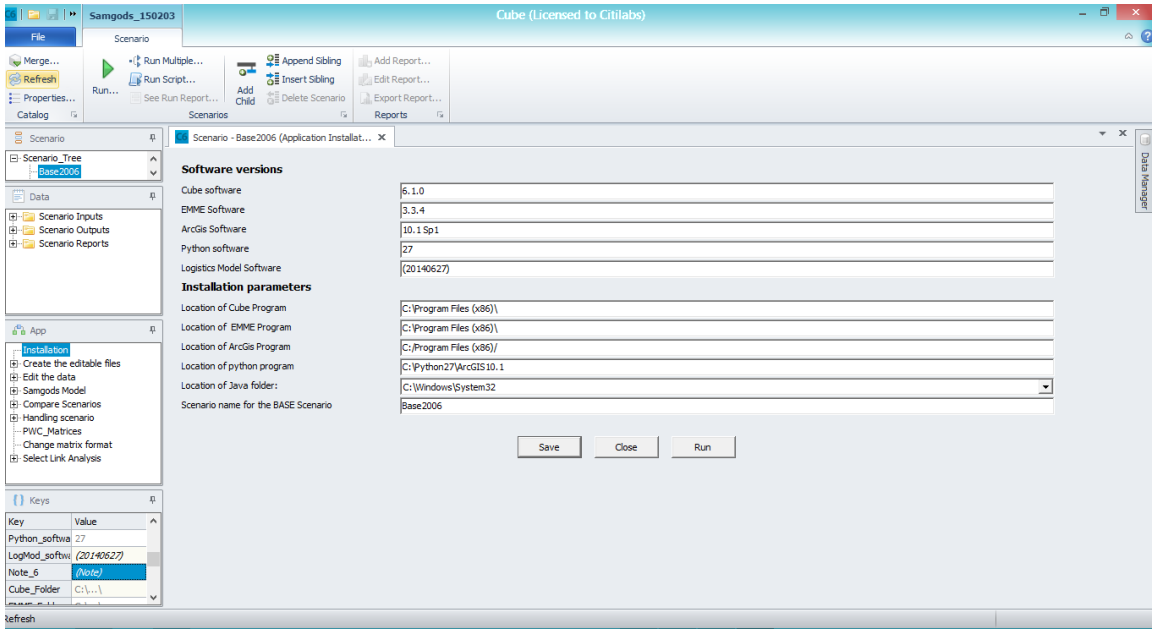


Figure 3 Example of catalog key values for the Installation application.

e) Run the Installation application by clicking “Run” in the scenario interface, or by selecting Application -> Run Application -> OK on the main toolbar. (If “OK” is clicked instead of “Run”, the application will not run – the changes in the settings will only be saved.)

Now the GUI is installed.

* To properly set the values for the catalog keys indicated with *, see the information under the Menu Bar; Help -> About (see Figure 4 and Figure 5 below for an example).

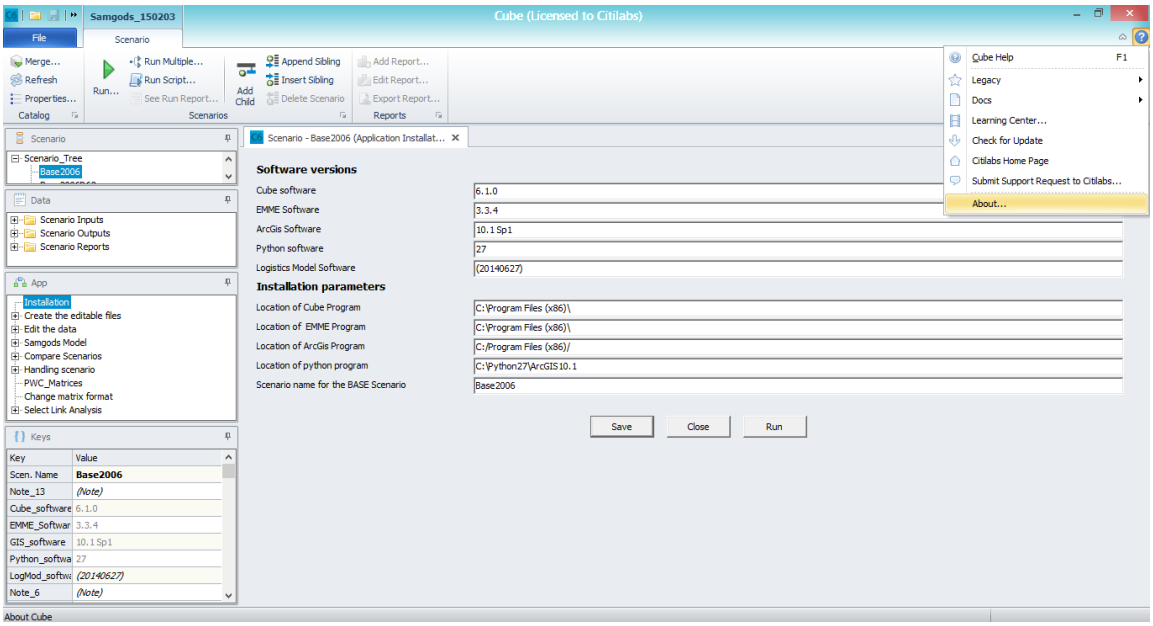


Figure 4 How to access the “About ...” information.

Figure 5 Example of the “About ... “ window.

2. Cube Interface components

This chapter outlines the main components of the Cube Interface and explains their functions. The Cube Interface has five different windows as shown in Figure 6. When opening the model, two different user types can be selected – *model developer* or *model Standard and Advanced user*. The *model developer* role is mainly used when setting up or installing the system, while the *model Standard user Advanced user* role typically is used when running the model and for scenario handling. The set of active windows depends on the user role, and this manual is relevant to both types of model users.

The large area to the right is a workspace where manager windows and messages are shown, e.g., when the user wants to manage a scenario, the Scenario manager window is shown here. There are also Application manager windows and Data section manager windows. The manager windows are opened from the corresponding window on the left hand side.

For more information on the Cube interface, please refer to the Cube Help, accessed from the main toolbar: Help -> Cube Help.

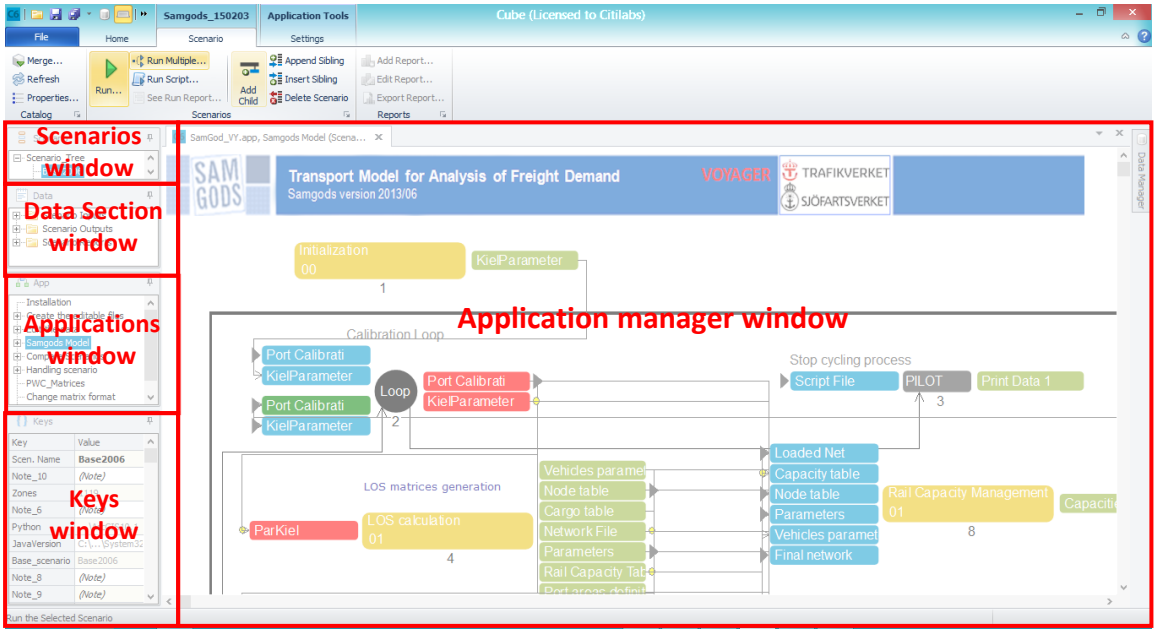


Figure 6 Cube Interface and the five windows.

2.1. Scenarios window

The purpose of the Scenarios window is to list the scenarios that exist in the model.

A *scenario* refers to a set of specific input files/values. An *application* is a group of programs. In the Samgods GUI a set of applications are defined with different types of functionalities. Different scenarios can be set up in the GUI by using the set of available applications. A scenario can be opened and managed using different applications by double-clicking on the scenario name in the Scenarios window (in model *Standard user Advanced user* mode). For example, the input data and parameters to the scenario can be displayed or edited. When the scenario is open in the Scenario manager window, it is possible to select the application you want to use by the scroll down menu. Another way to open the application you want to use is to select the application in the Applications window and then double-click on the scenario in the Scenarios window. The application is then run by clicking “Run”.

The tree structure of the scenarios included in the Samgods GUI is visualized in the Scenario_Tree in the Scenarios window. The Scenario_Tree is used for scenario management.

The default base scenario is included in the Scenario_Tree and is called Base2006. In the base scenario all the input data is defined and it represents the parent for future sibling and child scenarios.

An example of a Scenario manager window for the application *Edit the data* is given in Figure 7 below.

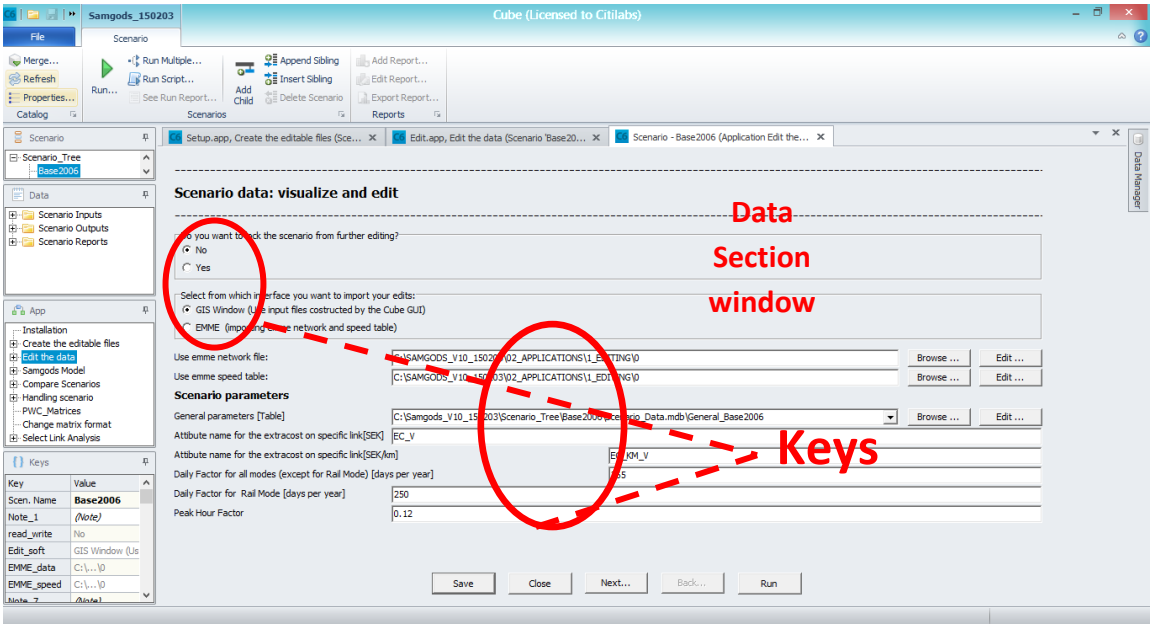


Figure 7 Example of Scenario manager window.

The keys which are possible to set values for in the Scenario manager window are strictly connected to the application selected in the Applications window. In Chapter 3, tables of keys connected to the respective applications are presented.

Tip. Open an application (in model applier mode) to set the parameters for a particular scenario by double-clicking on the scenario and select the application in the scroll down menu.

2.2. Applications window

In the Applications window all applications defined in the model catalog can be found. An *application group* is the collection of programs and sub-groups belonging to the respective application. When an application is selected (by clicking on it in the Applications window) the application group is shown in the Application manager window. In the Application manager window you can see Program boxes (e.g. MATRIX, HIGHWAY, NETWORK, and PILOT) and/or other applications (called sub-groups) belonging to the application group (see Figure 8). In the Applications window, you can see the main application at the highest level, and go through the tree structure down to lower levels.

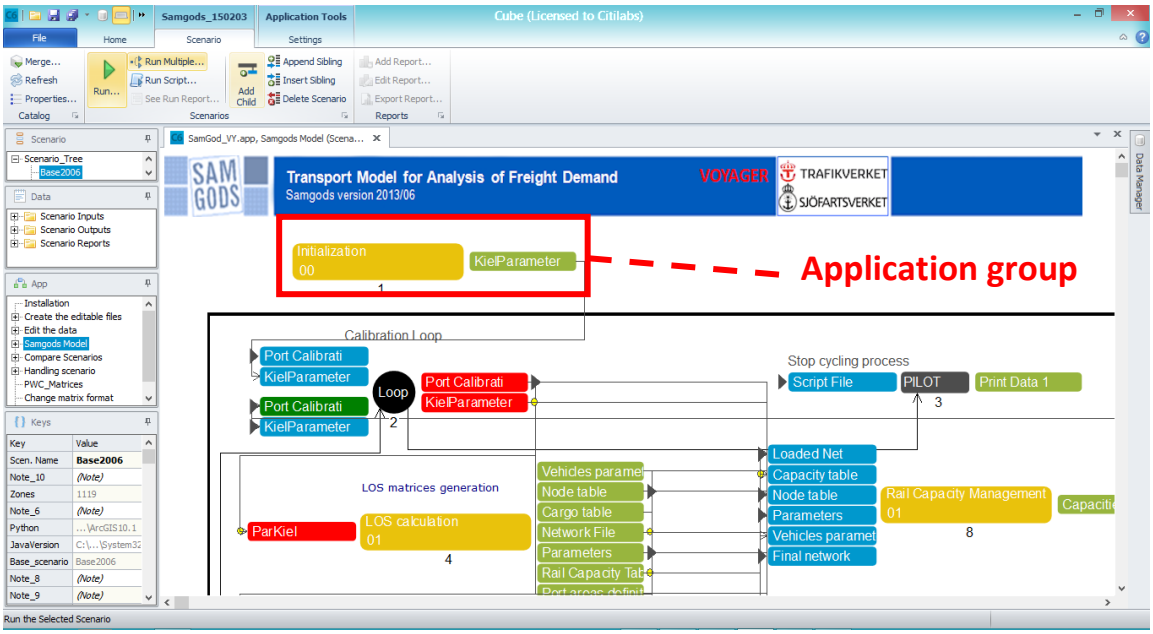


Figure 8 View of an application and its corresponding application groups.

In the Samgods GUI, the defined applications are (see the Applications window in model developer mode):

- Installation
- Create the editable files
- Edit the data
- Samgods Model
- Compare Scenarios
- Handling Scenario
- PWC_Matrices
- Change matrix format

2.3. Data Section window

The Data Section window provides direct access to the main input and output files, which can be utilized when working with the model (editing, controlling, etc.). It allows the user to display and edit the input data, as well as to display the outputs and reports for specific scenarios and runs. In conjunction with the Scenario manager window, it enables the user to easily access all data, without needing to know where it is actually stored. The structure of the Data Section window is described in Table 2, which also shows the location of the files, the names of the tables/maps, a short description of its contents and which application that produces or uses the files.

There are three main folders in the Data Section window: Scenario Inputs, Scenario Outputs and Scenario Reports. The General tables under Scenario Inputs are always accessible from the Data Section window. The Editable data (also found under Scenario Inputs) is accessible only during the edit phase or if the user has selected not to delete the temporary geodatabase (see explanation for the *Edit the data* applications in Section 3.4).

The available output in the Scenario Outputs folder depends on the choices made when running the *Samgods Model* application. The available outputs in the folder *Scenario Outputs\Samgods Report* are always listed in the log report *Scenario Outputs\Samgods Report\Existing Outputs*. There are two other log reports except Existing Outputs: *Report for the import phase* and *Report for the edit phase*, which state any error messages or other messages from the applications

Handling scenario and *Edit the data.* For more information on the log reports, see Table 2 and Chapter 0.

Moreover, the Data Section window includes the 17 standard reports per Standard Logistic Module and 18 standard reports for Rail Capacity Management, also called summary reports, which summarize the output from running the Samgods GUI, in Word format. The summary reports are found in the Scenario Reports folder and are listed last in Table 2. To browse to different pages in the reports, use the arrows in the main toolbar. It is possible to export the tables to Excel, by selecting the table in the Word format report, right-clicking and selecting "Export" and type in a name with an Excel file format ending. Some of the standard reports are also available as spread sheet reports in the Scenario Outputs folder, where they are marked with the same report number as in Scenario Reports (see, e.g., Scenario Outputs\Samgods Report\Logistic Module\OD Covered).

For some of the data files, the variable names that appear in the headings are explained in tables in the appendix.

Before using and analyzing any output data regarding empty vehicles/vehicle kilometres or the total number of vehicles (i.e. loaded + empty vehicles), please read the Section 11.2 about empty vehicles in the appendices.

The GUI allows producing different aggregations in the results for Standard Logistic Module. The model could produce the total number of loaded, empty and tonnes for all the commodity groups, or just for a specific commodity or STAN group. The outputs will be saved with different name files ending with a number of a suffix. Depending on the user choice, the possible values could be:

- 0 (zero): all the commodities are aggregated, so the volumes and tonnes represent totals
- A number among 1 and 35: a single commodity has been run
- A suffix STAN1 to STAN12: an aggregation of results based on STAN group definition

In order to access to the different aggregations, e.g. different files, it is requested to set the value for catalog key "Select commodities for the Logistics module (…)" in the *Samgods Model* application to the commodity or commodity group number you want to view and clicking "Save" (please refer to Section 3.5 for more information).

For Rail Capacity Management Module (RCM) there are not options and the only available choice is 0. That is related to the matter that the process requires all the volumes to properly assess the congested level on the rail network, therefore a run for a specific commodity or STAN group would be meaningless.

Folder	**Name**	**Description**	**Used by application**
Scenario Inputs		This folder contains all the inputs for the scenarios	All
Scenario Inputs\Model Operating instructions	Model Operating Instructions	Rtf file with a short description on how to run the Samgods GUI	All
Scenario Inputs\General tables	Link Categories	Lookup table for the categories in the network	All

Folder	Name	Description	Used by application
	NodeClass description	Lookup table for the numbering system (no longer required for the VY part)	All
	Transfer Type at terminals	Lookup table for the transfer type coded in the Nodes_Commodities data	*Samgods Model*
	List and codes for modes (only visible in developer mode)	Alphanumerical codes for modes	All
	Zoning System	Lookup table for the ID_Region and ID_Country codes	All
	Modes	Lookup table for codes used for modes	All
	V101 Speed Flow Curves	Speed flow table with parameter values for defining the delay functions for vehicle class 101 (light lorry)	*Samgods Model*
	V102 Speed Flow Curves	Same as previous but for vehicle classes 102-105	*Samgods Model*
	Ranges for node classes (only visible in developer mode)	For node classes from 12 to 19 the range of allowed values for node numbers	*Edit the data*
	Default values for the frequency matrices (only visible in developer mode)	Default frequencies for different vehicle classes based on the terminal type	*Edit the data*
	Port area classification	Port areas classification for Swedish ports	*Edit the data*
	Lower and upper bounds for consolidation factors	Default upper and lower bounds for the consolidation level ranking output per submode See Section 10 point 4 for reference.	*Samgods Model*

Cube Interface components

Folder	Name	Description	Used by application
	Empty vehicle fractions per vehicle type and distance	Function applied in extract procedure per vehicle type. The empty vehicles are calculated as fraction of loaded ones based on function depending on distance. See Section 10.6 for reference.	*Samgods Model*
	County names	List of Sweden counties (in Swedish: län) and related identification code	*Samgods Model*
	Other statistics 2006	Statistics on Kiel Canal, Öresund bridge and Jylland in year 2006 used in the calibration procedure	*Samgods Model*
Scenario Inputs\General tables\Logistics module (only visible in developer mode and advanced user)	Main vehicle class for BuildChain	The main vehicle type used in the BuildChain process by submode id (i.e. vehicle submode A-U) and commodity (P1-P35).	*Samgods Model*
	Vehicle types by chain and submode (ChainChoi)	List of vehicle types (VHCL_NR) by submode id and commodity for ChainChoi	*Samgods Model*
	Direct Access	Whether or not direct access is active by commodity (P1-P35) and type of firm-to-firm flow (0-9, see table Type of Flow MATRIX below)	*Samgods Model*
	Type of Flow MATRIX	Lookup table with codes for type of flow matrices	*Samgods Model*
	List of Chains	List of Chain types	*Samgods Model*
	Vehicle type (Vessel Type, vessel ≈ ship)	Lookup table with codes for vehicle types	*Samgods Model*

Folder	Name	Description	Used by application
	Consolidation factors by commodity groups (i. e. STAN product groups)	Individual consolidation bounds for all submodes [LB,UB] Default values and specific values for STAN groups 2, 8 and 9	*Samgods Model*
Scenario Inputs\Editable data	Input_Data.mxd	General map to visualize all georeferenced data	*Edit the data*
	EMME Network (211 format)	The Emme transport network with all link and node attributes (see Section 5.1 for further details)	*Edit the data*
	EMME Speed table	Emme speed table (see Section 5.1 for further details)	*Edit the data*
	General parameters (only visible in developer mode)	Table with the scenario parameters catalog key settings	*Edit the data*
	Logistics model parameters (only visible in developer mode)	Table with logistics module parameters	*Edit the data*
	Cargo Table	General values per commodity	*Edit the data*
	Vehicles Parameters	General values for each vehicle type. The attribute “EMPTY_V” (1 or 0) concerns whether the number of empty vehicles will be calculated (1) or not (0) (see the appendix and Section 5.4)	*Edit the data*
	Vehicle Parameters Exceptions	Specific values for some commodities. (see Section 5.5 for further details).	*Edit the data*
	Scenario Network	Network (links and nodes) for all modes (GIS map)	*Edit the data*

Cube Interface components

Folder	Name	Description	Used by application
	Nodes Commodities	GIS map with all terminals and specifications on allowed transfer types and commodities per terminal	*Edit the data*
	Nodes	GIS map of zones and terminals with values for the logistics module and port area classification	*Edit the data*
	Ports Sweden	GIS map of Swedish ports with the pilot fees by vehicle type (sea mode only)	*Edit the data*
	Frequency network	GIS map with service frequencies (transports per week) per mode/combination of modes and origin-destination connection. For more information on the frequency network, see the appendix	*Edit the data*
	Tax by country Table	Tax by country and vehicle type	*Edit the data*
	Tax by Linkclass	Tax by link type and vehicle type	*Edit the data*
	Tax by link	Tax for specific links by vehicle type	*Edit the data*
	Toll bridges	Bridge tolls per vehicle type	*Edit the data*
	Rail capacity table	Daily bidirectional capacity for domestic rail links	*Edit the data*
Scenario Inputs\Emme tables	Default values for the EMME macros (only visible in developer mode)	Table containing matrix names for LOS matrices in emme format	*Edit the data*

Folder	Name	Description	Used by application
Scenario Inputs\Others	In-zone distances – default values (only visible in developer mode)	Default values for distances within each zone (diagonal values in the distance matrices). Applied when origin and destination are in the same zone	*Samgods Model*
	Geodatabase file for exported matrices	Location of the geodatabase file	*Change matrix format*
	Rail capacity table with EMME node numbers	As Rail capacity table with added information of EMME nodes	*Samgods Model*
Scenario Inputs\PWC_Matrices	PWC matrix for commodity	Displays the PWC matrix in Voyager format for a specific commodity, see Section 3.8 for instructions	*PWC_Matrices*
Scenario Inputs\Calibration factors	Port area differences (RCM) (only visible in developer mode)	Differences between modelled and surveyed tonnes per port area and STAN group	*Samgods Model*
	Parameters for Port Area Calculation (only visible in developer mode)	Step length, minimum value, cut off value and default minimum value for calibration of port area throughputs	*Samgods Model*
	Parameters for Kiel Canal Calculation (only visible in developer mode)	Step length, minimum value, cut off value and default minimum value for calibration of Kiel canal flows	*Samgods Model*
	Port Area Scaling factors (only visible in developer mode)	Resulting scaling factors applied per STAN group and port area to TIME skims	*Samgods Model*
	Kiel Canal Scaling factor (only visible in developer mode)	Resulting scaling factor for the Kiel canal applied to TOLL value	*Samgods Model*
Scenario Outputs	Existing Outputs (Log report)	List of available outputs in the Samgods Report	*Samgods Model*

Cube Interface components

Folder	Name	Description	Used by application
Scenario Outputs\Scenario_Import_function_Report	Report for the import phase (Log report)	Report with any warnings or messages from the Scenario import function (in the *Handling scenario* application) (see Section 7.3)	*Handling scenario*
Scenario Outputs\Edit the data Report	Report for the edit phase (Log report)	Report with any warnings or error messages from the *Edit the data* application (see Section 7.1)	*Edit the data*
Scenario Outputs\Samgods Report\LOS matrices generation	LOS Road Mode LOS Raíl Mode LOS Sea Mode LOS Air Mode	LOS matrices between zones (both terminals and actual zones) per vehicle type for: time – T [hours], distance – D [km], extra costs – X [SEK], domestic distances – DD [km]	*Samgods Model*
Scenario Outputs\Samgods Report\Logistics Module\OD Vehicles MAT	Road – Vehicle Flows Rail – Vehicle Flows Sea – Vehicle Flows Air – Vehicle Flows	OD matrices of loaded vehicle flows by vehicle type. The sheet name indicates the vehicle type and the scenario name	*Samgods Model*
Scenario Outputs\Samgods Report\Logistics Module\OD Tonnes MAT	Road – Goods Flows Rail – Goods Flows Sea – Goods Flows Air – Goods Flows	OD matrices in tonnes by vehicle type. The sheet name indicates the vehicle type and the scenario name	*Samgods Model*

Folder	Name	Description	Used by application
Scenario Outputs\Samgods Report\Logistics Module\OD Empty Vehicles MAT	Road – Empty vehicle Flows Rail – Empty vehicle Flows Sea – Empty vehicle Flows Air – Empty vehicle Flows	OD matrices of empty vehicle flows by vehicle type. The sheet name indicates the vehicle type and the scenario name. For important explanations of the output in terms of empty vehicles, see appendix section 11.2	*Samgods Model*
Scenario Outputs\Samgods Report\Logistics Module\OD Covered	Output by vehicle class (spread sheet for summary report no. 2: Logistics module)	Summary table with information by vehicle type (number of shipments, number of loaded vehicles, transport distances, tonnes, tonne kms, average loading factors, average distances), split up on domestic, international and total	*Samgods Model*
	Output by chain (spread sheet for summary report no. 2: LM chains)	Summary table with information by chain type (total numbers of shipments, transport distances, tonnes, tonne kms, logistic costs, average costs per tonne km), split up on domestic, international and total	*Samgods Model*
	Loaded Demand (spread sheet for summary report no. 2: LM Demand) (new)	Summary table of the tonnes transported and the tonnes in the PWC-matrices together with allocation success rates	*Samgods Model*
	Report #3 Tonkms per Mode with statistics 2006 STD (Spread sheet for summary report no. 3)	Tonne-kms in millions on domestic movements per main mode (Road, Rail, Sea) and international (Air) in standard logistics module	*Samgods Model*

Cube Interface components

Folder	Name	Description	Used by application
	Report #5 Logistics costs at zone level (Spread sheet for summary report no. 5)	Logistics costs per zone per commodity (P01-P35) and from/to flows to a zone	*Samgods Model*
	Report #6 Goods flow through terminals (Spread sheet for summary report no. 6)	Goods flow (tonnes) through terminals per commodity (P01-P35) and divided by direct access to (DAIMPORN),and from (DAEXPORN) or regular (REGULARN). Regular refers to flows not having direct access	*Samgods Model*
	Report #7 Domestic tonne kms with container per mode (road, rail, sea, air) (Spread sheet for summary report no. 7)	Transport work (tonne kms) in Sweden for containers per commodity and vehicle type	*Samgods Model*
	Report #8 Domestic vehicle kms with container per mode (road, rail, sea, air) (Spread sheet for summary report no. 8)	Traffic work (vehicle kms) in Sweden for container transports per commodity and vehicle type	*Samgods Model*
	Report #10 Tonnes km per mode, commodity, domestic, total domestic and international (Spread sheet for summary report no. 10)	Transport work (tonne kms) per commodity, mode. Split into three categories: domestic, total domestic and international respectively	*Samgods Model*
	Report #11 Tonnes per mode, commodity, domestic, tdomestic and international (Spread sheet for summary report no. 11)	Transported tonnes per commodity. Split into three categories: domestic, total domestic and international respectively	*Samgods Model*
	Report#12 node and link costs per vehicle and product group (Spread sheet for summary report no. 12)(new)	Link and node costs per vehicle type, per commodity and split into total domestic and international respectively	*Samgods Model*

Folder	Name	Description	Used by application
Scenario Outputs\Samgods Report\Assignment	Road Assigned Network Rail Assigned Network Sea Assigned Network Air Assigned Network	GIS map with the assignment of the freight flows to the transport network per vehicle type, in tonnes and in number of vehicles (loaded and empty). For important information on the empty vehicles, see appendix Section 11.2.	*Samgods Model*
Scenario Outputs\Samgods Report\Reports	Assigned Network	GIS map with the assignment of the freight flows to the transport network with all vehicle types in the same network, in tonnes and in number of vehicles (loaded and empty) For important information on the empty vehicles, see appendix Section 11.2.	*Samgods Model*
	Report #1 VHL and VHCLKM (Spread sheet for summary report no. 1)	Summary table of number of vehicles and vehicle kms per vehicle type and mode (split up into 2 regional categories domestic and total domestic and 3 aggregation levels loaded/empty/all vehicles). See appendix Section 11.2.	*Samgods Model*
	Report #4 TONNES AND TONNESKM (Spread sheet for summary report no. 4)	Summary table of tonnes and tonne kms (domestic, international and total) per vehicle type and mode road, rail, sea and air.	*Samgods Model*

Cube Interface components

Folder	Name	Description	Used by application
	Report #9 Vehicle kms, tonne kms, empty vehicle kms and total vehicle kms per geographic region per mode (road, rail) (Spread sheet for summary report no. 9)	Summary table of vehicle kms (split up into loaded, empty and all vehicles) and tonne kms per geographic region and mode (road and rail). See appendix Section 11.2.	*Samgods Model*
	Report #13 Port area statistics STD (Spread sheet for summary repost no. 13)	Tonnes per port area and STAN group and comparison with statistics (results from standard logistics module)	*Samgods Model*
	Report #14 Oresund Kiel canal STD (Spread sheet for summary report no. 14)	Results on Öresund bridge, Kiel canal and Jylland and comparison with statistics (results from standard logistics module)	*Samgods Model*
	Bidirectional tonnes per mode STD	Network with bidirectional tonnes/100.000 per mode road, rail and sea (results from standard logistics module)	*Samgods Model*
	Report #16 VHCLKM and distribution per road vehicle type and county – totals (Spread sheet for summary report no. 16)	Vehicle kms per county and vehicle type and their distribution on all the roads (results from standard logistics module)	*Samgods Model*
	Report #17 VHCLKM and distribution per road vehicle type and county – Category 11 (Spread sheet for summary report no. 17)	Vehicle kms per county and vehicle type and their distribution on E10 (European roads = category 11) (results from standard logistics module)	*Samgods Model*

Folder	Name	Description	Used by application
	Report #18 VHCLKM and distribution per road vehicle type and county – Other roads (Spread sheet for summary report no. 18)	Vehicle kms per county and vehicle type and their distribution on all types roads except E10 (results from standard logistics module)	*Samgods Model*
Scenario Outputs\RCM Report	Rail Capacity table for current scenario	Definition of rail bidirectional capacities per day for the current scenario	*Samgods Model*
	Rail Capacity table with revised capacities from Adjust procedure	Definition of rail bidirectional capacities per day for current scenario after applying the Adjust procedure10.6 for reference.	*Samgods Model*
Scenario Outputs\RCM Report\Logistic Module\OD Vehicles MAT	Road – Vehicle Flows Rail – Vehicle Flows Air – Vehicle Flows Sea – Vehicle Flows	OD matrices of loaded vehicle flows by vehicle type (results from Rail Capacity Management module). The sheet name indicates the vehicle type and the scenario name.	*Samgods Model*
Scenario Outputs\RCM Report\Logistic Module\OD Tonnes MAT	Road – Goods Flows Rail – Goods Flows Air – Goods Flows Sea – Goods Flows	OD matrices in tones by vehicle type (results from Rail Capacity Management module). The sheet name indicates the vehicle type and the scenario name	*Samgods Model*
Scenario Outputs\RCM Report\Logistic Module\OD Empties MAT	Road – Empty vehicle Flows Rail – Empty vehicle Flows Air – Empty vehicle Flows Sea – Empty vehicle Flows	OD matrices of empty vehicle flows by vehicle type.	*Samgods Model*

Cube Interface components

Folder	Name	Description	Used by application
Scenario Outputs\RCM Report\Logistic Module\OD Covered	Output by vehicle class (RCM)	Summary table with information by vehicle type (number of shipments, number of loaded vehicles, transport distances, tonnes, tonne kms, average loading factors, average distances) and regional diff DTI.	*Samgods Model*
	Output by chain (RCM)	Summary table with information by chain type (total numbers of shipments, transport distance, tonnes, tonne kms, logistic cost, average cost per tonne km) and regional diff DTI.	*Samgods Model*
	Loaded Demand (RCM)	Summary table of the tonnes transported and the tonnes in the PWC-matrices together with allocation success rates	*Samgods Model*
	Report #3 TonsKm per mode with statistics 2006 RCM (Spread sheet for summary report no. 3)	Tonne-km in millions on domestic movements per main mode (Road, Rail, Sea) and international (Air)	*Samgods Model*
	Report #5 Logistic costs at zone level (RCM) (Spread sheet for summary report no. 5)	Logistics costs per zone per commodity (P01-P35) and from/to flows to a zone	*Samgods Model*
	Report #6 Goods flow through terminals (Spread sheet for summary report no. 6)	Goods flow (tonnes) through terminals per commodity (P01-P35) and divided by direct access to (DAIMPORN),and from (DAEXPORN) or regular (REGULARN). Regular refers to flows not having direct access	*Samgods Model*

Folder	Name	Description	Used by application
	Report #7 Domestic tonne kms with container per mode (road, rail, sea, air) (RCM) (Spread sheet for summary report no. 7)	Transport work (tonne kms) in Sweden for container transports per commodity and vehicle type	*Samgods Model*
	Report #8 Domestic vehicle kms container per mode (road, rail, sea, air) (RC) (Spread sheet for summary report no. 8)	Traffic work (vehicle kms) in Sweden for container tranports per commodity and vehicle type	*Samgods Model*
	Report #10 Tonnes km per mode, commodity, domestic, tdomestic and international (RCM) (Spread sheet for summary report no. 10)	Transport work (tonne kms) per commodity, vehicle type and regional diff DTI domestic/total domestic/international	*Samgods Model*
	Report #11 Tonnes per mode, commodity, domestic, tdomestic and international (Spread sheet for summary report no. 11)	Tonnes per commodity, vehicle type and regional diff DTI	*Samgods Model*
	Report #12 node and link costs per vehicle and product group (RCM) (Spread sheet for summary report no. 12)	Link and node costs per vehicle type, per commodity and regional diff DTI	*Samgods Model*
Scenario Outputs\RCM Report\Assignment	Road Assignment Network (RCM) Rail Assignment Network (RCM) Sea Assignment Network (RCM) Air Assignment Network (RCM)	GIS map with the assignment of the freight flows to the transport network per vehicle type, in tonnes and in number of loaded and empty vehicles respectively	*Samgods Model*

Cube Interface components

Folder	Name	Description	Used by application
Scenario Outputs\RCM Report\Reports	Assigned Network	GIS map with the assignment of the freight flows to the transport network with all vehicle types in the same network, in tonnes and in number of loaded and empty vehicles respectively	*Samgods Model*
	Report #1 VHL and VHCLKM (RCM) (Spread sheet for summary report no. 1)	Summary table of number of vehicles and vehicle kms per vehicle type and mode (split up into regional diff DT and into loaded/empty total number of vehicles).	*Samgods Model*
	Report #4 TONNES and TONNESKM (RCM) (Spread sheet for summary report no. 4)	Summary table of tonnes and tonne kms by regional DTI per vehicle type and mode	*Samgods Model*
	Report #9 Vehicle kms, tonne kms, empty vehicle kms and total vehicle kms per geographic region per mode (road, rail) (RCM) (Spread sheet for summary report no. 9)	Summary table of vehicle kms (split up into #LEA-vehicles) and tonne kms per geographic region and mode (road and rail)	*Samgods Model*
	Report #13 Port area statistics RCM (Spread sheet for summary report no. 13)	Tons per port area and STAN group and comparison with statistics	*Samgods Model*
	Report #14 Oresund Kiel canal RCM (Spread sheet for summary report no. 14)	Results on Öresund bridge, Kiel canal and Jylland and comparison with statistics	*Samgods Model*
	Report #15 Trains per day (tot, empty, loaded) from RCM procedure (Spread sheet for summary report no. 15)	Number of loaded and empty trains per day bidirectional and differences between totals and capacities	*Samgods Model*

Folder	Name	Description	Used by application
	Report #15b Rail Capacity Network	Network with capacities and #LEA-trains per day (same statistics as in Report #15 but shown in the network)	*Samgods Model*
	Bidirectional tonnes per mode RCM	Network with bidirectional tonnes/100.000	*Samgods Model*
	Report #16 VHCLKM and distribution per road vehicles and county – totals (RCM) (Spread sheet for summary report no. 16)	Vehicle kms per county and vehicle type and their distribution on all the roads	*Samgods Model*
	Report #17 VHCLKM and distribution per road vehicles and county – Category 11 (RCM) (Spread sheet for summary report no. 17)	Vehicle kms per county and vehicle type and their distribution on E10 (European roads = category 11)	*Samgods Model*
	Report #18 VHCLKM and distribution per road vehicles and county – Other roads (RCM) (Spread sheet for summary report no. 18)	Vehicle kms per county and vehicle type and their distribution on other road types than E10	*Samgods Model*
	Comparison Ml Tons RCM vs Standard per mode	Absolute and percentage differences per mode road, rail and sea (in millions of tonnes) between RCM and STD	*Samgods Model*
Scenario Outputs\Compare\LOS matrices generation	LOS Road Dif LOS Raíl Dif LOS Sea Dif LOS Air Dif	Absolute cost differences between the current scenario and the scenario used for comparison for the LOS matrices	*Compare Scenarios*

Cube Interface components

Folder	Name	Description	Used by application
Scenario Outputs\Compare\Logistics Module\OD vehicles MAT	Road OD Dif Rail OD Dif Sea OD Dif Air OD Dif	Absolute differences in loaded vehicles between the current scenario and the scenario used for comparison for the OD matrices	*Compare Scenarios*
Scenario Outputs\Compare\Logistics Module\OD Tonnes MAT	Road TON Dif Rail TON Dif Sea TON Dif Air TON Dif	Absolute differences in tonnes between the current scenario and the scenario used for comparison for the OD matrices	*Compare Scenarios*
Scenario Outputs\Compare\Logistics Module\OD empty MAT	Road EMP Dif Rail EMP Dif Sea EMP Dif Air EMP Dif	Absolute differences in empty vehicles between the current scenario and the scenario used for comparison for the OD matrices.	*Compare Scenarios*
Scenario Outputs\Compare\Logistics Module\Tot Gen Att	TRIPEND Road Dif TRIPEND Rail Dif TRIPEND Sea Dif TRIPEND Air Dif	Total generation (sum of each row) and attraction (sum of each column) for the vehicle OD matrices and absolute differences to the scenario used for comparison	*Compare Scenarios*
Scenario Outputs\Compare\Assignment	Compared Load Net STD Compared Load Net RCM	GIS map with absolute differences between the current scenario and the scenario used for comparison of loaded vehicles flows for all vehicle types and modes	*Compare Scenarios*
Scenario Reports\Logistic Module (contains the summary reports for standard logistic module)	Report_1_Tot VHC and VHCKM by VHC Type	Number of vehicles and vehicle kms per vehicle type (#LEA). And regional diff DT.	*Samgods Model*

Folder	Name	Description	Used by application
	Report_2_Logistics Module	Summary table of no. of shipments, no. of loaded vehicles, transport distances, tonnes, tonne kms, average load factors and average distance by vehicle type by regional diff DTI	*Samgods Model*
	Report_2_LM_CHAINS	Summary table of no. of shipments, costs, vehicle kms, tonnes, tonne kms and average logistic costs per tonne km, by transport chain type	*Samgods Model*
	Report_2_LM_DEMAND	Summary table of the tonnes transported and the tonnes in the PWC-matrices together with allocation success rate	*Samgods Model*
	Report_3_TonKm_per_Mode_with_2006StatisticsSTD	Tonne-kms in millions on domestic movements per main mode (Road, Rail, Sea) and international (Air)	*Samgods Model*
	Report_4_Total tonnes and tkms by VHC type	Summary table of tonnes and tonne-kms (regional diff DTI) per vehicle type	*Samgods Model*
	Report_5_Total logistic cost at zone-level	Total logistics costs per commodity type (P01-P35) split by import and export at geographical zone level	*Samgods Model*
	Report_6_Goods flow through terminals (number of tonnes in and out per year)	No. of tonnes through terminals (described as zones) per commodity (P01-P35), split into from/to flows for direct access and flow for other terminals (without direct access	*Samgods Model*

Cube Interface components

Folder	Name	Description	Used by application
	Report_7_Domestic tonne kms with container per mode (road, rail, sea, air) and vehicle cl	Domestic tonne kms with container transports per mode and vehicle type, split by commodity. Total volume is also reported	*Samgods Model*
	Report_8_Domestic vehicle kms with container per mode (road, rail, sea, air) and vehicle cl	Domestic vehicle kms with container transports per mode and vehicle type, split by commodity Total volume is also reported	*Samgods Model*
	Report_9_Vehicle kms and Tonnes kms per geographic region	Vehicle kms (for #LEA-vehicles) and tonne kms per geographical region (road and rail mode).	*Samgods Model*
	Report_10_Transport work (tonne kms) per mode and vehicle cl, total and split per commodity, domestic, tdomestic and international	Transport work (tonne kms) per mode and vehicle type and commodity. Regional diff DTI	*Samgods Model*
	Report_11_ Transported goods volume per mode vehicle cl, total and split per commodity, domestic, tdomestic and international	Transported goods (in tonnes) per mode and vehicle type and commodity, as well as regional diff DTI	*Samgods Model*
	Report_12_node and link costs per vehicle and product group	Node and link costs per vehicle type and product group, divided in total domestic and international	*Samgods Model*
	Report_13_Tons_per_PortArea_and_STAN_Group	Tonnes per port area and STAN group and comparison with statistics	*Samgods Model*
	Report_14_Oresund Bridge_Kiel Canal and Jylland	Results on Öresund bridge, Kiel canal and Jylland and comparison with statistics	*Samgods Model*

Folder	Name	Description	Used by application
	Report_16_VHCLKM and distribution by county - totals STD	Vehicle kms per county and vehicle type and their distribution on all the roads	*Samgods Model*
	Report_17_VHCLKM and distribution by county - E10 roads STD	Vehicle kms per county and vehicle type and their distribution on E10 (category 11)	*Samgods Model*
	Report_18_VHCLKM and distribution by county Other roads STD	Vehicle kms per county and vehicle type and their distribution on all the roads except E10	*Samgods Model*
Scenario Reports\Rail Capacity Management (contains the summary reports for rail capacity management)	Report_1_Tot VHC and VHCKM by VHC Type (RCM)	Number of vehicles and vehicle kms (#LEA) Regional diff DT	*Samgods Model*
	Report_2_Logistics Module (RCM)	Summary table of no. of shipments, no. of loaded vehicles, transport distances, tonnes, tonne kms, average load factors and average distances by vehicle type, split up into regional diff DTI	*Samgods Model*
	Report_2_LM_CHAINS (RCM)	Summary table of no. of shipments, costs, vehicle kms, tonnes, tonne kms and average logistic costs per tonne km, by transport chain type	*Samgods Model*
	Report_2_LM_DEMAND (RCM)	Summary table of the tonnes transported and the tonnes in the PWC-matrices together with allocation success rate	*Samgods Model*

Cube Interface components

Folder	Name	Description	Used by application
	Report_3_TonKm_per_Mode_with_2006Statistics (RCM)	Tonne-kms in millions on domestic movements per main mode (Road, Rail, Sea) and international (Air)	*Samgods Model*
	Report_4_Total tonnes and tkms by VHC type (RCM)	Summary table of tonnes and tonne-kms (regional diff DTI) per vehicle type	*Samgods Model*
	Report_5_Total logistic cost at zone-level (RCM)	Total logistics costs per commodity (P01-P35) split by from/to flow at geographical zone level	*Samgods Model*
	Report_6_Goods flow through terminals (number of tonnes in and out per year) (RCM)	No. of tonnes through terminals per P01-P35.	*Samgods Model*
	Report_7_Domestic tonne kms with container per mode (road, rail, sea, air) and vehicle cl (RCM)	Domestic tonne kms with container transports per mode and vehicle type, split by commodity Total volume is also reported	*Samgods Model*
	Report_8_Domestic vehicle kms with container per mode (road, rail, sea, air) and vehicle cl (RCM)	Domestic vehicle kms with container transports per mode and vehicle type, split by commodity Total volume is also reported	*Samgods Model*
	Report_9_Vehicle kms and Tonnes kms per geographic region (RCM)	Vehicle kms (#LEA) and tonne kms per geographical region (road and rail mode).	*Samgods Model*
	Report_10_Transport work (tonne kms) per mode and vehicle cl, total and split per commodity, domestic, tdomestic and international (RCM)	Transport work (tonne kms) per mode, vehicle type and commodity, and regional diff DTI	*Samgods Model*

Folder	Name	Description	Used by application
	Report_11_ Transported goods volume per mode vehicle cl, total and split per commodity, domestic, tdomestic and international (RCM)	Transported goods (in tonnes) per mode and vehicle type, commodity, and regional diff DTI	*Samgods Model*
	Report_12_node and link costs per vehicle and product group (RCM)	Node and link costs per vehicle type and product group, divided into regional diff DTI	*Samgods Model*
	Report_13_Tons_per _PortArea_and_STA N_Group (RCM)	Tons per port area and STAN group and comparison with statistics	*Samgods Model*
	Report_14_Oresund Bridge_Kiel Canal_Jylland (RCM)	Results on Öresund bridge, Kiel canal and Jylland and comparison with statistics	*Samgods Model*
	Report_15_Trains per day (tot,empty,loaded) (RCM)	Number of loaded and empty trains per day bidirectional and differences between totals and capacities	*Samgods Model*
	Report_16_VHCLKM and distribution by county - totals (RCM)	Vehicle kms per county and vehicle type and their distribution on all the roads	*Samgods Model*
	Report_17_VHCLKM and distribution by county - E10 roads (RCM)	Vehicle kms per county and vehicle type and their distribution on E10 (category 11)	*Samgods Model*
	Report_18_VHCLKM and distribution by country - Other roads (RCM)	Vehicle kms per county and vehicle type and their distribution on all the roads except E10	*Samgods Model*

Table 2 List of inputs and outputs accessible from the Data Section window.

2.4. Keys window

The model is based on Scenario Manager and Application Manager. Applications represent the flow chart of the model containing calculation and specific programs, while the purpose of

Scenario Manager is to allow an application to be conveniently executed with a varying set of inputs. This allows the user to compare the effects that different input values have on the results. A set of input values is a scenario and the varying inputs to the applications are called “keys”. Catalog keys define items that vary each time an application in a catalog is run. They may represent a file, number, character string, or Boolean flag. For instance, using a key it is possible to specify different values for parameters, different networks for LOS calculation and assignment, different control parameters for the Logistics Module or more.

In general terms the keys may serve different purposes; in summary:

- To manage input data
- To give general settings for the model
- To enable different ways to run the model

A key can for example be:

- The name of an input data file
- A directory
- A check box with true or false value
- A check list to choose a specific value
- A constant
- A radio button

Different kinds of keys appear in applications and other places where it is possible to select the settings.

In Chapter 3, the available catalog keys for each specific application are listed. Catalog keys are defined as keys for setting up parameters in the applications. The Keys window is available in developer mode and it is also possible to display from Main toolbar -> Scenario -> View -> Show Keys.

The following keys in the Cube interface are called system keys:

- {CATALOG_DIR} is the directory where the .cat file is located
- {SCENARIO_DIR} is the directory where the scenario folder is located
- {SCENARIO_CODE}, {SCENARIO_SHORTNAME) are defined in the Scenario Properties, see Figure 10 below
- {SCENARIO_FULLNAME} = {SCENARIO_SHORTNAME_PARENT}.{SCENARIO_SHORTNAME}, where {SCENARIO_SHORTNAME_PARENT} is the base scenario to the current scenario

These keys are important components in each scenario. Please refer to the online Cube Voyager help available from the menu bar for further information (see for instance Scenario Manager > Working with applications and catalogs > Cube Voyager and TP+ scripts). “Scenario properties” is accessed by right-clicking on the topical scenario in the Scenarios window and select “Properties” (see Figure 9).

Each time a scenario is created all catalog keys should be given a value. Some of the keys have a default value. If the default value is changed by the user, it will become specific for that scenario. When a scenario is created as the child to another scenario, it will inherit all the catalog key settings from the parent.

In the Keys window information on the origin of the keys can be found. The keys for a specific scenario and application can be viewed by selecting the scenario in the Scenarios window by clicking on it, and selecting the application in the Applications window in the same way. The keys marked in black in the Keys window are undefined. The keys are shown in bold font if they have

been explicitly defined by the user and in italics if they have been inherited from the parent scenario. If the value is in grey font, it is a default value that has not been changed by the user, neither for the current scenario, nor for its parent.

More information about the keys and the scenarios can be found in the Cube Help, accessed from the main toolbar (Help -> Cube Help -> Cube Base -> Scenario Manager -> Keys/Scenarios).

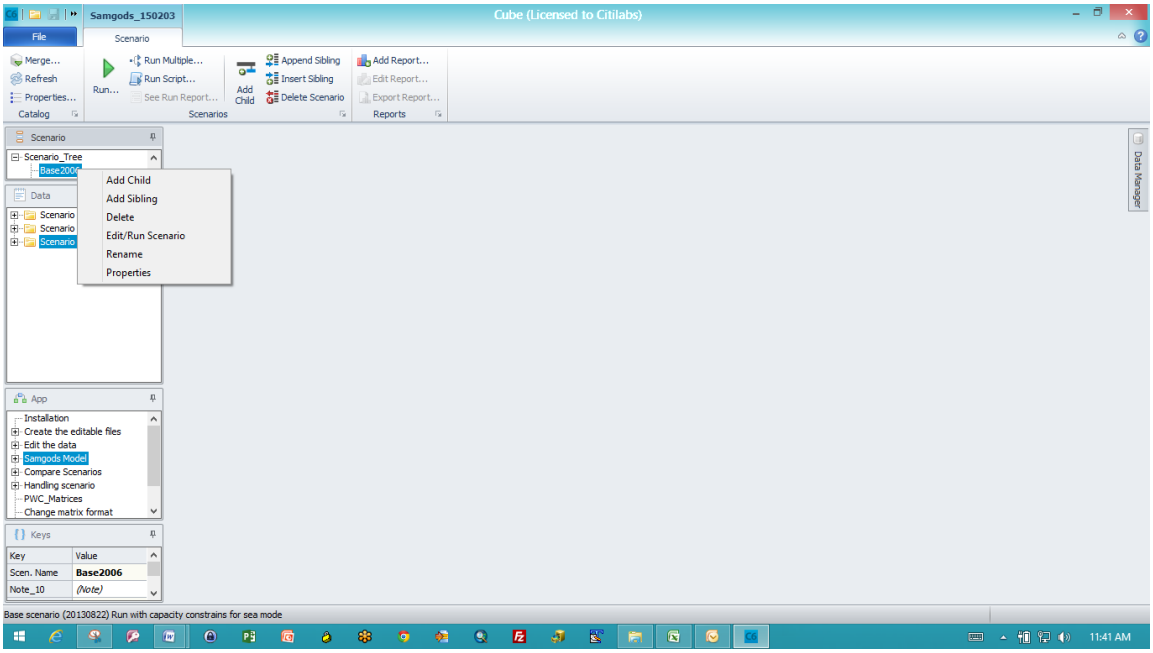


Figure 9 How to open the “Scenario Properties” window.

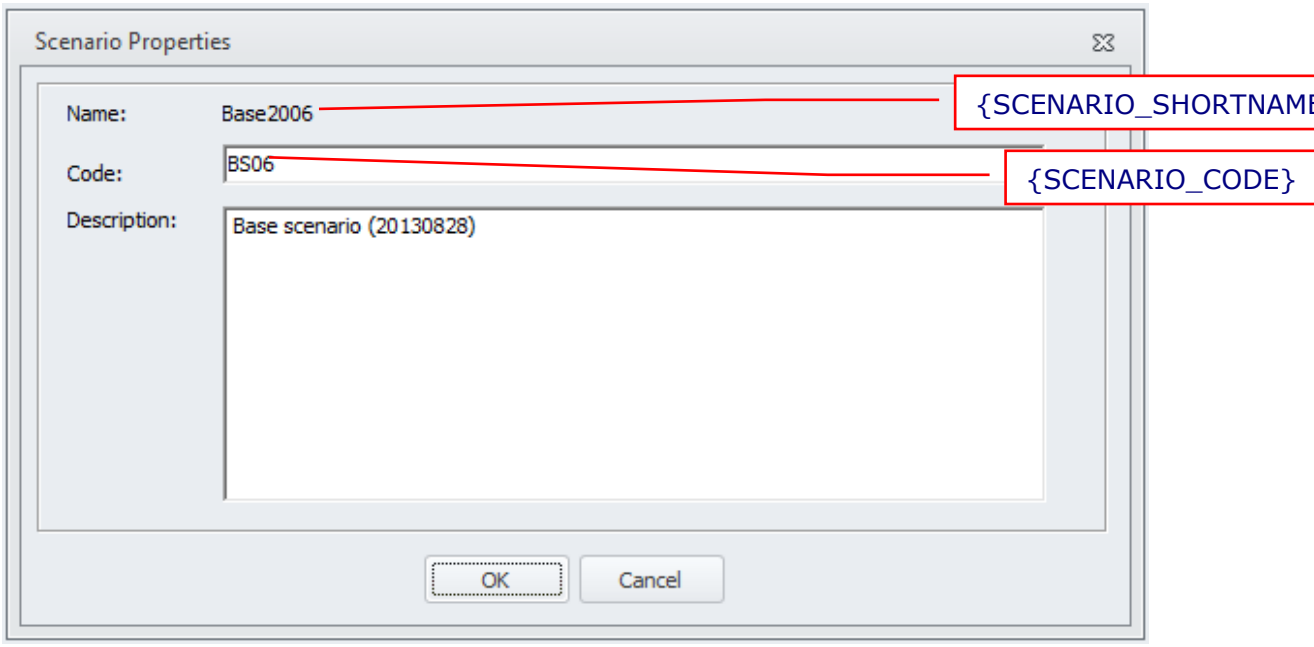


Figure 10 Set {SCENARIO_SHORTNAME} and {SCENARIO_CODE} in “Scenario Properties”.

2.5. Application manager window

The Application manager window is accessed by double-clicking on an application in the Applications window, and it provides a flow chart of a transportation modelling process, see Figure 11. The view is in a hierarchical flow style that offers:

- a view of the individual processes, the flow of data from one application to another, the sequence in which the processes are run
- a clear structure of what the input data and the output data are in each process
- a convenient interface for running specific parts of the process or the whole model

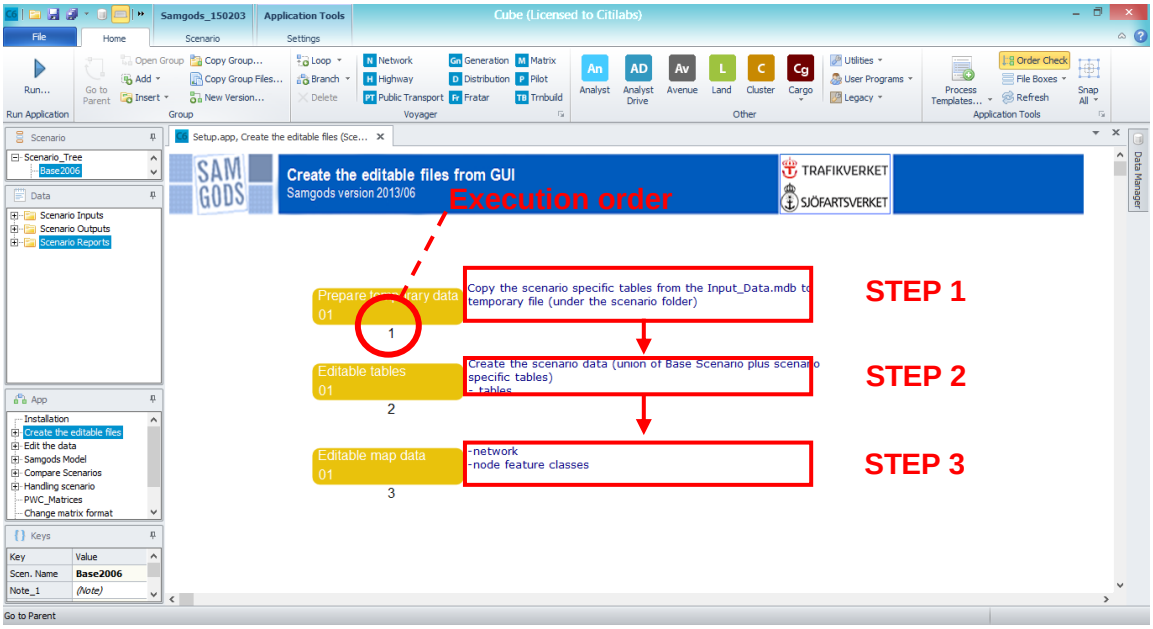


Figure 11 Application manager window.

2.6. Task Monitor program and the help function

The *Task Monitor program* is started automatically from the Application manager when the user runs either a single program or an application. The main purpose of the Task Monitor is to report the progress of the program/application execution, and to allow control of the run by pausing or abandoning it. When a run finishes successfully, a message box will indicate that the run is finished without any problem. If a failure occurred, a dialog box, showing the return code and error information, will appear.

The return code from the process gives the information on how the run completed. The codes are shown below.

Return codes:

Return code = 0 – the run completed successfully

Return code = 1 – along the process, a few warning messages were printed but the run was completed successfully

Return code = 2 – the run ended with a fatal error

Return code = 3 – the process was aborted by the user

There are facilities that allow showing:

- The report for the whole run
- The report for the step that failed, if the run ended with a fatal error

For more details on the Task Monitor, see reference guide RG_CubeBase.pdf under Citilabs\Cube folder, Chapter 16.

When the user needs help about the Cube Interface, the help function can be consulted. It is found on the Menu Bar; Help -> Cube Help.

3. Description of the applications

This chapter introduces the different applications in the Samgods GUI, how they are used and how the settings are made. The chapter is written as a catalog with detailed descriptions of the applications and should be consulted for the specifications of the applications rather than for instructions on how to use the entire Samgods model. For instructions on how to get started with Samgods, how to create and use scenarios etc., we refer to Chapter 4. The chapter commences with an explanation of the different Model User roles, followed by the description of the applications in the Samgods model GUI.

3.1. Model User roles

In the Samgods model GUI, three Model User roles are available:

- Standard user - should be used by the normal user when setting up scenarios and running the model
- Advanced user - should use when it is requested to manage some general parameters and values such as wait time for the prompt command or for running RCM process.
- Developer - should in general be used when advanced system settings are made, for instance when administrating the system by making installations and setting up the system

As mentioned earlier, in order to set the Model User roles, to go Scenario menu on the toolbar and select “Properties”. On the Catalog Properties window, select the “Model User” tab, where the settings for the Model User roles are made, as described below:

- Standard User – set the Model User to “Model Applier” and Current Applier group to “Standard User”
- Advanced User – set the Model User to “Model Applier” and Current Applier group to “Advanced User”
- Model Developer – set the Model User to “Model Applier” and Current Applier group to “Model Developer”

More details for when the Model User roles are used are given in the catalog key tables. Most of the catalog keys for the respective applications are described; however, not all keys are explicitly explained.

General guidelines for which Model User role to use:

Standard user – should be used by the normal user when running different scenarios

Advanced user – should be used by an experienced user of the model that would control some specific settings and parameters

Model developer – should be used when setting system keys, no restrictions are applied in this case

3.2. *Installation* application

The *Installation* application is only enabled in developer mode. A screenshot of the application is displayed in Figure 12. The purpose of the *Installation* application is to set the general information to properly run different programs involved in the model. In particular we have the following programs:

- Logistics module (executable programs buildchain.exe and chainchoi.exe)

- Rail Capacity Management module (executable programs buildchain4RCM.exe, chainchoi4RCM.exe, LP2CC.exe, MPS.jar, LP_solve.exe)
- Citilabs Cube Software
- ArcGIS Esri Software
- Python software

See the installation instructions in Section 1.5 for further details on how to access the keys and set the right values.

The first group of catalog keys, called “Software versions”, is introduced to avoid inconsistency of version problems over time. Different versions of the programs can be implemented (typically when a software is updated to a newer version), and it is important to know which software versions that were used for a particular scenario study to enable proper analysis and consistency of the outcome. The keys are displayed in Table 3.

Catalog key name	**Example of value**
Cube Software	6.1.0 Sp1
EMME Software	2.9.6
ArcGIS Software	10.1 Sp1
Python software	27
Samgods Model software	(20140627)

Table 3 “Software versions”.

The second group of catalog keys, “Installation parameters”, handles the possible problem of having different installation folders on different PC’s by setting the path of the programs. Since the path for the ArcGIS program is used by Python, the “\” signs must be replaced by “/” or “\\” in this key, see Table 4 for an example.

Catalog key name	**Example of value**
Location of Cube Program	C:\Program Files\
Location of EMME Program	C:\Program Files\
Location of ArcGIS Program	C:/Program Files/
Location of Python Program	C:\Python27\ArcGIS10.1
Location of Java Program	C:\Windows\System32

Table 4 “Installation parameters”.

The last key in the second group, see Table 5 below, defines the base scenario that is used in the current model. The base scenario is used as a reference when storing the data for other scenarios. Only the differences between the base scenario and other scenarios are stored in the database. The value of this key is related to the *Handling scenario* application; please refer to Section 3.7 for more information.

Catalog key name	**Example of value**

Scenario name for the BASE scenario	Base2006

Table 5 Base scenario definition.

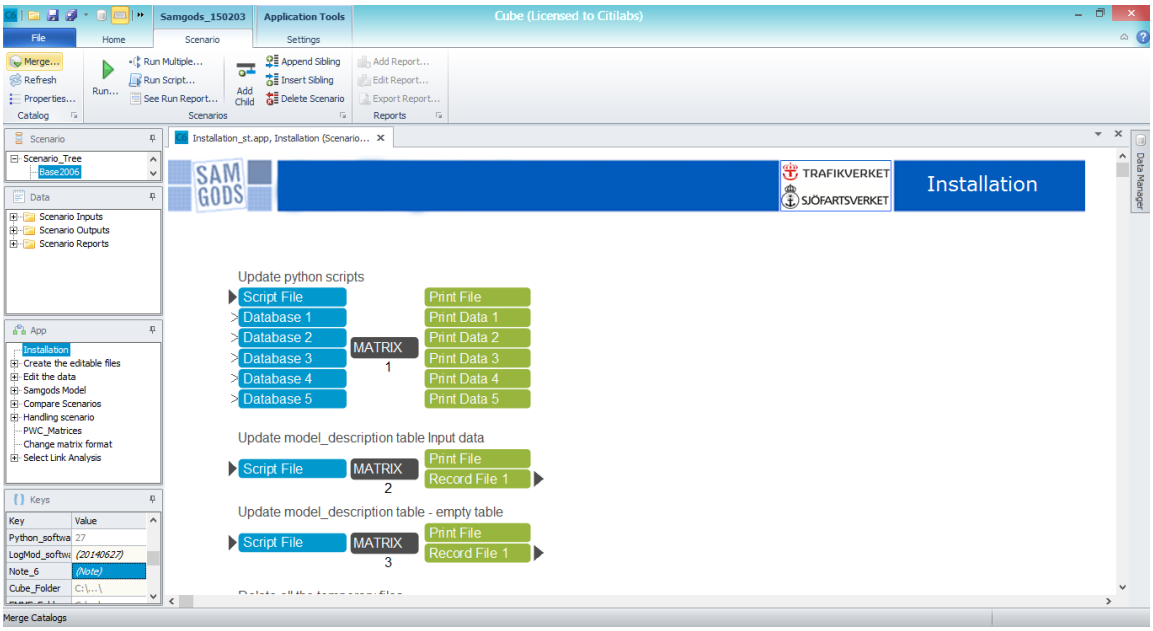


Figure 12 The Installation application.

To open the overview of the application as illustrated in Figure 12 double-click on the application. To access the catalog keys of a specific scenario, mark the application, and double-click on the specific scenario in the Scenario window. Please refer to Chapter 3 for further instructions on how to use the Samgods GUI.

3.3. Create the editable files application

A view of the *Create the editable files* application can be seen in Figure 14. The purposes of this application are to:

- Create the essential files for visualizing or editing the input data from the graphical user interfaces (Cube GIS window, DBI editor)
- For a new scenario, allow to copy all the parent scenario data to the new scenario

The concept of this is that all the input data connected to a specific scenario is stored in the database as the differences between the current scenario and the base scenario (i.e., the reference scenario). The benefits of this are:

- A smaller amount of data is stored, that is, only the differences between the base scenario and the alternative scenario(s)
- It makes different alternative scenarios independent of each other, by letting the alternative scenarios having only the base scenario as a reference. The only redundancy of the system occurs when children are added to an alternative scenario since all scenarios (including child and parent scenarios) are independent of each other and only have the base scenario as a reference
- When changes are made to the base scenario, there is no need to change all the other scenarios. This facilitates the handling of the overall scenarios. Furthermore the changes

and edits will be done only once, in the base scenario, avoiding risk of mistake when updating the correlated scenarios

To create the editable files for a specific scenario and the scenario specific tables, two applications work in conjunction:

- the *Create the editable files* application, that merges the base scenario with the scenario specific tables to view and edit a scenario, and
- the *Edit the data* application, that stores the scenario-specific tables into the database after any edits have been made.

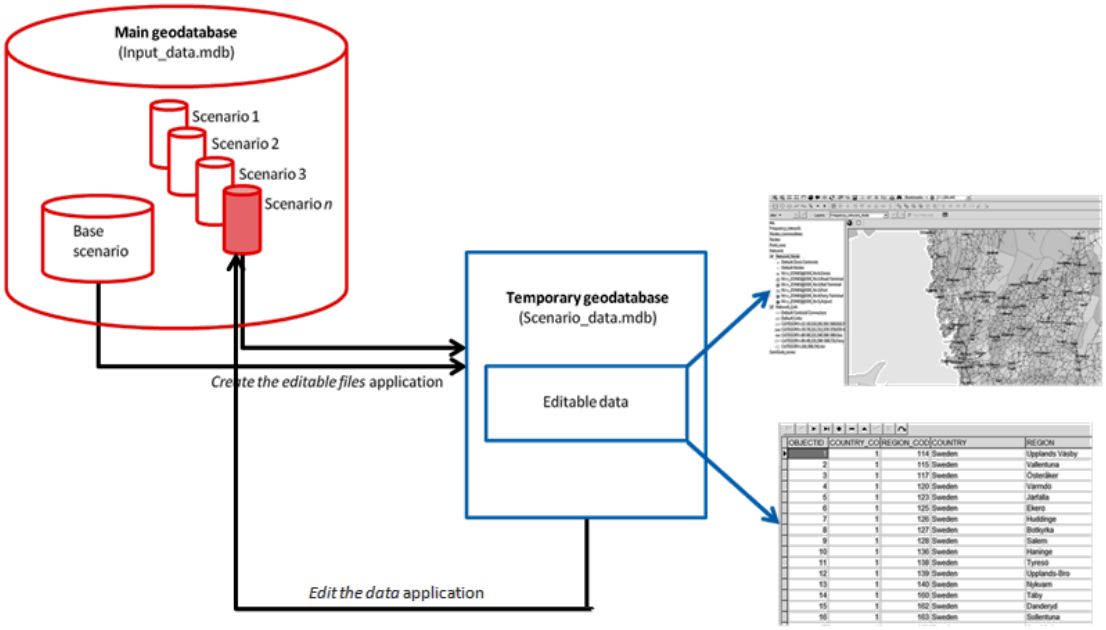


Figure 13 Database structure and scenario data of the Samgods GUI.

The main database is always present in the model, in the 05_Input_data folder (see Table 1 in Section 1.5). The temporary database (Scenario_data.mdb) is created in the scenario folder in each run of this application and is deleted on request by the user. The temporary database can also be viewed in the GUI.

The catalog keys available in the *Create the editable files* application are shown in Table 6 below.

	Catalog key name	**Example of value**	**Model User's rights**
1	Which scenario do you want to copy as new scenario? (Default is Base2006)	Base2006	S/A user
2	Location of Python program	C:\Python27\ArcGIS10.1	Developer
3	Scenario name for the BASE scenario	Base2006	Developer
4	Wait time for prompt messages during	600	Developer

	execution (default 10 minutes = 600 seconds)		Advanced user

Table 6 *Create the editable files* catalog keys.

The first key is relevant during the creation of a new scenario. When the scenario already exists, no action is needed. Keys number 2 and 3 are for installation purposes only. The last key represents a model run setting, specifying the wait time for prompt message during execution. For a normal user its value is set to 10 minutes, only for an expert user (advanced user right) it is possible to change the definition to a small value (for instance 10 secs). A different settings is required when several scenarios must be run and it would be minimize the interaction with the user.

To create a new scenario, the application copies the scenario-specific tables from the scenario (as indicated in the first catalog key in Table 6) and stores them in the temporary database. The *Edit the data* application will then store them back to the main database.

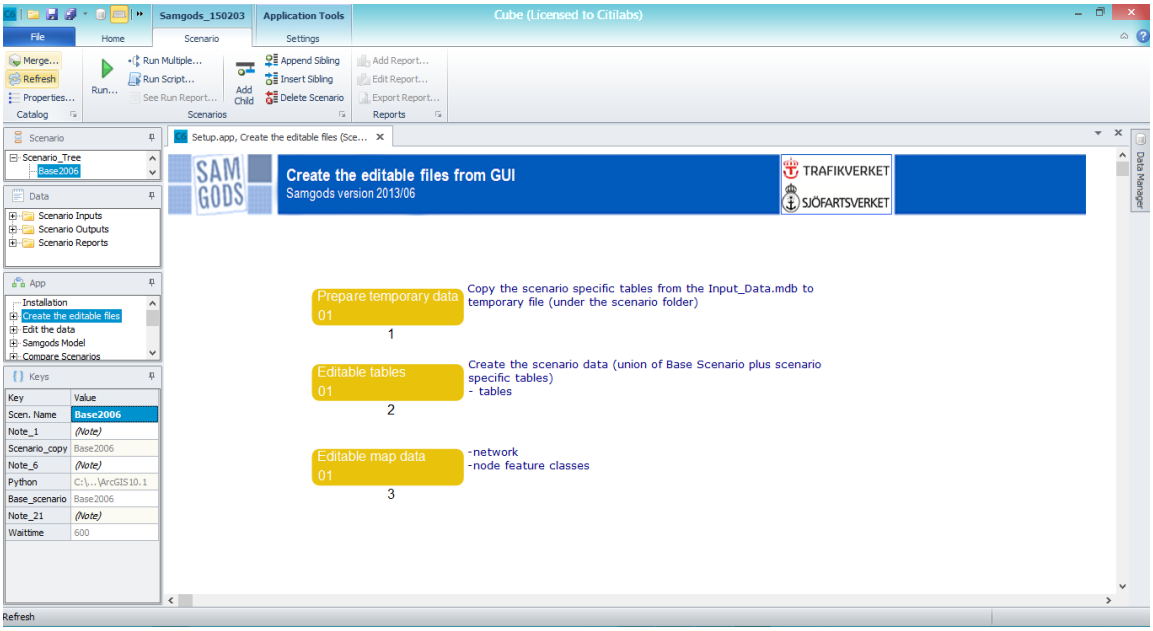


Figure 14 The Create the editable files application.

When the application has been executed, the output (i.e., the editable files) can be found in the folder Scenario Inputs\Editable data in the Data Section window. If the *Create the editable files* application has been executed before and the user after that has not selected to delete the temporary geodatabase, all the data will be available without the need to run the application again. If the temporary database has been deleted, it may always be reconstructed by running the *Create the editable files* application.

Please note: This application has to be run at least once for each scenario, including the base scenario. Otherwise, the necessary files for using the scenario will not be created.

The *Create the editable files* application is the only application that is necessary to run for *each* scenario - including the base scenario. For all other scenarios except the base scenario it is also necessary to run the *Edit the data* application.

Tip: The date and time of the last modification of the temporary and the main geodatabase are checked by the application to avoid inconsistencies between the two datasets. If any differences are found, the user is asked to choose whether the execution should be completed (the temporary geodatabase will then be overwritten) or cancelled, so that the temporary geodatabase could be saved to the main geodatabase by the user.

Please note:

- The location of the main database is in the 05_Input_data folder (see Table 1 in Section 1.5).
- The location of the temporary database, Scenario_data.mdb, is in the scenario folder, which can be found in the Scenario_Tree folder (see Table 1 in Section 1.5). It is available after each run. It can also be viewed from the GUI.

3.4. Edit the data application

The *Edit the data* application is used to store the scenario-specific tables into the database after any edits have been made.

A view of the application is shown in Figure 15. The purposes of the application are to:

- Enable editing of the scenario data by using the Scenario manager window or the Data Section window. All georeferenced data is visualized using the GIS Cube window and the other data is displayed in a database window. See the reference guide for Cube Base (RG_CubeBase.pdf under Citilabs\Cube folder) for further information on these tools;
- Store the modified data (the scenario-specific tables) to the main database after editing.

The catalog keys are ordered in two steps. The first ones are shown in Table 7 below.

	Catalog key name	**Example of value and explanation of values**	**Description**	**Model User's rights**
1	Do you want to lock the scenario from further editing?	Yes	This key is introduced due to data security reasons, where the user can choose to lock the scenario from further editing. Further explanation is given below	S/A user
2	Select from which interface you want to import your edits	GIS Window (Use input files constructed by the Cube GUI)	This key indicates if the edits are saved in a Voyager Network or in an EMME Network. If option "GIS window" is selected, the next two catalog keys (no. 3 and 4 below) do not need to be specified	S/A user

3	Use emme network file:	C:\Temp\EMME_NET_Emme2006.211	The network data can be edited by importing Emme data (format: .211). The file should be specified here. It is necessary that the network file exists in the specified folder, otherwise the system will prompt the user with a message during the execution	S/A user
4	Use emme speed table:	C:\EMME\NetworkBase2011\V101_1_02_SPEEDS.DAT	See key no. 3, except for the format, that is .DAT for speed table file	S/A user
5	General parameters [Table]	C:\Samgods\Scenario_Tree\Base2006\Scenario_Data.mdb\General_Base2006	This is the scenario data for the scenario, generated by the system	Developer
6	Attribute name for extra cost on specific link [SEK]	EC_V	Please refer to Section 5.2 for further explanation	S/A user
7	Attribute name for extra cost on specific link [SEK/km]	EC_KM_V	Please refer to Section 5.2 for further explanation	S/A user
8	Daily factor for all modes (except for Rail Mode) [days per year]	365	This key represents a value used to convert the annual flows into hourly flows and is expected to be changed rarely	Developer
9	Daily factor for Rail Mode [days per year]	250	This key represents a value used to convert the annual flows into hourly flows and is expected to be changed rarely	Developer
10	Peak Hour Factor	0.12	This key represents a value used to convert the annual flows into hourly flows and is expected to be changed rarely	Developer
11	Number of zones in network (see	1120	Maximum number of	S/A user

	value in scenario network):		zones in the network	
12	General parameters for Logistic Module [Table] (new)	C:\SamGods\Scenario_Tree\Base2006\Scenario_Data.mdb\LogMod_Base2006	This is the Logistic Module data for the scenario, generated by the system	Developer
13	Interest rate used in cost calculation [%/year] (new)	0.1	Interest rate used in cost calculations [%/year]	S/A user
14	Stuffing cost [SEK per tonne] (new)	18	Stuffing cost [SEK per tonne]	S/A user
15	Number of transport chain solutions for the Logistics module	1: the optimal solution 2: the second best solution … 5: the fifth best solution	See Table 5.2 in document under Section 10.3. The output is found in the Data Section window, in Scenario Inputs/Editable data/ General parameters table, in the field DATA. In the current implementation only the optimal solution is implemented. For the current RCM implementation it is strongly recommended to leave the number of alternatives set to 5.	S/A user
16	Output variables for the optimal transport solution [e.g.1,2,3, max is 8]	1: direct access 2: (un)loading costs 3: wait time costs 4: main utilization rate 5: number of vehicles 6: detailed information (total cost, total distance, total times, commodity, etc.) per f2f-solution 7: detailed information (transport cost share, total distance, total times, mode, etc.) per OD-leg. This table is linked to table 6 8: Statistics of the avail function	See Table 5.2 in document under Section 10.3. The output files are found in the scenario folder (see Table 1), in LogMod\ChainChoi\ OUTPUT and could be consulted by the advanced user. To reduce the amount of output files and produce meaning full reports it has been suggested to use reports 6 and 7.	S/A user

		Max is 8		
17	Initial consolidation factor in BuildChain (1 iteration)	0.75	This key concerns which consolidation factor (for all modes) that should be used in BuildChain. See Section 10.3 for reference.	S/A user
18	ALL_LORRY_TYPE_CONSOL (new)	Yes	This key will enable the consolidation of all lorries if the value is Yes. With No unconsolidated lorry transports will be enabled	S/A user
19	INDIVIDUAL_OD_LEG_OPTIMIZE (new)	Yes	If Yes then each chain is evaluated one leg at a time, and the lowest cost vehicle is chosen. This can be done since the OD-legs are independent. The exception is OD-legs for vehicles rolling on and off a RoRo vessel, where an recursive optimization method is used for the three OD-legs (roll on vehicle – RoRo – rolloff vehicle).	S/A user
20	MINIMUM_ANNUAL_TONNE_DEMAND_4_FREQ_OPTIMIZE [tonnes] (new)	10	If (Annual Demand / Nr Relations) < MINIMUM_ANNUAL_TONNE_DEMAND_4_FREQ_OPTIMIZE ChainChoi will exit 20 step frequency optimization loop after the first iteration, where frequency corresponds to EOQ.	S/A user
21	Lower bound for consolidation factor [Tonnes]	0.05	Lower bound for the consolidation factors ranking output	S/A user

	(new) (applied to all commodities)			
22	Upper bound for consolidation factor [Tonnes] (new) (applied to all commodities)	0.95	Upper bound for the consolidation factors ranking output	S/A user
23	TONNES (new)	DYNAMIC_MAX	Parameter to control how the demand shall be used in the calculation of the shipment sizes in BuildChain. The following values are allowed: DYNAMIC, DYNAMIC_MAX DYNAMIC_AVERAGE, DYNAMIC_GEOMEAN	S/A user
24	Do you want to log parameters from control files? (new)	Yes	If true the parameters from control file are logged in a log file (under LOG folder).	S/A user
25	Do you want to log reading of input data? (new)	Yes	If true the input data phase is logged in a log file (under LOG folder).	S/A user
26	Do you want to log cost values from vehicles files? (new)	Yes	If true the cost values read from LOS files are logged in a log file (under LOG folder).	S/A user
27	Do you want to delete the temporary geodatabase? (Tick=yes)	Tick =yes	This key gives the user the possibility to save hard disk space by deleting the temporary geodatabase (Scenario_Data.mdb). However, by keeping the temporary files, there is no need to run the *Create the editable*	S/A user

			files application again (for the current scenario)	

Table 7 Scenario parameters and handling keys.

The first key (lock the scenario or not) is introduced due to data security reasons. The user can choose to lock the scenario from further editing. A new scenario is always editable, because it is expected that the user will make some changes to the scenario tables. To lock a scenario means that after the run, all the scenario data can be visualized in the interface, but if any edits are made, these edits will not be saved in the main geodatabase. The base scenario is locked by default and it should always be locked to enable comparison of the scenarios. In the database, only the relative differences between the base scenario and the scenarios alternatives are stored, this is why it is important not to change the base scenario when new scenario alternatives have been introduced. A prompt window gives information on whether the scenario has been locked or not during the execution of the following applications: *Create the editable files*, *Edit the data*, *Samgods Model*.

The 11th key (Number of zones in network (see value in scenario network)) must be updated accordingly the number of zones in the EMME or Voyager network. The Emme network, in conjunction with the speed table, could be provided as input network and converted by the application. In this case the number of zones has specified as the record number in the emme node table for nodes starting with *. In Voyager the number could be identified and modified in the GIS window selecting the network in TOC and right clinking on that. For more details on the EMME network please refer to Chapter 5.1.

The last key (no. 27) gives the user the possibility to reduce the run time during the creation of the temporary files. By deleting the temporary geodatabase, hard disk space could be saved. On the other hand, by keeping the files, run time can be saved since the *Create the editable files* application does not have to be run again for the specific scenario. The *Create the editable files* application needs about 5-10 minutes to merge all scenario specific tables with the base scenario.

To avoid inconsistencies between the temporary and the main geodatabase, it is recommended to always control whether the two data sets have the same date and time of last modification, before running the *Samgods Model.* If they differ, there could be edits in the temporary geodatabase that have not been saved to the main geodatabase, so that edits will not be included in the execution of the model. In order to save edits in the main geodatabase, it is necessary to run the *Edit the data* application. For the *Create the editable files* application, this check is done by the application, in order not to overwrite any not saved edits in the temporary geodatabase by mistake (see Section 3.3).

When “Next” is clicked in the *Edit the data* application in the *Standard user Advanced user* mode, a second set of catalog keys is displayed, see Table 8. These keys give access from the interface to all the input data for the specific scenario. The model Standard user / Advanced user does not need to do anything to define the key values. The tables and geodata can be edited by clicking on the “Edit…” button in *Standard user Advanced user* mode. All these files are also accessible from the Data Section window, under Scenario Inputs\Editable data. In Section 2.3 a brief explanation of all files in the Data Section window is given.

Catalog key name	**Example of value**	**Model User’s rights**	**Name of file in Data Section window**

ArcMap GIS Project File	C:\Samgods\Scenario_Tree\Base2006\Input_Data.mxd	S/A user	Input_Data.mxd
Commodity data [Table]	C:\Samgods\Scenario_Tree\Base2006\Scenario_Data.mdb\Cargo_Base2006	S/A user	Cargo Table
General parameters of Vehicle Classes [Table]	C:\Samgods\Scenario_Tree\Base2006\Scenario_Data.mdb\Vehicles_Parameters_Base2006	S/A user	Vehicles Parameters
Specific parameters of Vehicle Classes in some commodities [Table]	C:\Samgods\Scenario_Tree\Base2006\Scenario_Data.mdb\Vehicles_exception_Base2006	A user	Vehicle Parameters Exceptions
Table with tax by country (SEK/km) [Table]	C:\Samgods\Scenario_Tree\Base2006\Scenario_Data.mdb\Tax_Country_Base2006	S/A user	Tax by country Table
Tax by Category (SEK) [Table]	C:\Samgods\Scenario_Tree\Base2006\Scenario_Data.mdb\Tax_Category_Base2006	S/A user	Tax by Link class
Tax by Link (SEK) [Table]	C:\Samgods\Scenario_Tree\Base2006\Scenario_Data.mdb\Tax_Link_Base2006	S/A user	Tax by link
Toll for bridges (SEK) [Table]	C:\Samgods\Scenario_Tree\Base2006\Scenario_Data.mdb\Toll_Link_Base2006	S/A user	Toll bridges
Network specific of scenario [Geodata]	C:\Samgods\Scenario_Tree\Base2006\Scenario_Data.mdb\Network	S/A user	Scenario Network
Port terminals (pilot fees values) [Geodata]	C:\Samgods\Scenario_Tree\Base2006\Scenario_Data.mdb\Ports_Swe	S/A user	Ports Sweden
Zones and terminals attributes [Geodata]	C:\Samgods\Scenario_Tree\Base2006\Scenario_Data.mdb\Nodes	S/A user	Nodes
Nodes commodities (interchanges allow) [Geodata]	C:\Samgods\Scenario_Tree\Base2006\Scenario_Data.mdb\Nodes_commodities	S/A user	Nodes commodities
Frequency data	C:\Samgods\Scenario_Tree\Base2006\Scen	S/A user	Frequency

[Geodata]	ario_Data.mdb\Frequency_network		network
Table with Rail Capacity [Table]	C:\Samgods\Scenario_Tree\Base2006\Scenario_Data.mdb \Rail_Capacity_Base2006	S/A user	RailCapacity Table

Table 8 Editable data.

The last three catalog keys are only accessible in model developer mode with the exception for Wait time (that could be also specified by the Advanced user). They define the base scenario, the folder for the Python program and the wait time for prompt message during execution, see Table 9.

Catalog key name	**Example of value**	**Model User's rights**
Location of Python Program	C:\Python27\ArcGIS10.1	Developer
Scenario name for the BASE scenario	Base2006	Developer
Wait time for prompt messages during execution (default 10 minutes = 600 secs):	600	Developer Advanced user

Table 9 Developer and advanced user keys.

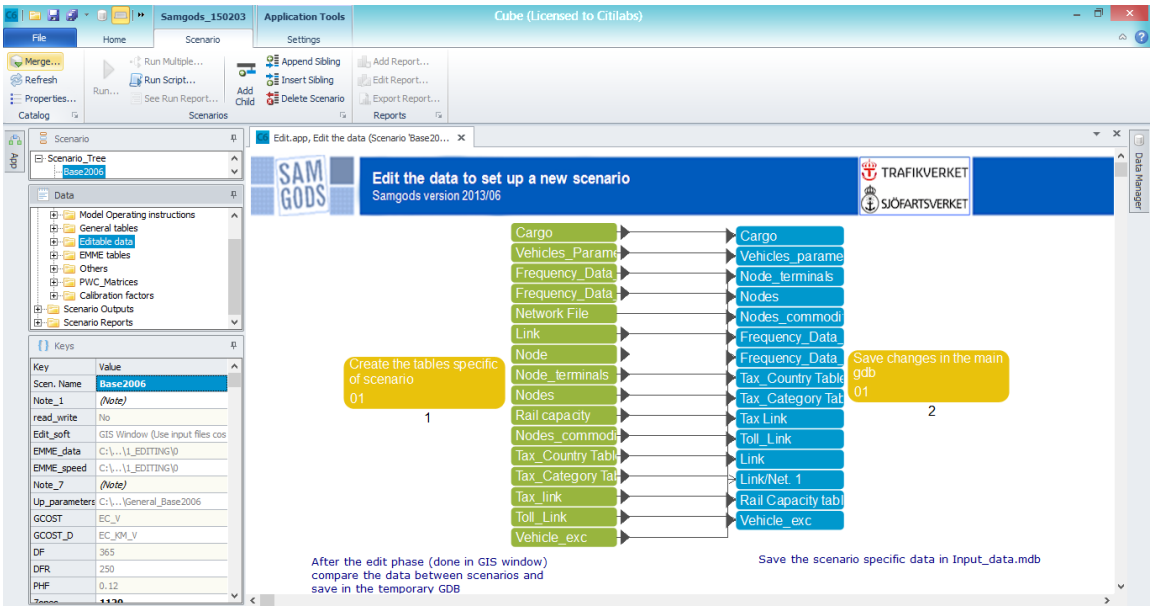


Figure 15 The *Edit the data* application.

The output of the *Edit the data* application, a log report containing information on the execution of the application, can be found in the folder Scenario Outputs\Edit the data Report in the Data Section window. This file contains a list of numbered messages giving information on, e.g., whether any data is missing in the input data (e.g. a missing port in the ports_swe table). For a list of messages, see Chapter 0.

3.5. Samgods Model application

A schematic picture of the *Samgods Model* application is outlined in Figure 16. The *Samgods Model* application is the core of the system, since it has the purpose to:

- run the Samgods model
- make sure that all required input data exists (in the main geodatabase or created along the process)
- save all the outputs in the right places (depending on the request of the user)

The Samgods Model application provides three different processes integrated in a unique application:

- The logistics module (in the document it could be referred to as Standard Logistics Module or STD - steps 4,5,6,and 7): the transport solutions are produced considering all the available chains and the results are summarized in vehicle, tonne and empty vehicle matrices assigned to the transport network. The solution considered for each firm-to-firm relationship is one and only one
- The Rail Capacity Management module (steps 8,9 and 10): in an iterative process the transport chains solutions using rail infrastructure are modified with the goal to redistribute the flows and reduce the congestion on the rail network. In each iteration a new alternative per each firm-to-firm using rail links may be added, may since possibly existing alternatives are not added again, to the capacity problem manager (called LP since it involves the definition of a linear programming problem). The variables in the LP model are the usage split of the available solutions per f2f-relation.. The initial step is denoted LP0 and considers the best solution from logistic module and the second best choice. New alternatives are successively added in step LP1, LP2 etc. until the total LP model cost is minimized, i. e. when the solution has converged according to defined stopping criteria. One alternative stopping criteria could be a maximum number of iterations. Should any rail link be overloaded after stopping, a heuristic procedure involving the use of a congested assignment of empty train flows and capacity adjustments of the constraints in the LP-model may be used. The heuristic is denoted Adjust Capacity procedure and is referred to as LP1b in some catalog keys. Note! Each step in this procedure is just as CPU time requiring as solving the last full LP-model..
- The calibration module (steps 1,2,11 and 12): details will be provide in the document listed in Section 10.7. It has been used to calibrate the current version. The standard and advanced user are not allowed to access to the catalog keys that control this process

The steps related to the Logistics Module are:

- LOS calculation (step 4)– the step where the Level Of Service matrices are calculated. There is one LOS matrix for each vehicle type providing transport time, transport distance, infrastructure fees/charges and the domestic distance for zone-to-zone relations. The LOS matrices are mandatory input to the Samgods model (We refer to the Method Report and/or the VTI report for further explanation, see Section 10 References)
- Logistics module (step 5) – the step where the freight flows of the different commodities are assigned to transport chains
- Assignment (step 6) – the step where the freight flows are assigned to the infrastructure network
- Reports (step 7) – the step where all standard reports (also called summary reports) from the *Samgods Model* application are produced

Description of the applications –

The steps related to the RCM module are:

- Rail Capacity Management (step 8): using the results from standard logistics module sets up the LP and provides a new revised set of vehicle and tonne OD matrices
- Assignment RCM (step 9) – the step where the freight flows are assigned to the infrastructure network. The empty rail assignment considers the congestion on rail links by applying a vehicle-delay function that depends on bidirectional link flows, the other modes maintain the standard all-of-nothing assignment
- Reports RCM (step 10) – the step where all standard reports (also called summary reports) from the *Samgods Model* application are produced with results for RCM

We refer to the reference material listed in Section 10, for further information of the Samgods model.

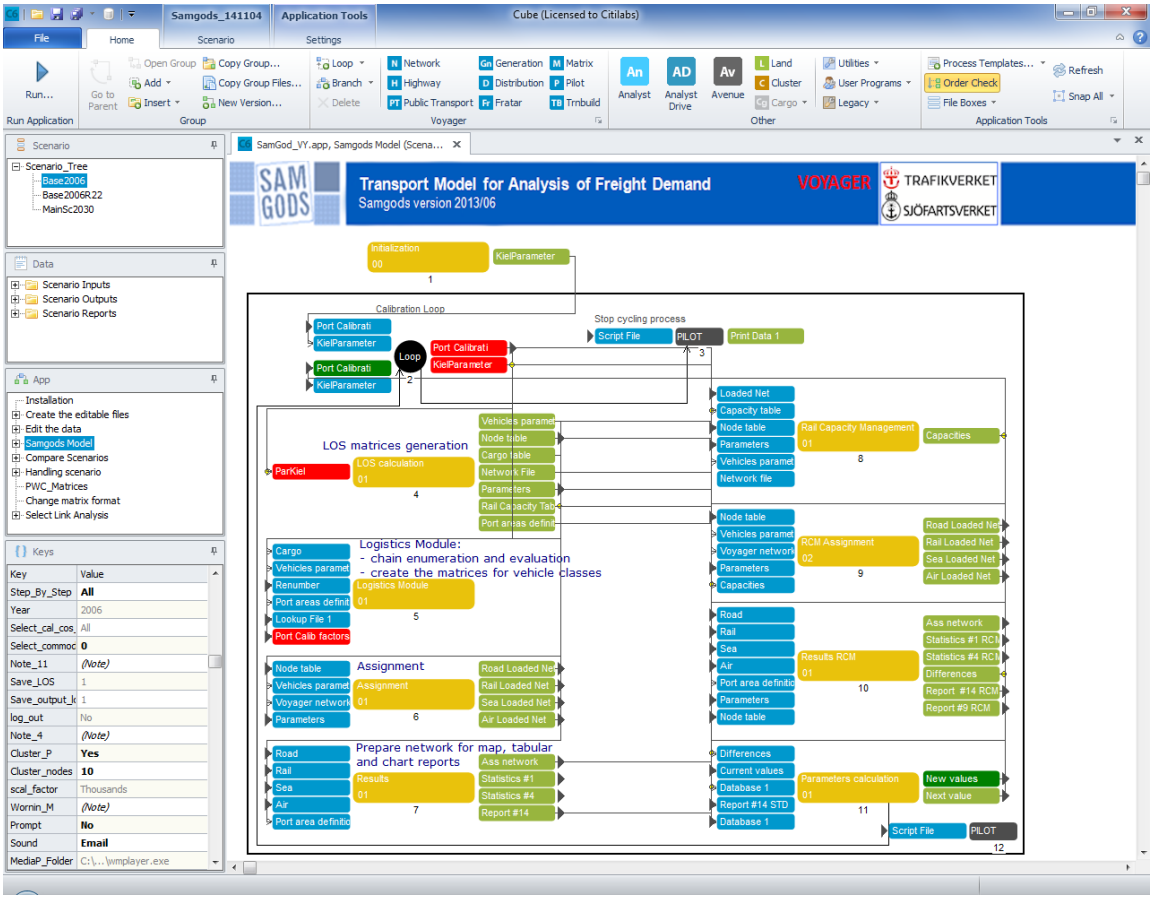


Figure 16 The *Samgods Model* application.

3.5.1.Standard Logistic Module

The first four steps of the application represent the “standard” module where the capacity and congestion on rail links are not considered. This “standard logistic” module has different choice dimensions, depending on the results that the user wants to simulate (as showed in the Figure 17).

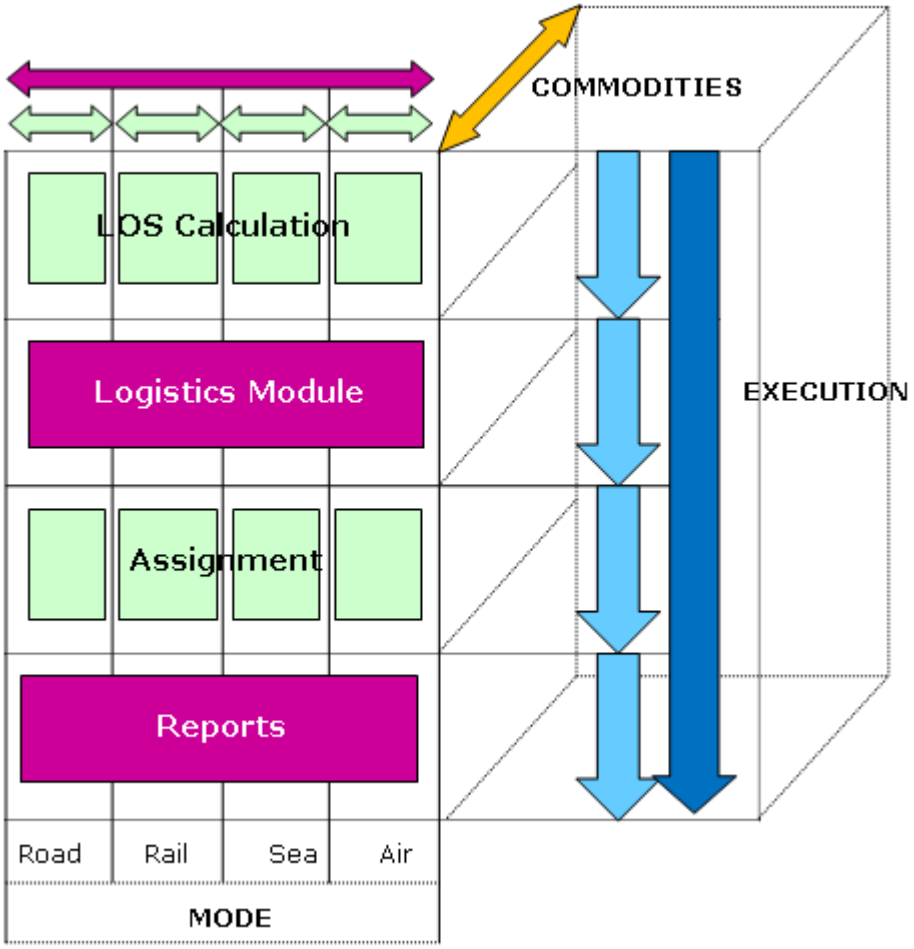


Figure 17 Different ways to run the *Samgods Model* application for the standard part.

All the possible dimension are:

- The model could be run as an uninterrupted process or step-by-step (illustrated in the figure by the blue arrows to the right)
- It is possible to run all the commodities at once or one commodity at the time (illustrated by the yellow arrow at the top of the figure)
- For the steps *LOS Calculation* and *Assignment* is it possible to run all the modes or only a specific mode (illustrated by the green boxes to the left in the figure)
- It is possible to select which specific outputs to save from running the Samgods model

Not all combinations of these choices are allowed. Details are given in the following paragraph. During the run, the user will be informed with a prompt window whether the selections made are coherent with each other.

The option to run the model for one mode at a time is allowed only for the steps highlighted in green, i.e. *LOS Calculation* and *Assignment*. This is due to the fact that the Logistics module needs LOS matrices for all modes. A reason for running only a specific mode could be that the differences in the input data are related only to one mode. For instance, if no other changes have

been made in the input data, there is no need to rerun the whole scenario in the *LOS Calculation* step. Regarding the *Assignment* step, the user may be interested in examining the assignment of the freight to the network for only one mode.

The fourth step, *Reports*, produces summary reports from running the Samgods model. Since this step summarizes the three previous steps, a full run of all four modes needs to be done to obtain complete reports.

It is allowed to run all steps related the standard logistic module in the *Samgods model* application for only one specific commodity group (as illustrated by the blue arrows). With the new setting of empty add-on factors for empty rail flows, these will be correct at any level of disaggregation. For other vehicle types the empty flow distributions are not separable, i. e. the sum of individual commodity based empty flow generations will not sum to the empty flow generation from the combined set of commodities.

If changes in the input data are detected after the LOS matrices have been created, the program will prompt the user with a message in the report file in the folder Scenario Outputs\Samgods report\Existing Outputs in the Data section window. During the execution, the user is provided with the option to cancel the run (by ticking the answer “Do you want to check data and skip the process?”). See Chapter 0 for further information on the log reports.

The last step of the application represent the “Rail Capacity Management” module where capacity and congestion on rail links are taken into account. This module has several sub-steps:

- Rail Capacity Management – the step where the freight flows of the different commodities are assigned to transport chains considering link congestion on rail
- RCM Assignment – the step where the freight flows are assigned to the infrastructure network considering link congestion on rail
- Results RCM – the step where all reports for the Rail Capacity Management module are produced

For the “rail capacity management” it is not possible to select which commodity and mode to run, but it is mandatory run all the commodities and all the modes. In fact the rail capacity management module considers the congestion on the rail links, and to do this properly you have to consider all the commodities and modes simultaneously. Moreover, you cannot select which step to run but you need to run all the RCM steps (Rail Capacity Management, RCM Assignment and Results RCM).

For the *Samgods Model* application there are several groups of catalog keys.

The first group is “Parameters for Logistics Module” and it contains only one key that specifies the number of zones in the network.

	Catalog key name	**Example of value**	**Description**	**Model User’s rights**
1	Number of zones in the network (see value in scenario network)	1120	Number of zones in the network	S/A user

Table 10 “Parameters for Logistic Module” key.

The next group of catalog keys is only available in developer mode and it contains installation parameters.

Description of the applications –

	Catalog key name	Example of value	Description	Model User's rights
1	Location of python program	C:\Python27\ArcGIS10.1	It specifies the installation directory for Python program	Developer
2	Java folder	C:\Windows\System32	It specifies the installation directory for Java	Developer
3	Scenario name for the BASE scenario	Base2006	It specifies the name of the base scenario	Developer

Table 11 "Installation Parameters" keys.

The next group of catalog keys, "Run Selections", refers to the execution order specifying which steps to run (see Table 12).

	Catalog key name	Example of value	Description	Model User's rights
1	Run only one application, or run all steps	All	It specifies which step that is to be run for Standard Logistic Module; it is possible to specify only one application or all the steps	S/A user
2	Year of PWC matrices	2006	It specifies the year for the PWC demand matrices	S/A user
3	Select the mode for the LOS Calculation and the Assignment steps	Road	It specifies which mode that is to be run; it is possible to specify only one or all the modes NOTE: if you run RCM, you need to consider all the modes	S/A user
4	Select commodities for the Logistics Module (for all commodities, select 0)	0	It specifies which type of commodity that is to be run; it is possible to specify only one NSTR commodity type (value from 1 to 35), or only one STAN commodity type (value from STAN1 to STAN12) or all the commodities (value 0) NOTE: if you run RCM, you need to consider	S/A user

			all the commodities	

Table 12 “Run Selections” keys.

Possible input values for the first key listed in Table 12 are:

- LOS calculation: it indicates to run only “LOS calculation” step
- Logistics module: it indicates to run only “Logistics Module” step
- Assignment: it indicates to run only “Assignment” step
- Reports: it indicates to run only “Results” step
- Standard LogMod: it indicates to run all the “Standard LogMod” steps (LOS calculation + Logistic module + Assignment + Reports)
- Rail Capacity Management: it indicates to run all the “Rail Capacity Management” steps (Rail Capacity Management + RCM Assignment + Results RCM)
- All: it indicates to run all the steps

Note that, when running Standard Logistic Module, the input for Rail Capacity Management procedure is created in the scenario folder. Therefore the Rail Capacity Management procedure could be run after a full run of Standard Logistic Module.

Output is produced from all steps in the *Samgods model* application. Together with the Microsoft Office tools (such as Access and Excel) this output can be analyzed in-depth in various ways. The purpose of the standard reports produced in the Report step is to give the user a quick overview of the results from running the *Samgods model* application.

Possible input values for the second key (Year of PWC matrices) in Table 12 are:

- 2006: PWC matrices for year 2006
- 2030: PWC matrices for year 2030
- 2030BnM: PWC matrices for year 2030 with 2006 demand for commodity 15

Possible input values for the third key listed in Table 12 are:

- All
- Road
- Rail
- Sea
- Air

The last key has a more general function. It is used in all the applications where the output data is filtered by commodity. It is the most important catalog key of these three keys. If the Samgods model first is run for commodity type 1 (for instance), then for all the commodity types (key set to zero), then both the results for commodity type 1 and for all the commodities will be saved. In the scenario folder (under Scenario_Tree, see Table 1), the name of the specific output database is OutputX_{SCENARIO_SHORTNAME}.mdb, where X is the commodity group. Switching from one set of output to another in the interface is easily made by changing the value of this catalog key and clicking “Save”. The possible values for this key are the numbers representing different commodities or zero, representing all commodities. The possible commodities are the NSTR commodity types (1-35) and the STAN commodity types (STAN 1-12). See the Appendix or for instance the Program Documentation (see References) for more information.

The report “Existing Outputs” (in the folder Scenario Outputs\Samgods Report in the Data Section window) is updated during each run and it gives information on the output and the commodity class.

The next set of catalog keys, “Other options”, refers to the optional outputs which can be saved in the scenario folder, see Table 13 below.

	Catalog key name	Example of value	Description	Model User’s rights
1	Do you want to save the LOS matrices?	Tick	It indicates if you want to save the LOS matrices	S/A user
2	Do you want to produce buildchainxx.log files?	Yes	It indicates if you want to generate a log file containing any warning that can occur during the execution of the Buildchain program	S/A user

Table 13 “Other options” keys.

The LOS matrices produced during the cost calculation step are stored in the scenario folder in Voyager format (i.e. in MAT format).

With the second key the user selects whether the Buildchain program will produce log files or not. The log files (*.log) contain any warnings that can occur during the execution. Please refer to the Program documentation for the logistics model (see References) for more information.

The next group of keys allows the user to set the advanced options for the logistics module (heading “Logistics module settings – advanced”) and is made up by three catalog keys, see Table 14 below.

	Catalog key name	Example of value	Description	Model User’s rights
1	Do you want to run the Logistics module on several processors?	Yes	It indicates if you want to run the model on several processors	S/A user
2	How many processors would you like to run simultaneously?	4	It specifies the number of processes to run simultaneously	S/A user
3	Scaling factor for outputs	Thousands	It specifies the scaling factor for outputs	S/A user

Table 14 “Logistics module settings – advanced” keys.

If the computer has more than one CPU available, it is possible to split up the processes between the CPUs to speed up the run time of the model, using the catalog keys above. The third key enables the user to define the scale of the output that will be presented in the reports. If the value is thousands, the output value (for instance 2.000.000 vehicle kilometers) will be presented as the value divided by thousand (i.e., 2.000 vehicle kilometers in the example).

The next group of catalog keys is named “Stop points setting”. During the execution of the *Samgods Model* application is possible to pause the simulation running on each steps (LOS,

Logmod, LP0, LP1 LP1b). Using these keys listed in the Table 15, is it possible to define settings for the stop points. For a deep description of meaning of LP0, LP1 and LP1b see section for RCM.

	Catalog key name	**Example of value**	**Description**	**Model User's rights**
1	Do you want to pause the run waiting for your action on steps LOS, Logmod, LP0, LP1, LP1b	Yes	It indicates if you want to pause the simulation running at each step If you select "yes", the run will be paused at the end of the processes LOS, LogMod, LP0, LP1(or higher) and LP1b.	S/A user
2	Step completion	Email	It indicates how to inform the user that a step is completed	S/A user
3	Folder where is installed Media Player	C:\Program Files (x86)\Windows Media Player\wmplayer.exe	It specifies the installation directory for Media Player program Media Player is used to inform by a sound that a step is completed, if the previous key is set to "Sound" or "Both"	Developer
4	Location of song to Play	C:\Users\Public\Music\Sample Music\Kalimba.mp3	It specifies the sound file used to inform that a step is completed, if key number 2 is set to "Sound" or "Both"	Developer
5	Insert the email address for status on run	name@account.com	It specifies an e-mail address used to send an e-mail to inform that a step is completed, if key number 2 is set to "Email" or "Both"	S/A user
6	Email server address	smtp.company.com	It specifies the server address for sending e-mail and it is your SMTP address; if IMAP address is used instead of SMTP, it is possible to convert it in SMPT address using a free software (http://www.roadkil.net/	Developer

			downloads.php, DIG© 2004-2009)	
7	Email password	password	It specifies the password of your e-mail address	Developer
8	Email username	name	It specifies the username provided when setting up your e-mail	Developer
9	Sending account	name@account.com	It specifies sending account e-mail address	Developer

Table 15 “Stop points settings” keys.

In the table above, for key no. 1 indicates if you want to pause the simulation running at each step and possible values are:

- Yes – The run will be paused at the end of each step (LOS, LogMod, LP0, LP1(or higher) and LP1b). To continue the run, CUBE will wait for your confirmation
- No – The run will not be paused at the end of each step (LOS, LogMod, LP0, LP1 (or higher), and LP1b)

Key no. 2 how to inform the user that a step is completed and possible values are:

- Sound – When a step is completed a sound starts
- Email – When a step is completed an e-mail is sent to a specified e-mail address
- Both – When a step is completed a sound starts and an e-mail is sent to a specified e-mail address
- None – When a step is completed do nothing

Key no. 3 and 4 specify the program used to reproduce the sound and the sound file, while key no. 5 specifies the e-mail address for sending e-mail about the step completion.

Keys from no. 6 to no. 9 specified your provider details and e-mail settings.

If you set the first key to “Yes”, make sure to set properly all keys for e-mail settings.

3.5.2.Rail Capacity Management

Next group of catalog keys, specifies several parameters for Rail Capacity Management (see Table 19). For a complete comprehension we refer to documentation listed in 10.1 and 10.6.

	Catalog key name	**Example of value**	**Description**	**Model User’s rights**
1	Cut off criteria for RMC process (will consider links with V/C > XX% where XX is the value defined)	50	It specifies a percentage value for exclusion of link flows. According to experience, railway links with flow to capacity rates (V/C) at this or lower levels will not have any impact on	Advanced user

			the solution	
2	Maximum number of iterations in Rail assignment	500	It specifies the maximum number of iteration in the empty train rail assignment (considering link congestion)	Advanced user
3	Delay function for Empty assignment (Derivate)	2*10000*(MAX(0,VOLC[LI.ID_LINK]-C))	It specifies the delay function used for the assignment of empty vehicles	Advanced user
4	Options to save output files from RMC process	Yes, for all iterations	It indicates you want to save output file from Rail Capacity Management process for all the iterations (for instance LP0, LP1, LP2 etc.) or only in the last iteration.	S/A user
5	Maximum number of loops for Linear Programming process (LP)	0	It specifies the maximum number of loops for the linear programming process (LP). The 0 value means that only LP0 will be perform. A different number between 1 and 9 will iterate the process until that number (or earlier if convergence will be reach).	S/A user
6	Maximum number of loops for Adjust Capacity Procedure	0	It specifies the maximum number of loops for the Adjust Capacity procedure. Similarly as for the previous catalog key, 0 means that the Adjust Procedure will be skipped.	S/A user
7	Percentage of Overcapacity to be removed (over_capacity factor)	0.5	It specifies the value for the over capacity factor. It represents the share of capacity overload to remove from the right hand side in the LP-model	Advanced user
8	File with list of locked solutions for RCM:	LockedSTDLogMod_empty.txt	Free format file placed under C:\Samgods\01_Progr	Advanced user

			ams\Logmod\RCM with list of transport chains that must be excluded in setting up the LP problem. The solution evaluated in Standard Logistics Module will be applied.	
9	Link number to use in debug mode CheckLinkN_itXX.dat Max 10 links (Commas, ex. 1,25,182,164)	51,82,84,234,272,274	Providing the ID_Link list an extra report will be produced under RCM folder.	Advanced user

Table 16 “RCM Parameters” keys.

The first key in the table above will filter the transport chain solutions for rail links where the ration between total vehicle flows and capacity is greater or equals the value specified in the catalog key. Since the linear programming problem could be huge (millions of records), this limit could cut down the dimension of the problem. It is recommended to keep the default value.

The second key specifies the maximum number of iteration for the rail assignment with capacity constraints.

The third key specify the delay function used for the assignment of empty vehicles; possible choices are:

- 2*10000*(MAX(0,VOLC[LI.ID_LINK]-C))
- 4*10000*(MAX(0,VOLC[LI.ID_LINK]-C)^3)

The fourth key indicates if you want to save output files from RCM process and possible choices are:

- Yes, for all iteration
- No, This option will save results only for the final iteration and the previous one

The options for these keys are:

- Run only LP0
    - Maximum number of loops for Linear Programming process (LP) = 0
    - Maximum number of loops for Adjust Capacity Procedure = 0
- Run only LP1
    - Maximum number of loops for Linear Programming process (LP) = 1
    - Maximum number of loops for Adjust Capacity Procedure = 0
- Run only LP1b
    - Maximum number of loops for Linear Programming process (LP) = 1
    - Maximum number of loops for Adjust Capacity Procedure = 1
- Run LP2, LP1b
    - Maximum number of loops for Linear Programming process (LP) = 2
    - Maximum number of loops for Adjust Capacity Procedure = 1

IMPORTANT NOTE - Warm start for Rail Capacity Management !!!

The Samgods model could be run in several different ways. The current setup allows the following choices (using "Run only one step, or run all steps" catalog key and catalog keys 5 and 6 in Table 16):

Description of the applications –

- All: an interrupted run from LOS to reports for RCM. The number of LP and Adjust LP will be specified by catalog keys 5 and 6;
- Logistics Module or Assignment or Reports: a single step for standard log mod;
- Standard LogMod: all the steps related to Standard Logistic module (LOS +Logistic Module +Assignment +Reports)
- Rail Capacity Management: only the rail capacity management running the number of LP and Adjust Capacity loops specified via keys 5 and 6.

If the user wishes to run an extra step for LP or LP Adjust, it would be sufficient set the three keys as shown below:

For instance in a previous step LP1 has been run, and it is required to run LP2, it will be sufficient set the model in the following manner:

- Run only one step, or run all steps=Rail Capacity Management
- Maximum number of loops for Linear Programming process (LP) =2
- Maximum number of loops for Adjust =1

3.5.3.Calibration

Next group of catalog keys specifies parameters and table for calibration and they are available for developer users only (see Table 17). The calibration procedure should be not used at all. The following keys should be not changed, except catalog key 7.

	Catalog key name	**Example of value**	**Description**	**Model User's rights**
1	Initial values for port calibration by Port Area and STAN group	C:\Samgods\05_Input_Data\Calibration\PortAreasParameters_12082014.txt	It specifies a text file containing the initial values of factors for port areas; these values are specific by port area and STAN group. These scaling factors are applied to time for sea vessels 301 – 321.	Developer
2	Starting value for scaling factor on Kiel canal	1.55	It specifies the initial values of factor for Kiel canal. This scaling factor is applied to the canal toll	Developer
3	Maximum number of loops in calibration process	1	It specifies the maximum number of loops to run in the process	Developer
4	Parameters for port calibration procedure (step length,	C:\Samgods\ 05_Input_Data\Calibration\Parameters_portcalib	Step length, minimum value, cat off value and default minimum value	Developer

	minimum value, threshold, default)	ration.dbf	for calibration procedure on port areas	
5	Parameters for Kiel calibration procedure (step length, minimum value, threshold, default)	C:\Samgods\ 05_Input_Data\Calibration\ Parameters_Kielcalibration.dbf	Step length, minimum value, cat off value and default minimum value for calibration procedure on Kiel canal	Developer
6	Restart process from loop	1	The calibration procedure could be run for a fix number of loops. If the run crashes at a specific loop or it is required to run an extra loop, this catalog key sets the loop number to restart with.	Developer
7	Consolidation factors table	C:\Samgods\05_Input_Data\Input_Data.mdb\BuildChain_CONSOL	Individual consolidation bounds for all sub modes [LB,HB] Default values and specific values for STAN groups 2, 8 and 9	Developer Advanced user

Table 17 “Parameters and tables for calibration” key.

The calibration procedure uses a set of initial values specified via catalog keys 1 and 2 and progressively changes those values comparing the results with statistics. It applies a revision to the values using a step length search specified in catalog keys 4 and 5. For further details on this please refer to document listed under Section 10.7.

Catalog keys 3 and 6 are used to manage and control the calibration process. The first sets the maximum number of loops for the process, the second allows to run extra loops after a completed run.

The catalog key 7 allows specification of a different consolidation factors table and could be used in setting up sensitivity tests for the lower and upper bounds for each submode. For further details on its usage refer to Chapter 5.

The last catalog key is only accessible in model developer or advanced user mode and it defines the wait time for prompt message during simulation running (see Table 18).

Catalog key name	**Example of value**	**Model User’s rights**
Wait time for prompt messages during execution (default 10 minutes = 600 secs):	600	Developer Advanced user

Table 18 Settings key.

For a standard user the model will prompt window messages along the run and wait for the reaction from the user for 10 minutes. After that time it will apply the first choice available in each message and the run will continue to the next prompt window. The advanced user could decide

to reduce the wait time to a small value, for instance 2 sec, just changing the value for this catalog key. This choice, in other words, is suitable when several scenarios must be run in a sequence, since it will not require any action from the operator.

3.5.4.Outputs

Based on the selections made by the user, different outputs are created – one set of outputs for each specific setting of the catalog key “Select commodities for the Logistics Module (…)” for Standard LogMod. The output files and their locations are listed in the file Scenario Outputs\Samgods Report\Existing Outputs in the Data Section window.

Regarding empty vehicle calculations, the reader is referred to the appendix section 11.2 for further details.

The available outputs from the respective steps in the *Samgods model* application that can be accessed from the interface are:

LOS Calculation step

- LOS matrices by mode showing distance, time, extra cost, domestic distance and generalized cost summarized link-by-link along the minimum cost path (if the *LOS Calculation* step or the whole run was selected)

Logistics module step

- The loaded vehicle matrices (number of vehicles) by vehicle type (if the *Logistics module* step or the whole run was selected)
- Tonnes flow matrices – tonnes of freight by vehicle type (if the *Logistics module* step or the whole run was selected)
- The empty vehicle matrices (number of empty vehicles) by vehicle type (if the *Logistics module* step or the whole run was selected and the attribute “EMPTY_V” in the Vehicles Parameters table was set to 1 for the specific vehicle type, see Section 5.4).
- OD covered – various output reports per vehicle type, chain type, zone, and commodity – all the output used to create summary reports no. 2, 5-8, 10,11 and 12 (see Table 2)

Assignment step

- All freight flows in tonnes, number of loaded vehicles and number of empty vehicles assigned to the network by vehicle type (if the *Assignment* step or the whole run was selected).

Report step

- The freight flows in tones, number of loaded and empty vehicles assigned to the network with all modes in the same network (if the *Report* step or the whole run was selected).
- Summary report no. 1. Summary table of number of vehicles and vehicle kilometres per vehicle type (domestic and in total) and per mode in the assigned network (if the *Report* step or the whole run was selected).
- Summary report no. 4. Summary table of tonnes and tonne kms per vehicle type (domestic, international and total) and per mode (if the *Report* step or the whole run was selected)
- Summary report no. 9. Summary table of vehicle kms, tonne kms, empty vehicle kms, and total vehicle kms per geographic region and mode (road and rail only) (if the *Report* step or the whole run was selected).
- Summary report no. 13. Summary table of tons per port area and STAN group and comparison with statistics (if the *Report* step or the whole run was selected)

Description of the applications –

- Summary report no. 14. Summary table of results on Oresund bridge, Kiel Canal and Jylland and comparison with (if the *Report* step or the whole run was selected)
- Network with bidirectional tonnes per rail vehicle type
- Summary report no. 16. Summary table of vehicle kms per county and vehicle type and their distribution on all the roads (if the *Report* step or the whole run was selected)
- Summary report no. 17. Summary table of vehicle kms per county and vehicle type and their distribution on E10 (category 11) (if the *Report* step or the whole run was selected)
- Summary report no. 18. Summary table of vehicle kms per county and vehicle type and their distribution on all the roads except E10 (if the *Report* step or the whole run was selected)

RCM Logistic Module step (if the *Rail Capacity Management* step or the whole run was selected)

- The loaded vehicle matrices (number of vehicles) by mode and vehicle class
- Tonnes flow matrices – tonnes of freight by mode and vehicle type
- The empty vehicle matrices (number of empty vehicles) by mode and vehicle type
- OD covered – various output reports per vehicle type, chain type, zone, and commodity – all the output used to create summary reports no. 2, 5-8, 10,11 and 12 (see Table 2)

RCM Assignment step (if the *Rail Capacity Management* step or the whole run was selected)

- All freight flows in tones, number of loaded vehicles and number of empty vehicles assigned to the network by mode

RCM Report step (if the *Rail Capacity Management* step or the whole run was selected)

- The freight flows in tones, number of loaded and empty vehicles assigned to the network with all modes in the same network
- Summary report no. 1. Summary table of number of vehicles and vehicle kilometres per vehicle class (domestic and in total) and per mode in the assigned network. See appendix section 11.2 for details
- Summary report no. 4. Summary table of tones and tonne kms per vehicle type (domestic, international and total) and per mode
- Summary report no. 9. Summary table of vehicle kms, tonne kms, empty vehicle kms, and total vehicle kms per geographic region and mode (road and rail only) See appendix section 11.2 for details
- Summary report no. 13. Summary table of tonnes per port area and STAN group and comparison with statistics
- Summary report no. 14. Summary table of results on Öresund bridge, Kiel canal and Jylland and comparison with statistics
- Summary report no. 15. Summary table of bidirectional number of trains and tonnes per day Summary report no. 15b. Summary table of bidirectional number of trains and tonnes per day indicating capacity and train flows above the capacity level
- Network with bidirectional tons per mode
- Summary report no. 16. Summary table of vehicle kms per county and vehicle type and their distribution on all the roads
- Summary report no. 17. Summary table of vehicle kms per county and vehicle type and their distribution on E10 (category 11)
- Summary report no. 18. Summary table of vehicle kms per county and vehicle type and their distribution on all the roads except E10

3.6. Compare scenarios application

A view of the application can be seen in Figure 18 on the next page. The purpose of this application is to compare model outputs between different scenarios. Each scenario can be compared with any other scenario present under the Scenario_Tree structure. There are four catalog keys to handle this application, see Table 19.

	Catalog key name	**Example of value**	**Description**	**Model User's rights**
1	Select commodities for the Logistics Module (for all commodities, select 0)	0	It specifies which commodity type result has to be compared; it is possible specify only one NSTR commodity type (value from 1 to 35), or only one STAN commodity type (value from STAN1 to STAN12) or all the commodities (value 0)	S/A user
2	What do you want to compare?	LOS Matrices	It specifies which set of result to compare; it is possible to specify a single step or all the steps	S/A user
3	Scenario name to use in comparison:	Base2006	It specifies the name of the scenario to compare with the current scenario	S/A user
4	Scenario folder for comparison:	C:\Samgods\Scenario_Tree\Base2006	It specifies the directory of the scenario to compare	S/A user

Table 19 *Compare Scenarios* application catalog keys.

The user needs:

- to select the scenario name that he/she wants to compare with the current scenario using the third catalog key;
- to identify the folder location for the scenario used for comparison (e.g. folder where the outputs for scenario selected with previous catalog key are places., usually under Scenario_Tree folder plus short scenario name) and to update accordingly the fourth catalog key value;
- to select which commodity type results to compare (select the commodity number, a STAN commodity group or 0 for all in first catalog key) between different scenarios. It is the user's responsibility to verify that the same outputs exist for both scenarios. This could be done by looking in the Existing Outputs file for the respective scenario, found in the folder Scenario Outputs\Samgods Report in the Data section window. If the requested files do not exist for any of the scenarios, the process will be terminated with return code 2 from the Task Monitor program, see Section 2.6.

- With the second catalog key the user has the option to compare only a specific set of output (among the ones listed below) or all of the results

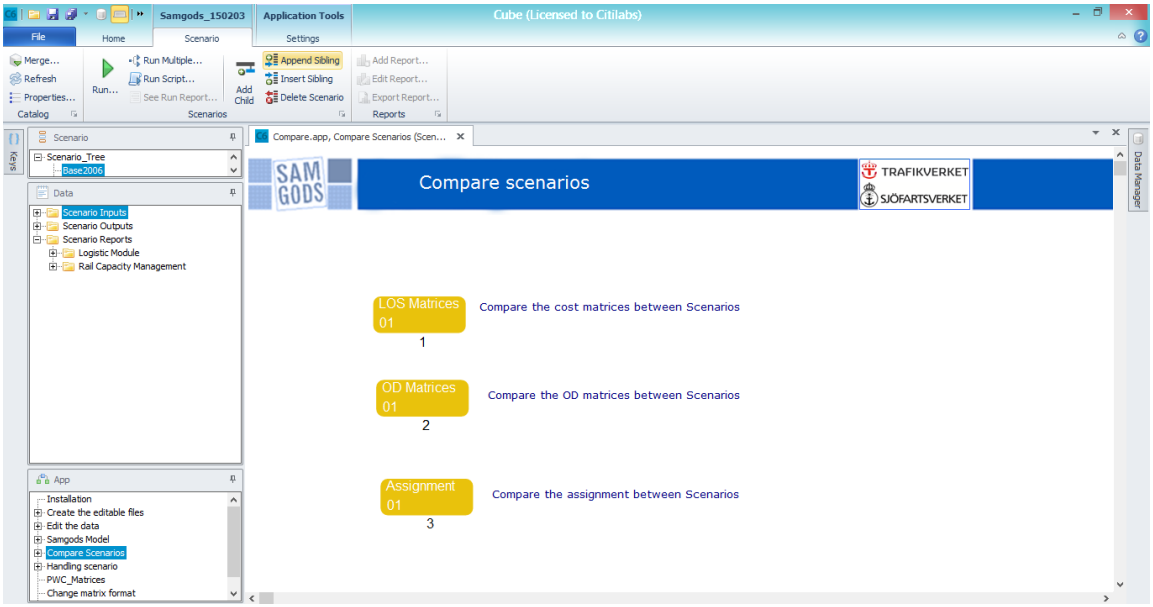


Figure 18 *Compare Scenarios* application.

Three sets of output will be produced by this application:

- The LOS matrix comparison: the difference values with sign between the base scenario and the selected scenario for each matrix by mode;
- Logistics Module output comparison: The OD matrices with number of vehicles (totals and empties) and the tonnes are analyzed as well as the margins of the matrices for the vehicle OD matrices (TRIPEND) (the margin is the sum of each row and column respectively, i.e., the totals of attraction and generation): the absolute differences between the base scenario and the selected scenario.;
- The Assignment comparison: the differences between the assigned network for the base scenario and the selected scenario in absolute values.

3.7. Handling scenario application

Figure 19 shows an outline of the *Handling Scenario* application. As described earlier, the scenario data is stored in the main geodatabase as a group of scenario specific table\s, so managing this group of files requires dedicated tools to avoid creating any inconsistencies in the input data between scenarios. This application allows the user to delete all no longer required data, to easily import or export scenarios from or to other catalogs, to set up a new structure with a new base scenario, etc.

This application has different subgroups with specific purposes, all of them related to handling the scenario data. The structure can be seen in the applications tree in the Applications window.

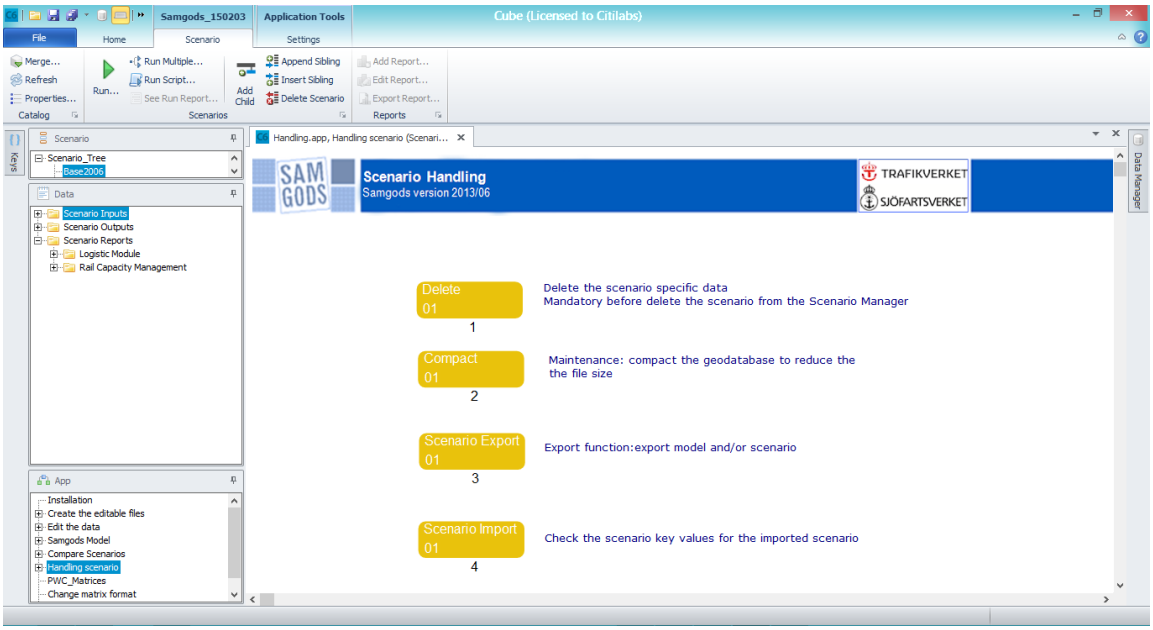


Figure 19 *Handling scenario* application.

Each subgroup corresponds to a specific operation:

- **Delete**: delete the scenario-specific tables completely in the main geodatabase
- **Compact**: compress the geodatabase files to save disk space (see Section 4.9 for further information)
- **Scenario Export**: This subgroup has two main purposes:
    1. One is to enable the set up of a new catalog, using the current scenario (i.e., the scenario that the application is executed for) as the base scenario in the new catalog. One case where it may be appropriate to create a new catalog with a new base scenario is if one of the scenarios in a catalog is being used as the base scenario in a new project. Another reason could be that the database becomes too large (with too many alternative scenarios, for instance), since it has a physical limit for its size. Then it may be appropriate to create a new catalog with a base scenario that is a copy of the original, where more alternative scenarios (belonging to the same overall project) may be stored
    2. Another one is to enable to export the scenario-specific tables for a specific scenario into another, already existing catalog with a different base scenario. The exported scenario can never become the base scenario in the destination catalog – if the user wants this, then alternative 1. above must be used. This function is useful e.g. when the user wants to set up a scenario in a new catalog with a certain base scenario, and already has a similar scenario in another catalog with another base scenario. Then the old scenario can be exported to the new catalog and the user only has to change some of the input data, instead of starting all over again
- **Scenario Import**: When the scenario-specific tables have been exported to another catalog using the previous subgroup (Scenario Export), the Scenario Import tool is used to control whether the scenario parameters in the new catalog have the same values as those in the imported scenario

As showed in the Table 20, the first two groups of catalog keys specify scenario parameters and parameters for the logistics module. These keys are used only by the Scenario Import subgroup; no editing is required for these keys otherwise.

	Catalog key name	**Example of value**	**Model User's rights**
1	Attribute name for extra cost on specific link [SEK]	EC_V	S/A user
2	Attribute name for extra cost on specific link [SEK/km]	EC_KM_V	S/A user
3	Daily factor for all modes (except for Rail Mode) [days per year]	365	S/A user
4	Daily factor for Rail Mode [days per year]	250	S/A user
5	Peak Hour Factor	0.12	S/A user
6	General parameters for Logistics Module [Table]	C:\SamGods\Scenario_Tree\Base2006\Scenario_Data.mdb\LogMod_Base2006	Developer
7	Interest rate used in cost calculations [%/100/year]	0.1	S/A user
8	Stuffing cost [SEK per tonne]	18	S/A user
9	Number of transport chain solutions for the Logistics Module	2	S/A user
10	Output variables for the optimal transport solution [e.g.1,2,3, max is 8]	6,7	S/A user
11	Initial consolidation factor in BuildChain (1° iteration)	0.75	S/A user
12	ALL_LORRY_TYPE_CONSOL	Yes	S/A user
13	INDIVIDUAL_OD_LEG_OPTIMIZE	Yes	S/A user
14	MINIMUM_ANNUAL_TONNE_DEMAND_4_FREQ_OPTIMIZE	10	S/A user
15	Lower bound for consolidation factor	0.1	S/A user
16	Upper bound for consolidation factor	0.95	S/A user
17	TONNES	DYNAMIC_MAX	S/A user
18	Consolidation factors table	{CATALOG_DIR}\05_Input_Data\Input_Data.mdb\BuildChain_CONSOL	S/A user
19	Do you want to log parameters from control files?	Yes	S/A user

20	Do you want to log reading of input data?	Yes	S/A user
21	Do you want to log cost values from vehicle files?	Yes	S/A user

Table 20 Catalog keys for the Import subgroup.

The third group of catalog keys is “Installation parameters“, and it is only available in developer mode, see Table 21. It defines the location of the Python program and the name of the base scenario.

	Catalog key name	**Example of value**	**Model User’s rights**
1	Location of Python program	C:\Python27\ArcGIS10.1	Developer
2	Scenario name for the BASE Scenario	Base2006	Developer

Table 21 “Installation parameter” keys.

The next group, “Run Selections”, contains only one key that is for defining the commodity type(s), see Table 22. It is only used when the user wants to compress the geodatabase files.

	Catalog key name	**Example of value**	**Model User’s rights**
1	Select commodities for the Logistics Module (for all commodities, select 0)	STAN1	S/A user

Table 22 “Run Selections” key.

The fourth group of keys is related to which subgroup the user wants to use, and how to use it, see Table 23.

	Catalog key name	**Example of value**	**Model User’s rights**
1	Do you want to delete the current scenario? (mandatory if you want to delete the scenario)	Tick	S/A user
2	Do you want to compact the geodatabase files?	Tick	S/A user
3	Select how you want to use the export function (1) Do you want to export the model into a new folder using the current scenario as base? (2) Do you want to export the current scenario into another model? (3) Do nothing	3	S/A user

4	Where do you want to export the model (1) or scenario (2)?	C:\Samgods_V20130701	S/A user
5	Name of the base scenario in the new model (1), (2)	Base2006	S/A user
6	Do you want to check the imported scenario?	Yes	S/A user

Table 23 Catalog keys for selecting actions.

The first catalog key in Table 23 enables the application to delete the scenario specific tables for the current scenario. During the execution, a prompt window will ask the user to confirm the selections made to avoid mistakes.

The second catalog key in Table 23 enables the application to compact all the geodatabase files for the scenario, for both the input and output data. It is recommended to do this regularly, especially after tables etc. have been deleted. Please refer to Section 4.9 for more information.

The third catalog key activates the export function. It has a default value, (3) – "Do nothing". To export the entire catalog (option (1), catalog = model in the Samgods GUI) (including the current scenario as the new base scenario), a folder location must be provided in the fourth catalog key and a new name should be given to the new base scenario in the fifth catalog key. If the user wants to export only the selected scenario to another catalog (option 2 in the third key), the folder where the .cat file for this catalog is located should be indicated in the fourth key. The name of the base scenario in the destination catalog should be specified in key no. 5. If the user wants to delete or compact a scenario (i.e. has selected "(3) Do nothing" for key no. 3), it does not matter what is typed in for keys no. 4 and 5, but since no keys can be left undefined, something must be put there because of the construction of the software (just typing in a random character works).

The last catalog key (no. 6) enables the application to control the scenario parameters for an imported scenario. The scenario parameter values in the new catalog must be identical to the ones in the imported scenario. The execution of this subgroup produces a report, *Report for the import phase*, accessible from the Data Section window in the interface, in the folder Scenario Outputs\Import function report. The report provides a list of the scenario parameters that need to be changed. The parameters are changed by editing the catalogue keys for the imported scenario according to the report, under "Scenario Parameters" in the *Handling Scenario* application and then run the application again.

Regarding output or reports from these functions:

- No outputs are produced by the Delete and Compact subgroups, because they work on the tables inside the geodatabase or on the geodatabase itself;
- The Scenario Export function creates a new catalog with a new base scenario, or a new scenario in an existing catalog, depending on the selections made;
- The Import Scenario subgroup will create a report, *Report for the import phase*, as described above.

3.8. *PWC_Matrices* application

A screenshot of the *PWC_Matrices* application is shown in Figure 20 below. The purpose of the application is to create the PWC matrices in Voyager format in order to enable visualization in the interface.

In Standard user /Advanced user mode there is only one catalog key to specify the year of the PWC matrices. In developer mode there is also a key to identify the base scenario.

	Catalog key name	Example of value	Model User's rights
1	Year of PWC matrices	2006	S/A user
2	Scenario name for the BASE Scenario	Base2006	Developer

Table 24 Catalog keys for the PWC_Matrices application.

Possible input values for the first key (Year of PWC matrices) in Table 24 are:

- 2006: PWC matrices for year 2006
- 2030: PWC matrices for year 2030
- 2030BnM: PWC matrices for year 2030 (with PWC 2006 matrix for commodity 15)

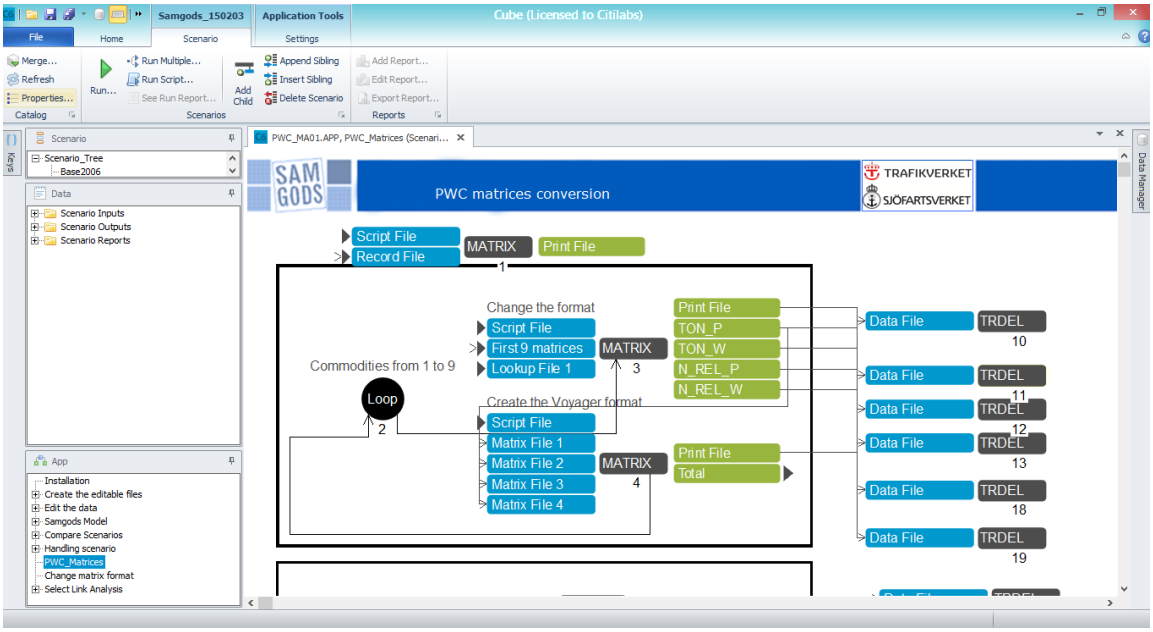


Figure 20 *PWC_Matrices* application.

It is only necessary to run the *PWC_Matrices* once per year in order to create the matrices. PWC matrices for all commodities will be produced when running the application – 35 matrices in Voyager format are created in the folder 01_Programs\LogMod\Input\PWC\VY_F\, found in the Samgods folder (see Table 1 in Section 1.5). In order to access the matrices from the Data Section window (in Scenario Inputs\PWC_Matrices\PWC matrix for commodity), open the *Samgods Model* application in the Scenario Manager window and select a commodity using the catalog key "Select commodities for the Logistics Module (…)". In this step, the application should not be run, just save the settings by clicking "Save" and the matrices can be found in the Data Section window. The value 0 (for all commodities) is not allowed for this application. This is because the *PWC_Matrices* application only allows showing one commodity at a time.

3.9. Change matrix format application

In Figure 21 below, the *Change matrix format* application is outlined. The purpose of the application is the following. All the data in a catalog is accessible using Microsoft Office Access

(2003 or later) (all data except the geodatabases could also be accessed using Excel or Notepad). The only exception is the data related to the matrix structure, which has a binary Voyager format. The matrix files have a .mat extension. There are two ways to export these files in order to use them in Access, Excel or a text editor. The first way is to use the functions in the Cube Interface. For further details, see the reference guide RG_CubeBase.pdf in Chapter 10 – *Exporting matrix cell values*. In short, this is done by choosing “Export…” from “File” on the menu bar and selecting the appropriate file format.

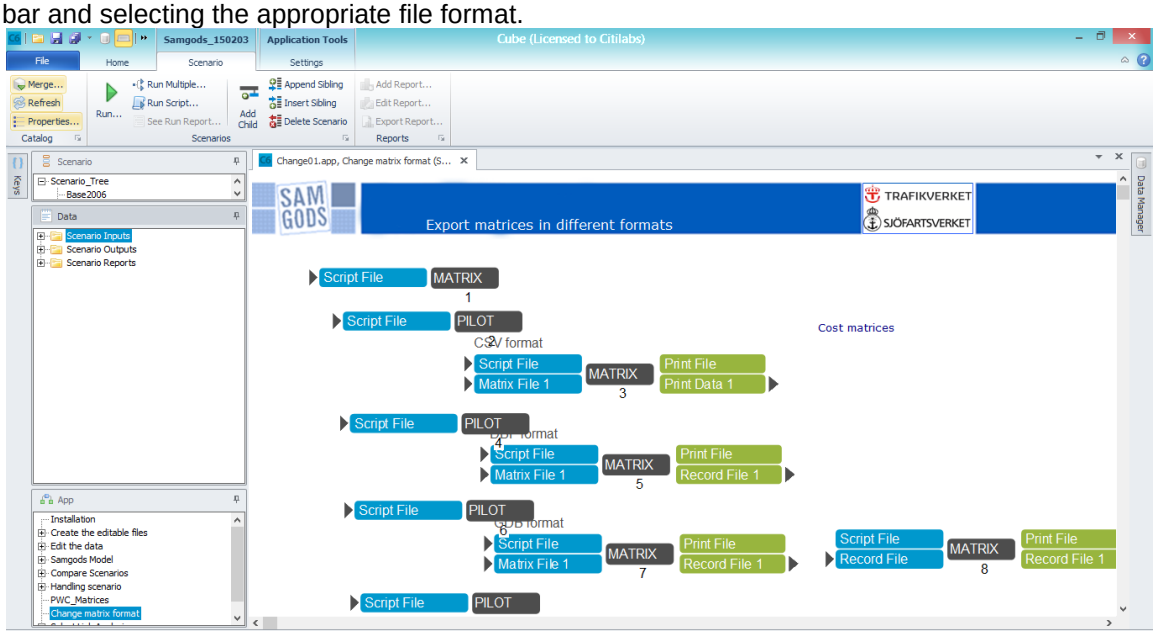


Figure 21 *Change matrix format* application.

The second way is provided by this application, as follows. The catalog keys in Table 25 below handle the export of Voyager format matrix files.

	Catalog key name	**Example of value**	**Model User’s rights**
1	Select commodities for the Logistic Module (for all commodities, select 0)	STAN1	S/A user
2	Do you want to export to CSV, DBF or GDB format?	CSV	S/A user
3	Do you want to create a new geodatabase or use an existing one?	Existing	S/A user
4	Define the GDB where the matrix should be exported.	C:\Samgods\Scenario_Tree\ Base2006\Matrices_Base2006.mdb	S/A user
5	What kind of matrix do you want to export?	COST	S/A user
6	What vehicle class do you want for the LOS matrices?	317	S/A user
7	What is the mode that you want	ROAD	S/A user

	for the matrices?		
8	Do you want the distance, time, domestic distance or extra cost LOS matrix?	Time	S/A user
9	What type of vehicle class (or total) do you want for the VEHICLES and TONNES matrices?	202	S/A user

Table 25 *Change matrix format* application catalog keys.

Regarding key no. 2, CSV format refers to Comma Separated Values, DBF refers to Database Format and GDB refers to Geodatabase format. If the matrix is exported to a geodatabase, it will be created as a table inside an existing geodatabase or a new geodatabase containing this table will be created, depending on the choices made by the user.

To understand the usage of the keys 5-9, and how to export the correct values, an explanation of the size and the structure of the matrices is required.

The following table (Table 26) presents how the LOS matrices are saved in the scenario folder, how many matrices that are saved in each matrix file and what their names are. For the OD matrices, see the next table (Table 27).

Folder	Name of matrix file	Name of matrix	Description	Total number of matrices
{Scenario_Dir}	COST_ROAD_{SCENARIO_SHORTNAME}.MAT	D101_{SCENARIO_SHORTNAME}, D102_{SCENARIO_SHORTNAME}, D103_{SCENARIO_SHORTNAME}, D104_{SCENARIO_SHORTNAME}, D105_{SCENARIO_SHORTNAME}	Distance (km) for vehicle type 101-105	25
		T101_{SCENARIO_SHORTNAME}, …, T105_{SCENARIO_SHORTNAME}	Time (hours) for vehicle type 101-105	
		X101_{SCENARIO_SHORTNAME}, …, X105_{SCENARIO_SHORTNAME}	Extra costs for vehicle type 101-105	
		CG101_{SCENARIO_SHORTNAME}, …, CG105_{SCENARIO_SHORTNAME}	Generalized cost for vehicle type 101-105	
		DD101_{SCENARIO_SHORTNAME}, …, DD105_{SCENARIO_SHORTNAME}	Domestic distance (km) for vehicle type 101-105	
{Scenari	COST_RAIL_{SCENARI	D201_{SCENARIO_SHORTNAME},	Distance	40

Folder	Name of matrix file	Name of matrix	Description	Total number of matrices
o_Dir}	O_SHORTNAME}.MAT	D202_{SCENARIO_SHORTNAME}, D204_{SCENARIO_SHORTNAME}, D205_{SCENARIO_SHORTNAME}, D206_{SCENARIO_SHORTNAME}, D207_{SCENARIO_SHORTNAME}, D208_{SCENARIO_SHORTNAME}, D209_{SCENARIO_SHORTNAME}	(km) for vehicle type 201, 202, 204-209	
		T201_{SCENARIO_SHORTNAME}, T202_{SCENARIO_SHORTNAME}, T204_{SCENARIO_SHORTNAME}, …, T209_{SCENARIO_SHORTNAME}	Time (hours) for vehicle type 201, 202, 204-209	
		X201_{SCENARIO_SHORTNAME}, X202_{SCENARIO_SHORTNAME}, X204_{SCENARIO_SHORTNAME}, …, X209_{SCENARIO_SHORTNAME}	Extra costs for vehicle type 201, 202, 204-209	
		CG201_{SCENARIO_SHORTNAME}, CG202_{SCENARIO_SHORTNAME}, CG204_{SCENARIO_SHORTNAME}, …, CG209_{SCENARIO_SHORTNAME}	Generalized cost for vehicle type 201, 202, 204-209	
		DD201_{SCENARIO_SHORTNAME}, DD202_{SCENARIO_SHORTNAME}, DD204_{SCENARIO_SHORTNAME}, …, DD209_{SCENARIO_SHORTNAME}	Domestic distance (km) for vehicle type 201, 202, 204-209	
{Scenario_Dir}	COST_SEA_{SCENARIO_SHORTNAME}.MAT	D301_{SCENARIO_SHORTNAME}, D302_{SCENARIO_SHORTNAME}, …, D321_{SCENARIO_SHORTNAME}	Distance (km) for vehicle type 301-321	105
		T301_{SCENARIO_SHORTNAME}, T302_{SCENARIO_SHORTNAME}, …, T321_{SCENARIO_SHORTNAME}	Time (hours) for vehicle type 301-321	
		X301_{SCENARIO_SHORTNAME}, X302_{SCENARIO_SHORTNAME}, …, X321_{SCENARIO_SHORTNAME}	Extra costs for vehicle type 301-321	
		CG301_{SCENARIO_SHORTNAME}, CG302_{SCENARIO_SHORTNAME},	Generalized cost for	

Folder	Name of matrix file	Name of matrix	Description	Total number of matrices
		…, CG321_{SCENARIO_SHORTNAME}	vehicle type 301-321	
		DD301_{SCENARIO_SHORTNAME}, DD302_{SCENARIO_SHORTNAME}, …, DD321_{SCENARIO_SHORTNAME}	Domestic distance (km) for vehicle type 301-321	
{Scenario_Dir}	COST_AIR_{SCENARIO_SHORTNAME}.MAT	D401_{SCENARIO_SHORTNAME}	Distance (km) for vehicle type 401	5
		T401_{SCENARIO_SHORTNAME}	Time (hours) for vehicle type 401	
		X401_{SCENARIO_SHORTNAME}	Extra costs for vehicle type 401	
		CG401_{SCENARIO_SHORTNAME}	Generalized cost for vehicle type 401	
		DD401_{SCENARIO_SHORTNAME}	Domestic distance (km) for vehicle type 401	

Table 26 Matrix table: LOS matrices.

Table 27 presents how the Vehicle, Tonne, and Empty Vehicle OD-matrices are saved in the scenario folder, how many matrices that are saved in each matrix file and their names .The matrices in Table 27 have an index (0 in the table) that represents the commodity class number (e.g., ROAD_VHCLFLOW0_{SCENARIO_SHORTNAME}.MAT). The value 0 refers to all commodities, and a specific number in the range 1 to 35, or STAN1 to STAN12, represents the respective commodity selection.

Folder	Name of matrix file	Name of matrix	Description	Total of matrices
{Scenario_Dir}	ROAD_VHCLFLOW0_{SCENARIO_SHORTNAME}.MAT	101_{SCENARIO_SHORTNAME}, … 105_{SCENARIO_SHORTNAME}, Road_{SCENARIO_SHORTNAME}	OD vehicles by vehicle type 101-	6

Folder	Name of matrix file	Name of matrix	Description	Total of matrices
			105 and total for road mode	
{Scenario_Dir}	RAIL_VHCLFLOW0_{SCENARIO_SHORTNAME}.MAT	201_{SCENARIO_SHORTNAME}, 202_{SCENARIO_SHORTNAME}, 204_{SCENARIO_SHORTNAME},... 209_{SCENARIO_SHORTNAME}, Rail_{SCENARIO_SHORTNAME}	OD vehicles by vehicle type 201, 202, 204-209 and total for rail mode	9
{Scenario_Dir}	SEA_VHCLFLOW0_{SCENARIO_SHORTNAME}.MAT	301_{SCENARIO_SHORTNAME}, … 321_{SCENARIO_SHORTNAME}, Sea_{SCENARIO_SHORTNAME}	OD vehicles by vehicle type 301-321 and total for sea mode	22
{Scenario_Dir}	AIR_VHCLFLOW0_{SCENARIO_SHORTNAME}.MAT	AIR_{SCENARIO_SHORTNAME}	OD vehicles by vehicle type 401 and total for air mode	1
{Scenario_Dir}	ROAD_TON0_{SCENARIO_SHORTNAME}.MAT	101_{SCENARIO_SHORTNAME}, … 105_{SCENARIO_SHORTNAME}, Road_{SCENARIO_SHORTNAME}	OD tonnes by vehicle type 101-105 and total for road mode	6
{Scenario_Dir}	RAIL_TON0_{SCENARIO_SHORTNAME}.MAT	201_{SCENARIO_SHORTNAME}, 202_{SCENARIO_SHORTNAME}, 204_{SCENARIO_SHORTNAME}, … 209_{SCENARIO_SHORTNAME}, Rail_{SCENARIO_SHORTNAME}	OD tonnes by vehicle type 201, 202, 204-209 and total for mode rail	9
{Scenario_Dir}	SEA_TON0_{SCENARIO_SHORTNAME}.MAT	301_{SCENARIO_SHORTNAME}, … 321_{SCENARIO_SHORTNAME}, Sea_{SCENARIO_SHORTNAME}	OD tonnes by vehicle type 301-321 and total for sea mode	22
{Scenario_Dir}	AIR_TON0_{SCENARIO_SHORTNAME}.MA	AIR_{SCENARIO_SHORTNAME}	OD tonnes by vehicle type 401	1

Folder	Name of matrix file	Name of matrix	Description	Total of matrices
	T		and total for air mode	
{Scenario_Dir}	ROAD_EMP0_{SCENARIO_SHORTNAME}.MAT	101_{SCENARIO_SHORTNAME}, … 105_{SCENARIO_SHORTNAME}, Road_{SCENARIO_SHORTNAME}	OD vehicles by vehicle type 101-105 and total for road mode	6
{Scenario_Dir}	RAIL_EMP0_{SCENARIO_SHORTNAME}.MAT	201_{SCENARIO_SHORTNAME}, 202_{SCENARIO_SHORTNAME}, 204_{SCENARIO_SHORTNAME}, … 209_{SCENARIO_SHORTNAME}, Rail_{SCENARIO_SHORTNAME}	OD vehicles by vehicle type 201, 202, 204-209 and total for mode rail	9
{Scenario_Dir}	SEA_EMP0_{SCENARIO_SHORTNAME}.MAT	301_{SCENARIO_SHORTNAME}, … 321_{SCENARIO_SHORTNAME}, Sea_{SCENARIO_SHORTNAME}	OD vehicles by vehicle type 301-321 and total for sea mode	22
{Scenario_Dir}	AIR_TON0_{SCENARIO_SHORTNAME}.MAT	AIR_{SCENARIO_SHORTNAME}	OD vehicles by vehicle type 401 and total for air mode	1

Table 27 Matrix table with file structure for OD matrices for number of vehicles (loaded and empty) and tonnes.

Potentially, as many as 2759 matrices with different level of aggregation could exist in the scenario folder. See Table 28 below which values to set in the keys in order to print out a specific matrix.

Catalog key name	**Choices available**	**Description**	**Refer to matrix table**
Select commodities for the Logistics Module (for all commodities, select 0)			
	0	All commodities	

	1-35, STAN 1-12	Single commodity or STAN group	
Do you want to export in CSV, DBF or GDB format?			
	CSV	Comma Separated Values	
	DBF	Database Format	
	GBD	Geodatabase table	
Do you want to create a new geodatabase or use an existing one?			
	Create		
	Existing		
Define the gdb where export matrix:		An existing or new geodatabase, depending on choice for previous key	Table 25
What kind of matrix do you want to export?			
	COST	LOS matrix	Table 26
	VHCLFLOW	OD Vehicles matrix	Table 27
	TON	OD Tonnes matrix	Table 27
	EMP	OD Empty Vehicles matrix	Table 27
Which vehicle class do you want to select for the LOS matrices?		Vehicle type for the LOS matrices	Table 26
	101-105, 201, 202, 204-209, 301-321, 401	Vehicle types	
What is the mode that you want for the matrices?		Mode for the LOS matrices	Table 26
	ROAD, RAIL, SEA, AIR		
Do you want the distance, time, domestic distance or extra cost LOS matrix?		Specification for the LOS matrix	Table 26
	Distance	D101-D105, D201, …	
	Time	T101-T105, T201, …	
	Domestic Distance	DD101-DD105, DD201, …	
	Extra cost	X101-X105, X201, …	
What type of vehicle class (or total) do you want for the VEHICLES and		Specification for the OD matrix	Table 27

TONNES matrices?			
	101-105, 201, 202, 204-209, 301-321	Select a specific vehicle type	
	Road, Rail, Sea, Air	Select a mode	

Table 28 Choice order.

Based on the choices made in the catalog keys described above, the *Change matrix format* application creates a CSV or DBF file, or a table inside an existing or a new geodatabase, with the structure Origin zone, Destination zone and matrix value. The matrix file is found in the scenario folder and will have a name that gives the specifications made in the catalog keys, e.g.:

{Scenario_DIR}\COST_RAIL_DD202_VOY.CSV

Where the first part (COST) defines the type of matrix (COST, VHCLFLOW, TONNES or EMPTYVEHICLEFLOW), the second part (RAIL) the mode (RAIL, ROAD, SEA or AIR), the third part (DD) the type of matrix for the LOS matrices (DD, D, T or X), the fourth part (202) the vehicle type and the fifth part gives whether the user is an Emme or a Voyager user.

4. General instructions

This chapter gives instructions for how to start using the Samgods GUI. Please note that the procedure is described for Standard user or Advanced user mode since the available parameter settings are different if developer mode is used.

4.1. Open the model

- Open Cube by clicking on the icon on the desktop
- On the Welcome Screen select “Open catalog”
- Browse to Samgods catalog (file name: Samgods.cat – default folder C:\Samgods)
- Click on “Open”

4.2. Set the model to Standard user or Advanced user mode

- Select “Properties” on the menu bar under section “scenario (see Figure 22)
- In the Catalog Properties window, select the “Model User” tab (see Figure 23)
- Select “Model user" to "Model Applier" mode
- Select "Current Applier Group" among "Developer", "Standard User" or "Advanced User"

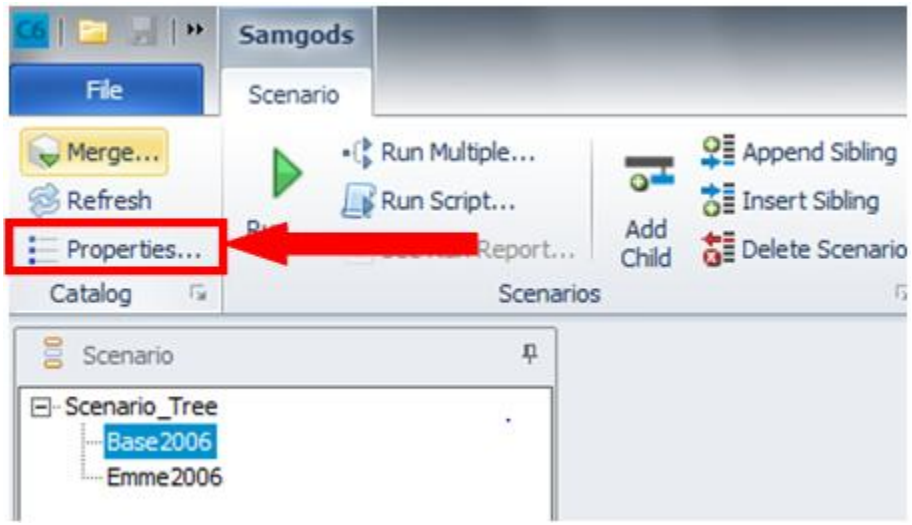


Figure 22 How to access “Catalog Properties”.

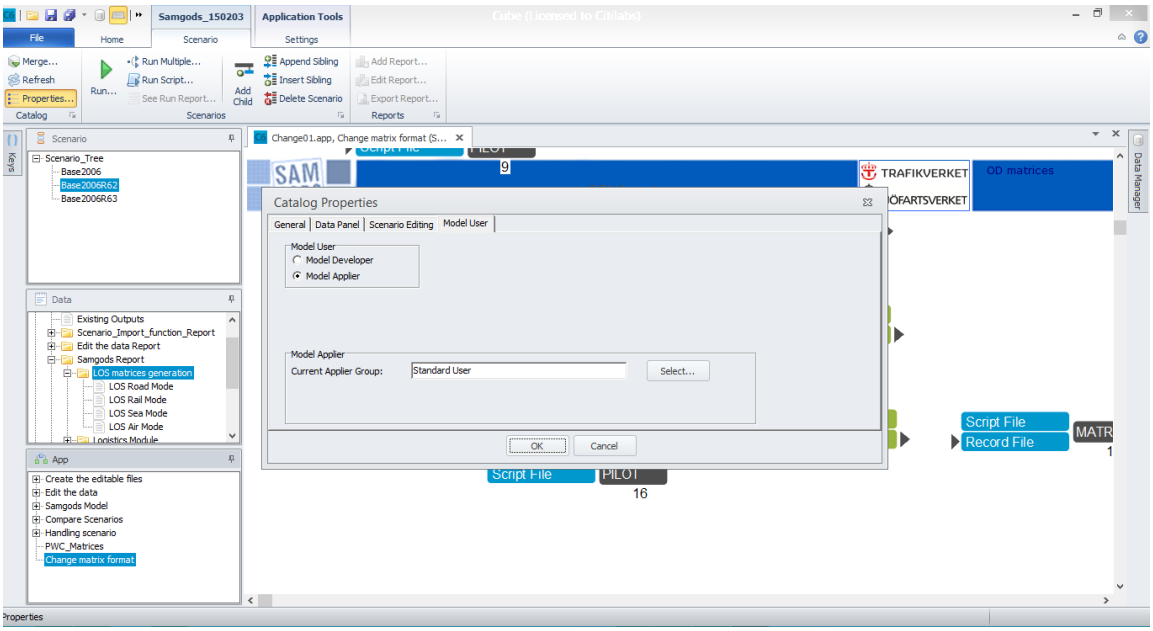


Figure 23 How to set the model to Model Applier>Standard user mode.

Tip: Each time changes have been made to the catalog, such as creating a new scenario, creating new output data by running the model or deleting data, the catalog should be saved. This is done by clicking the “save catalog” icon (see Figure 24) or going to “File” menu and choosing “Save” -> “Catalog” (see Figure 25). It is recommended to do this often when working with the model.

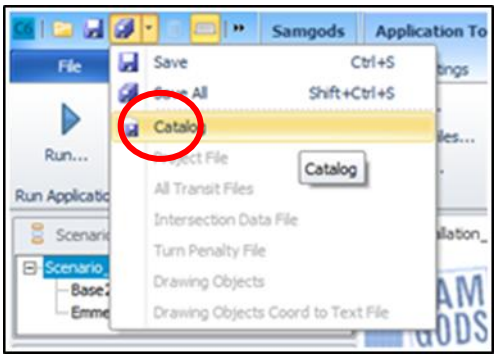


Figure 24 How to save catalog file using icon.

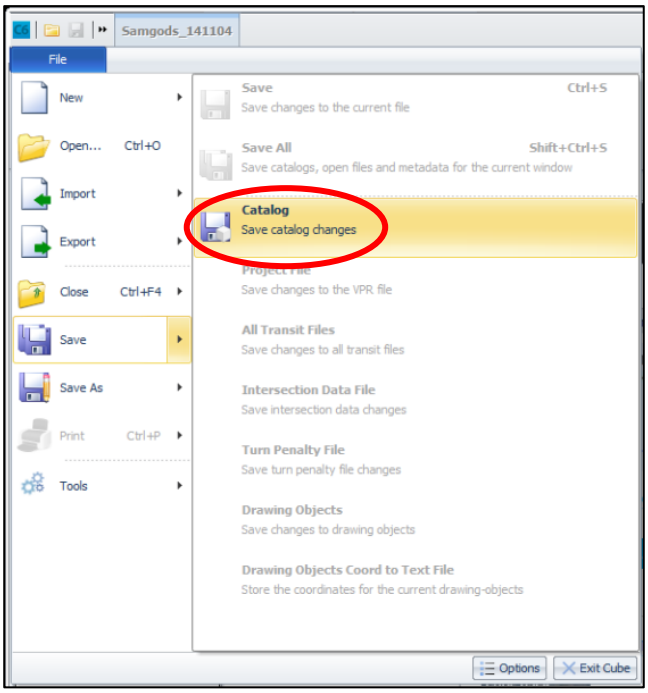


Figure 25 How to save the catalog file using the menu bar.

4.3. General guidelines for how to work with the model

After having opened the model and set it to Standard User mode, the user can start working with the model. Instructions for each specific action can be found in the chapter 5. However, it is necessary to also know which actions that should be taken and what to look for in the manual. This section gives some guidelines for the order of doing different things.

Working with the model is done by using the different applications and via the Data Section window. In order to use an application for a specific scenario:

- Double-click on the scenario name in the Scenarios window and select the application in the window that opens
- When using the Data Section window, select the scenario you want to work within the Scenarios window by clicking on it and then open the file you want to use from the Data Section window

In order to work with the input data, i.e. to set up a scenario, the input data must be made editable. This is done by:

- Running the *Create the editable files* application, see Section 4.5 for instructions. This must be done also if you just want to view the input data and it is mandatory to run the application at least once for every scenario you want to use in the model
- When the editable data has been created, it could be edited according to the instructions in Chapter 5 (for example). This is done by **using** the *Edit the data* application. Via the application, the editable data can be accessed (see Section 4.5 for instructions). An alternative to use *Edit the data* application to access the editable data, is to use the Data Section window
- When all edits to the input data have been made, the edits must be saved before running the actual Samgods model. This is done by **running** the *Edit the data* application (until this point the application has only been used to access the editable data, but it has not been run). For a locked scenario, such as the base scenario, no edits can be saved. However, the application can still be used to view the data

At this point the Samgods model can be executed, by running the *Samgods Model* application (see Section 4.6). By doing that, the output data is produced and can be compared or exported according to the instructions in the following chapters.

Different sets of output could be produced for different runs for the same scenario, for example if the model is run for two different commodity groups for the Standard Logistics module. In order to run the same scenario for different commodities, first run the *Create the editable files* application and then *Edit the data* as described above (the *Edit the data* application doesn't have to be run for a locked scenario as e.g. the Base2006 scenario). Then select the commodity group and run the *Samgods Model* application. After this another commodity can be selected and the *Samgods Model* can be run again. The different sets of outputs will be saved separately.

In the scenario folder (under Scenario_Tree, see Table 1), the name of the specific output database is OutputX_{SCENARIO_SHORTNAME}.mdb, where X is the commodity group. In the interface, just one set of output for one scenario can be accessible at the time. In order to access a specific set of output, double-click on the specific scenario, select the *Samgods Model* application and select the specific commodity group in the catalog key "Select commodities for the Logistics Module (…)". Click "Save" (not "Run"). In this way the correct set of output is activated and can be accessed from the Data Section window. The scenario selected under scenario window always filter the data shown under data panel. This is a peculiar characteristic of Cube and catalog file. All the logical relations are maintained in a coherent frame. The selection of a particular scenario will specify the values of catalog keys, the folder where results will be saved, and the data will be shown under data panel.

Whenever a scenario has been deleted or several runs have been made, the geodatabase files should be compressed in order to save disk space – see Section 4.9 for instructions. When working with the model and making changes to the catalog, such as adding a scenario or making changes to the geodatabase, it is recommended to save the catalog often. This is done by clicking the save button (the black floppy disk icon above the Scenarios window.

An exception is the output for Rail Capacity Management, since it can be run only with all the commodities (X=0 always) and its results will be always produced in Output0_{SCENARIO_SHORTNAME}.mdb.

4.4. Create a new scenario

To create a new scenario it is necessary to copy the scenario specific tables from another scenario, then merge the scenario specific tables with the base tables and finally visualize them in the graphical interface. To create a new scenario, do the following:

1) In the first step, create the scenario name in the catalog:
    a) In the Scenarios window, right-click on "Scenario_Tree" and select "Add Child"
    b) Type the scenario name (it is neither allowed to use blank entries or to start with a number, nor to start with the following letters **n f t**) and press "Enter"
    c) In the Scenario Properties window, which then is opened, set a scenario code (or use the default one) and click "OK". It is recommended to use a short code that can be associated with the scenario name
    d) The Scenario manager window is opened automatically
2) In the second step, run the *Create the editable files* application as described below:
    a) In the Scenario manager window, select the *Create the editable files* in the Application scroll down menu

b) Define from which scenario to copy the scenario specific tables from (e.g., Base2006) by typing the scenario name in the catalog key ”Which scenario do you want to use? (Default is Base2006)”

c) Click “Run”

d) At the end of the run, click “OK”

The temporary geodatabase is now available in the scenario folder (located in the Scenario_Tree folder, see Table 1 in Section 1.5) with all the scenario data. To visualize the tables and the layers of the scenario, change the application from *Create the editable files* to *Edit the data* in the Scenario manager window. In Figure 29, Figure 30 and Figure 31 the default values of the catalog keys are displayed. The first set of catalog keys (

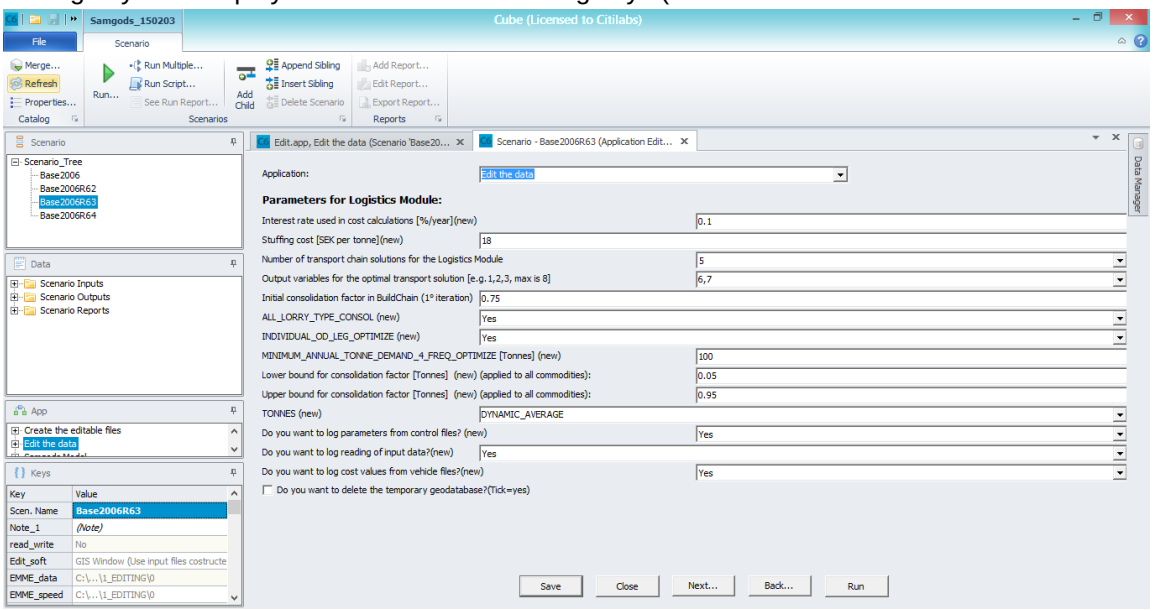


Figure 29) lists the scenario parameters and each catalog key has an editing box (a box where a numerical value or label is expected), a scroll down menu, or a check box.

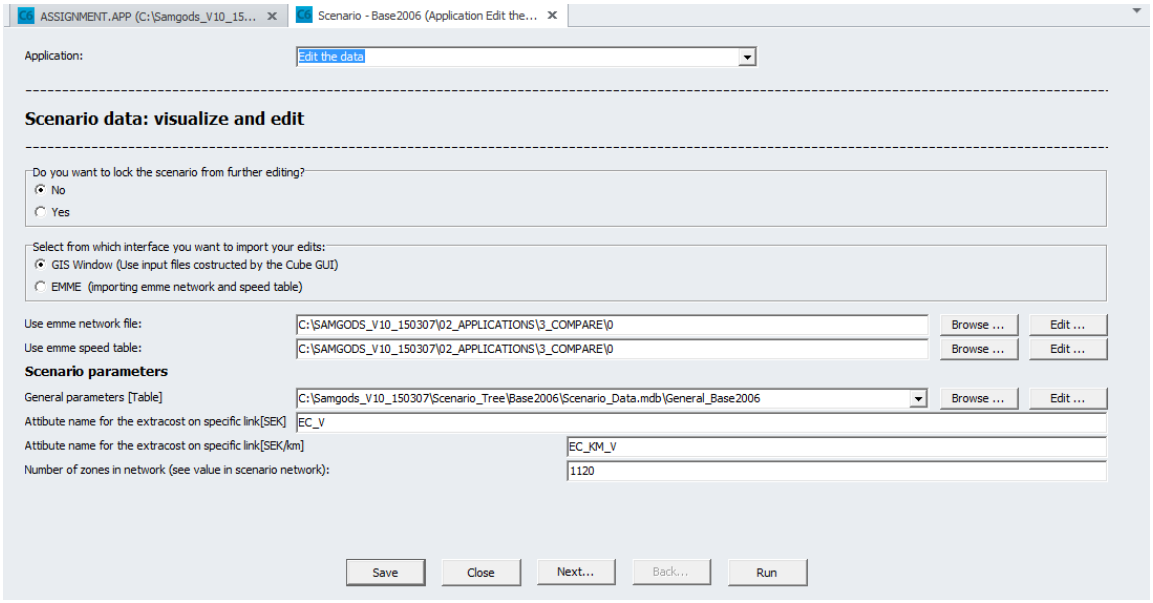


Figure 26 Catalog keys in first window for *Edit the data* application

The second set of catalog keys (Figure 30, accessed by clicking “”Next…” in the window in

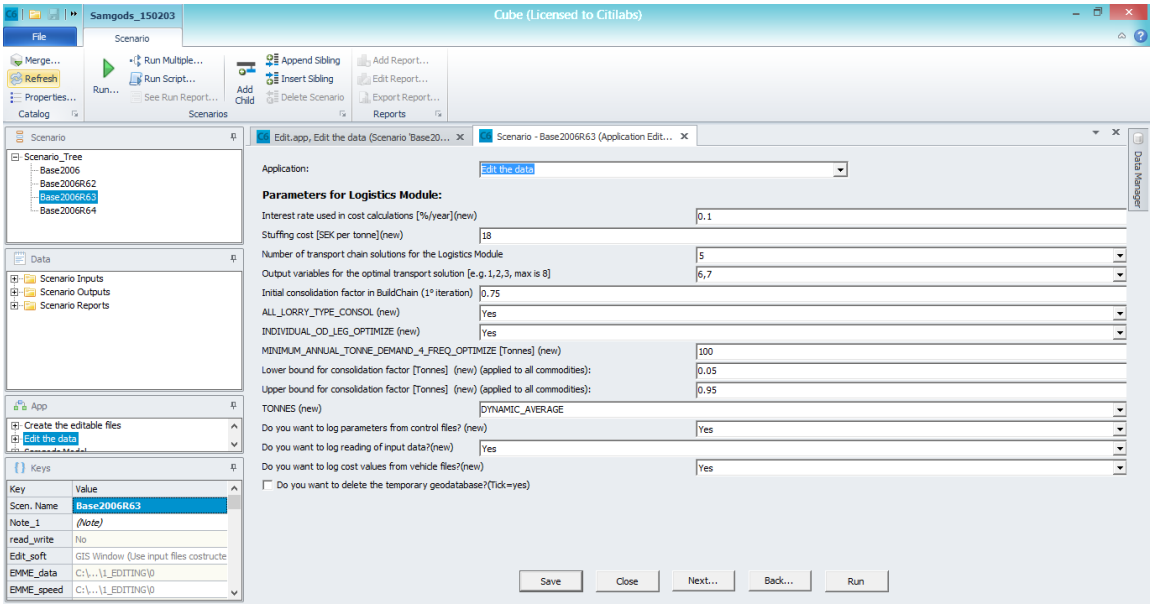


Figure 29) consists of tables and layers of scenario data. By clicking the “Edit...” button on the right, the data is opened in the correct format (i.e., a table in a database window or a layer in a GIS window). Descriptions of the keys and of how to use them for editing and displaying the data are given in Section 3.4.

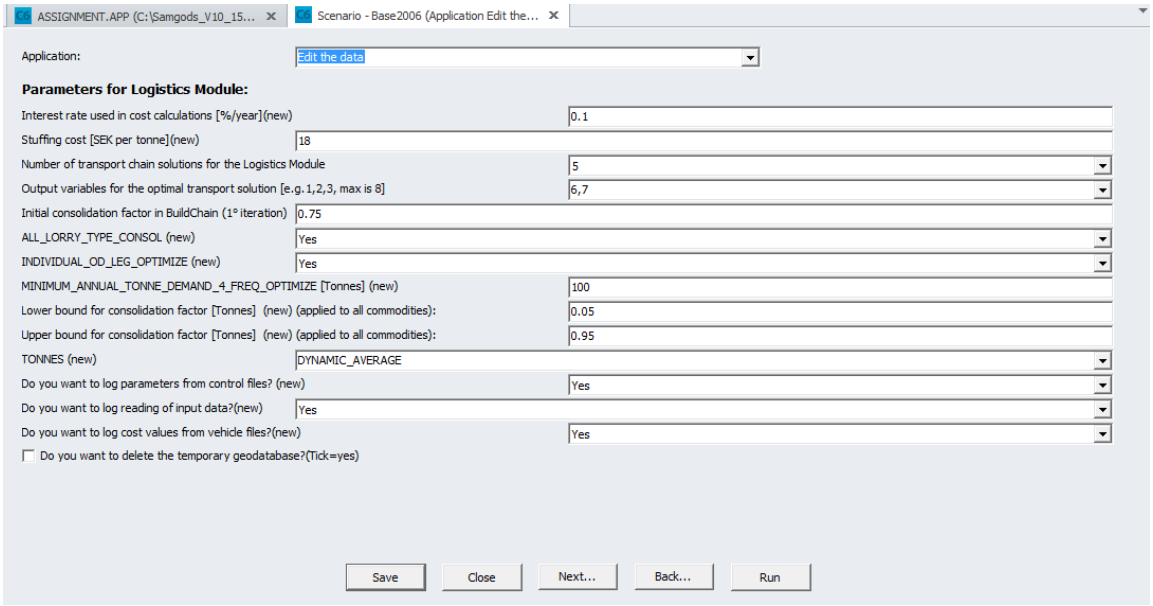


Figure 27 Catalog keys in second window for *Edit the data* application

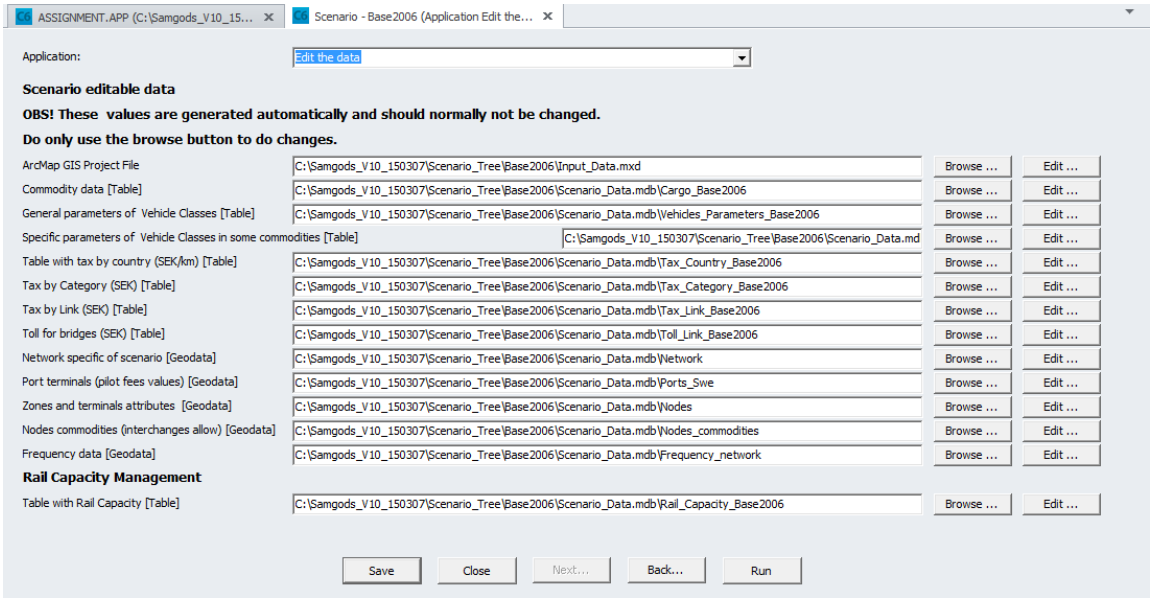


Figure 28 Catalog keys in third window for *Edit the data* application

Tip: To visualize all the layers in a map, click the "Edit..." button, next to the ArcMap GIS Project File catalog, key shown in Figure 30, pointing at the file Input_Data.mxd. All the geographical data will be loaded with a few default legends. The same file is available via Scenario Inputs\Editable Data\ Input_Data.mxd in the Data Section window.

3) Set the catalog keys according to the instructions in Section 3.4 and edit the data. For instructions on how to edit the scenario data, see Chapter 5.
4) To save the edits that have been made in the temporary geodatabase, the *Edit the data* application must be run. During this phase the scenario specific tables will be created and saved into the main geodatabase. Also, the report file "Report for the edit phase" with information or errors from running the *Edit the data* application will be created in Scenario Outputs\Edit the data Report in the Data Section window.
    a) Click "Run"
    b) During the execution, the program will prompt with the question: "Do you really want to save the scenario {SCENARIO_SHORTNAME}?". If "No" is selected, the temporary geodatabase will be deleted. No changes will then be made to the main geodatabase. If "Yes" is selected, the scenario specific tables will be saved into the main geodatabase. Whether the temporary geodatabase is deleted or not depends on the choice made for the catalog key "Do you want delete the temporary geodatabase?"
    c) At the end of the run, click "OK"
    d) Close the Scenario Manager window. To the question "Do you want to create the scenario {SCENARIO_SHORTNAME}?", click "Yes"

Tip: Information on errors or results from running the *Edit the data* application is available in ***Scenario Outputs\Edit the data Report\Report*** for the edit phase in the *Data Section* window. For information on this and other log reports, please refer to Chapter 7. It is recommended to consult the reports to make sure no errors have occurred in the input data.

When changes have been made to the catalog, such as adding a new scenario, the catalog file should be saved. This is done by clicking the black floppy disk icon to the left above the catalog in the interface.

4.5. Visualize and/or edit an existing scenario

In terms of the general structure and terminology of the Samgods GUI, an *existing scenario* means that the scenario specific tables are already included in the main geodatabase. To visualize the data, the scenario-specific tables must be merged with the base scenario tables, and the appropriate layer (or feature class) for the data that is graphically represented in a map needs to be created. A layer can be described as the visual representation of a geographic dataset in any digital map environment. More information on the layers is given in Section 5. We have already introduced how the applications *Create the editable files* and *Edit the data* work together to guarantee consistence and coherence in the input data (see Sections 3.3 and 3.4).

Please note that **it is not allowed to rename a scenario**, due to the way input and output data are handled in the model.

There are two possible statuses of a scenario (see Section 3.4 for further explanation):

- The scenario is still editable (the key “Do you want to lock the scenario from further editing?” in Edit the data was set to “No” when Edit the data was run and the scenario was saved)
- The scenario is locked, either because it is the base scenario or because the user has locked it (the key “Do you want to lock the scenario from further editing?” was set to “Yes” when the scenario was saved by the *Edit the data* application)

4.5.1. Editable Scenario

To visualize and edit an existing scenario, two steps must be performed.

First, the *Create the editable files* application should be run:

1) Double-click on the scenario name in the Scenarios window
2) To the right, the Scenario manager window appears
3) In the Application scroll down menu, select *Create the editable files* (by default this application is selected)
4) Click “Run”
5) Click “OK” at the end of the run

After the run, the temporary geodatabase is available in the scenario folder (located in the Scenario_Tree folder, see Table 1 in Section 1.5) containing all scenario data. To visualize the tables and the layers of the scenario, switch the application from *Create the editable files* to *Edit the data* in the Application scroll down menu in the Scenario manager window. The Scenario

manager window will then look as in

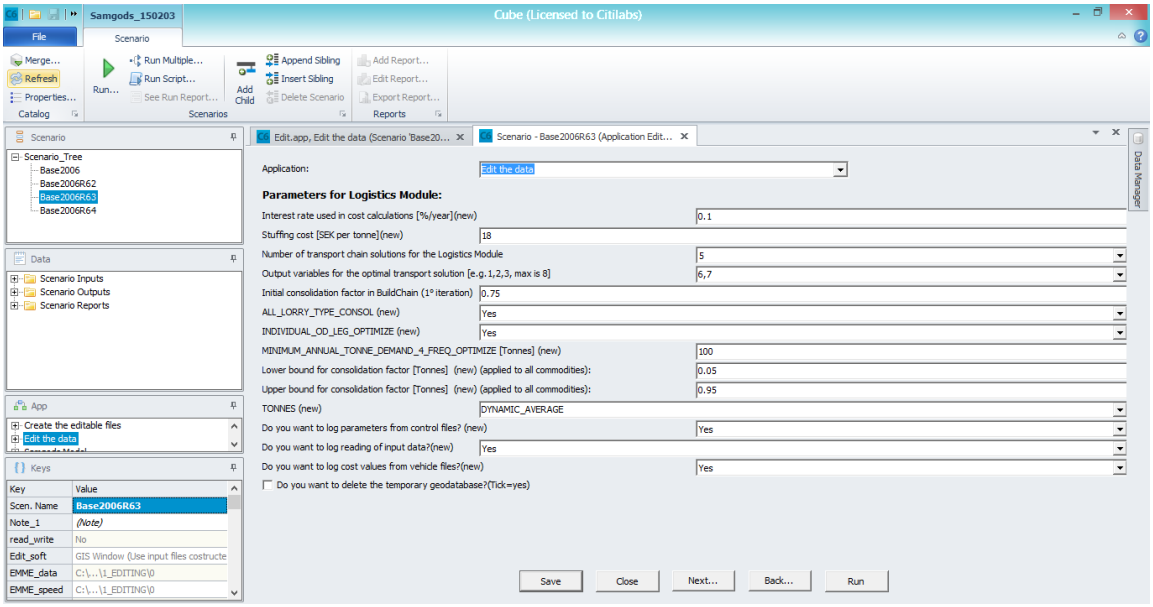
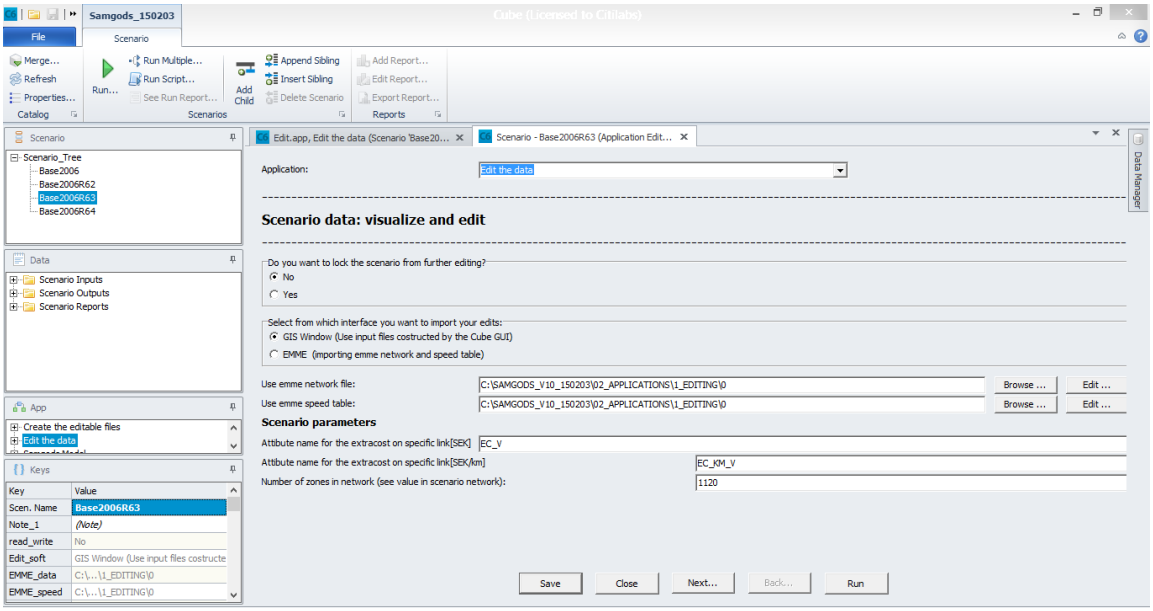


Figure 29 and Figure 30.



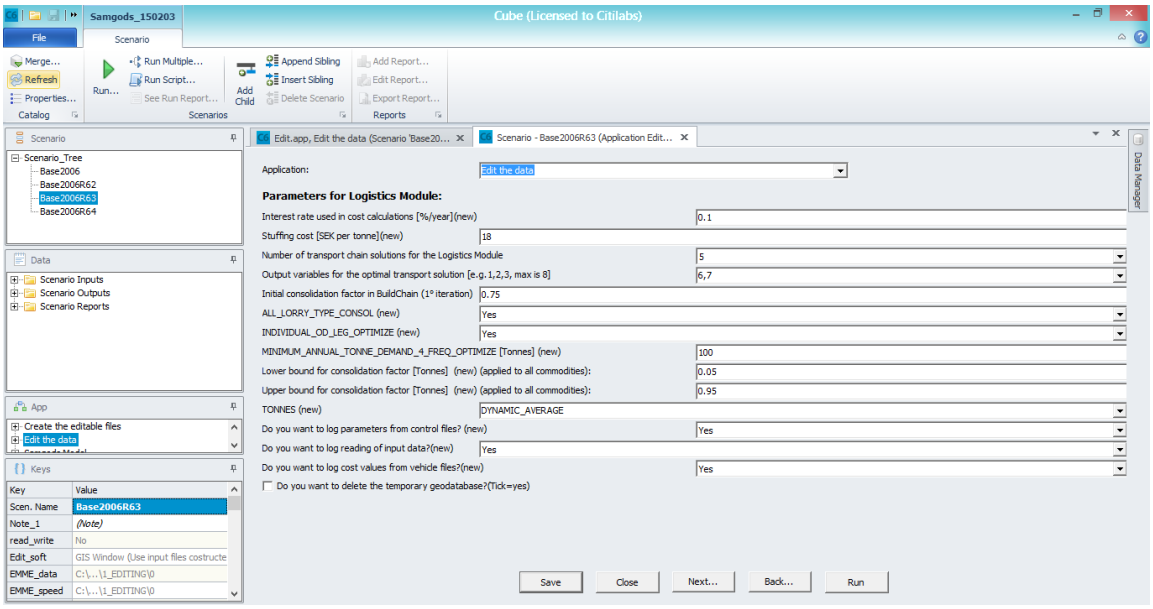


Figure 29 The first set of catalog keys for the Edit the data application.

The first set of catalog keys (

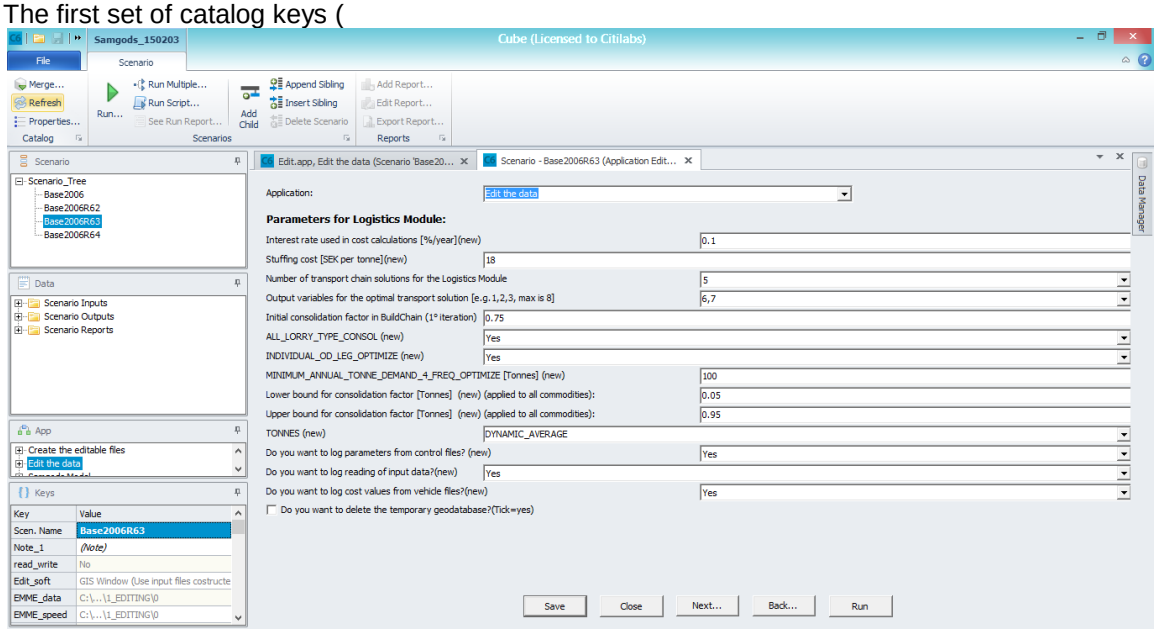


Figure 29) lists the scenario parameters and each catalog key has an editing box (a box where a numerical value or label is expected), a scroll down menu, or a check box. The second set of

catalog keys (Figure 30, accessed by clicking “Next…” in the window in

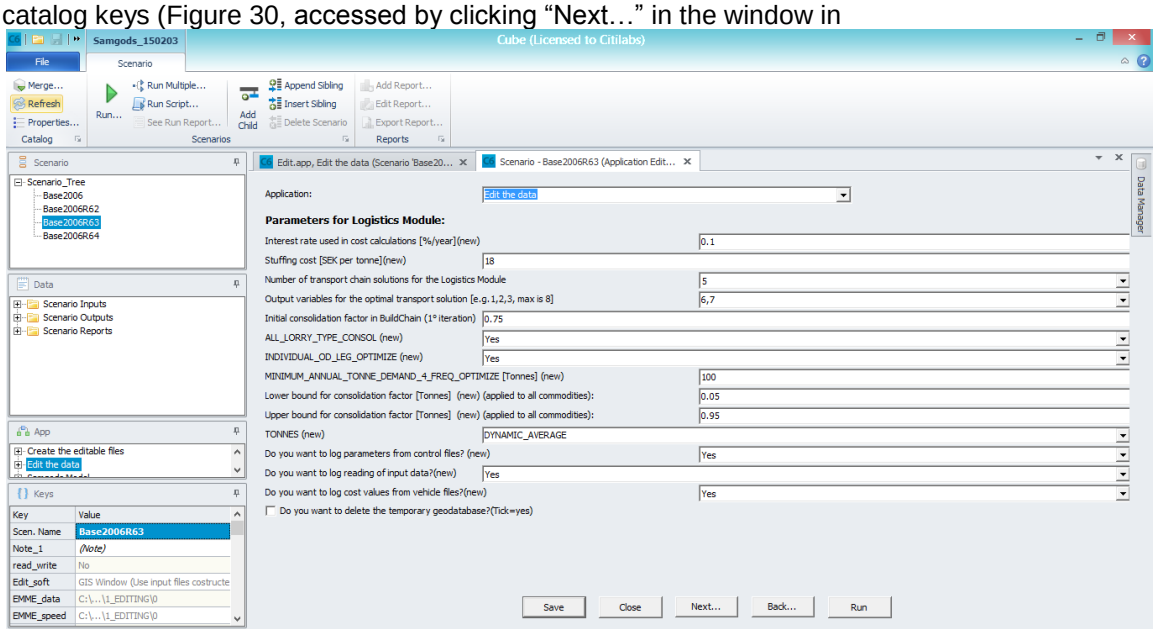


Figure 29) consists of tables and layers of scenario data. By clicking the “Edit...” button on the right, the data is opened in the correct format (i.e., a table in a database window or a layer in a GIS window). Another way to access the data is to use the Data Section window, where the scenario data can be found in the folder Scenario Inputs\Editable data.

Tip: To visualize all the layers in a map, use the first catalog key (“ArcMap GIS Project File”) shown in Figure 30, pointing at the ***Input_Data.mxd*** file. Click the “Edit…” button and all the geographical data will be loaded with only a few default legends. The same file is also available via the *Data Section* window, in ***Scenario Inputs\Editable Data\ Input_Data.mxd***.

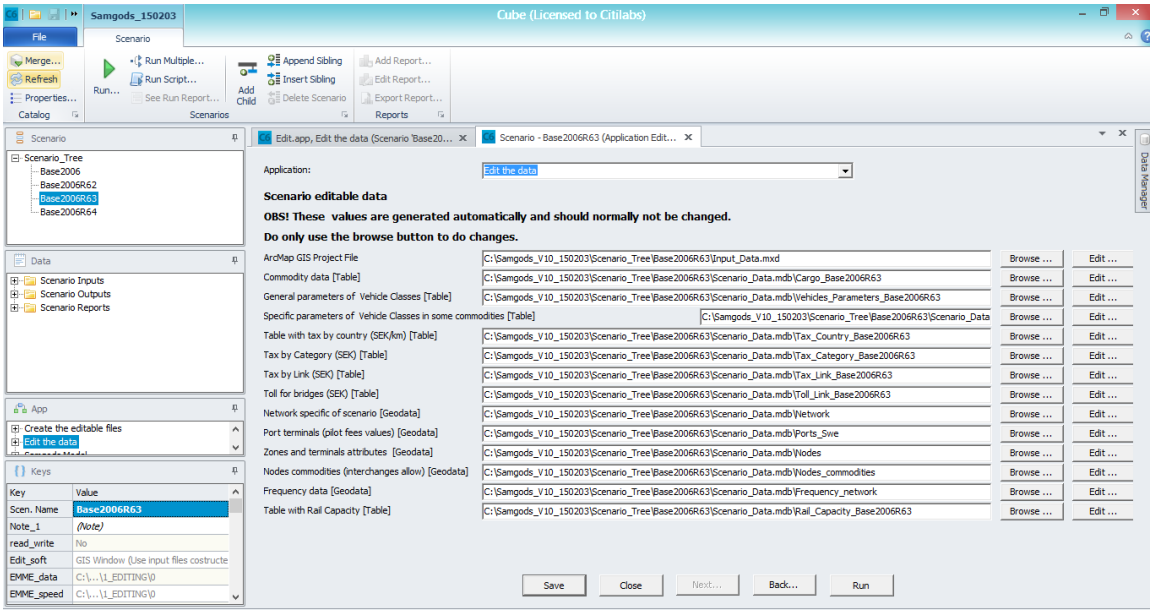
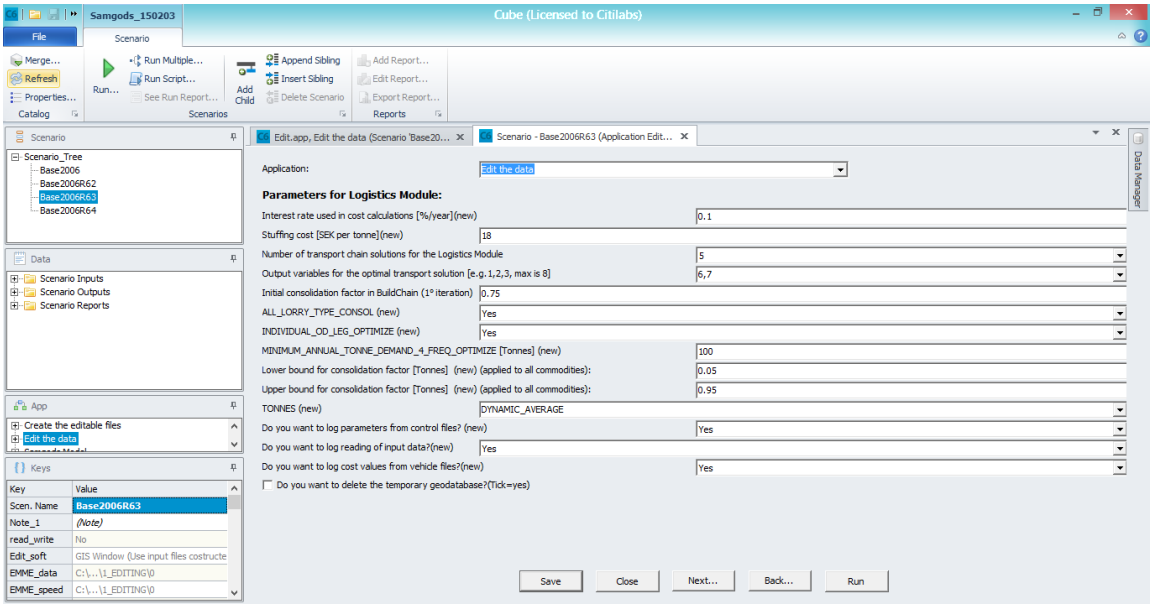


Figure 30 The second set of catalog keys for the *Edit the data* application.

The second step to edit an existing scenario is to save the scenario data into the main geodatabase. This is done by running the *Edit the data* application. During this phase, the scenario specific tables are created and saved into the main geodatabase. Also, the report file

“Report for the edit phase” is created in the folder Scenario Outputs\Edit the data, which is found in the Data Section window.
If the scenario still should be editable, select “No” in the first catalog key (first group of catalog keys,



6) Figure 29) (to lock the scenario, select “Yes)
7) Select whether the temporary geodatabase should be deleted or not in the scenario folder
8) Make any edits in the scenario data (see Chapter 5 for instructions)
9) Click “Run”

During the execution, the program will prompt with the question: “Do you really want to save the scenario {SCENARIO_SHORTNAME}?”. If “No” is selected, the temporary geodatabase will be deleted. No edits will then be saved into the main geodatabase. If “Yes” is selected, the scenario specific tables will be saved into the main geodatabase. Whether the temporary geodatabase is deleted or not depends on the choice made for the catalog key “Do you want delete the temporary geodatabase?”.

10) At the end of the run, click “OK” and close the Scenario Manager window.

Tip: In the log report in Scenario Outputs\Edit the data Report\Report for the edit phase in the Data Section window, information is given on any errors or on the results of the process during the execution of the *Edit the data* application. For information on this and other log reports, please refer to Chapter 0. It is recommended to consult these reports to make sure no input data errors have occurred.

4.5.2. Locked Scenario

For a locked scenario, the first step (i.e., running the *Create the editable files* application and visualizing the data using the *Edit the data* application) is exactly the same as for an editable scenario. It is sufficient to run the *Create the editable files* application once and leave the temporary geodatabase in the scenario folder so that it is accessible each time the user wants to display the input data. It is only necessary to run the *Edit the data* application if the temporary geodatabase should be deleted.

4.6. Run the Samgods model

The different ways to run the Samgods model are described in Sections 3.5 and Section 5. The following paragraph describes the procedure to run the Samgods model as a Standard user.

1) Open the scenario that you want to run by double clicking on it in the Scenarios window. The *Create the editable files* application as well as the *Edit the data* application must be run before running the Samgods model, otherwise the error message ReturnCode=2 will be shown. Please refer to Section 4.5 for an explanation on how this should be done
2) Select the *Samgods Model* application in the Application scroll down menu. The catalog key "Number of zones in network" has shown, its value should be consistent with the input network and its value should be modified in *Edit the data*
3) Under “Run Selections”, make appropriate selections for the keys below:
    a) “Run only one step, or run all steps”; choices: All (full run), LOS Calculation, Logistics Module, Assignment, Reports, Standard LogMod, Rail Capacity Management
    b) "Year of PWC matrices", choices: 2006, 2030 or 2030BnM
    c) “Select the mode for the LOS Calculation and Assignment steps”; choices: All, Road, Rail, Sea, Air (Choice available only for LOS Calculation, Assignment, Reports)
    d) “Select commodities for the Logistics Module”; choices: 0 for all the commodities or the commodity number for a specific commodity (1-35, or STAN1-STAN12) (Choice available only for Logistics Module, Assignment, Reports)
4) Under “Other options”, make appropriate selections for the keys below:
    a) “Do you want to save the LOS matrices?”; tick if you want to save the LOS matrices
    b) For the key “Do you want to produce buildchainxx.log files?”, choose whether to produce the log files from the Buildchain program, containing any warnings from the execution
5) Under “Logistics Module settings – advanced”, make appropriate selections for the keys below:
    a) “Do you want to run the Logistics Module on several processors?”; tick “Yes” or “No”
    b) “How many processors would you like to run simultaneously?”; indicate 1-16 processors
    c) “Scaling factor for outputs”, select “Thousands”, “Millions” or “Billions”.
6) Under “Stop points – settings”, make appropriate selections for the keys below:
    a) “Do you want to pause the run waiting for your action on steps LOS, Logmod,LP0,LP1,L1b?" tick “Yes” or “No”
    b) “Step completion:” represents witch event will prompt the user when reach the completion of Logmod, LP0, etc. Choices are Sound (play a music), Email (sending an email at the email address specified via key " Insert the email address for status on run:", Both or None
7) Under “Rail Capacity Management – settings”, make appropriate selections for the keys below:

a) “Cut off criteria for RCM process (will consider links with V/C > XX% where XX is the value defined)": provide a number between 50 and 80. In setting up the linear programming problem all links with V/C equals or above this number (that is expressed as percentage, e.g. 50%) will be enter in the problem. Recommendable numbers are in the below range, default value is 50

b) “Options to save output files from RCM process:”, each LP or AdjustLP produces a full set of files (see document listed in Section 10.7) that could be saved in specific folders under LogMod. This catalog key will control the option to save all the performed loops or just the last one

c) "Maximum number of loops for Linear Programming process (LP)": number of LP loops the user would like to perform. Provide an integer value between 0 and 9. 0 will perform only LP0, The LogMod process will produce the best solutions and the suboptimal solutions (in terms of transport chains), the number of suboptimal solutions is controlled by the catalog key " Number of transport chain solutions for the Logistics Module". It is recommended to not change these settings and leave the default value

d) "Maximum number of loops for Adjust Capacity Procedure": number of Adjust Capacity Procedure to perform. A value among 0 and 100 could be selected. 0 means that the process will be skipped. Strong runtime implications suggest to use a conservative value from 1 to 3. Please note that with the setting of empty rail flow OD construction in December 2014 not allowing asymmetric empty flow generation, this procedure will not be required unless the LP model solution is infeasible.

8) Click “Run”

9) A message window appears that informs whether the scenario is locked or still editable – click “OK”

Tip: The run time for the Samgods model varies depending on the selected options. If a full run with all commodities and modes is selected together the RCM, it may be appropriate to use multiple processors to reduce the run time.

In the current model version the program used to solve the Linear Programming Problem can use only a single processor. Therefore this is the only part that will not have any benefit.

Tip: Each time changes have been made to the catalog, such as creating a new scenario, creating new output data by running the model or deleting data, the catalog should be saved. This is done by clicking the save icon (the black floppy disk above the Scenarios window). It is recommended to do this often when working with the model.

4.7. Compare scenarios

The comparison of outputs from running scenarios is always made between the current scenario and an alternative scenario. The comparison encompass the following results:

1. differences in LOS matrices (dist, ddist, time and extracost) for all modes and vehicle types
2. differences in OD tonnes, empty and loaded vehicles for all modes and vehicle types for STD
3. differences in tonne flows per mode rail, road and sea for STD and RCM
4. differences in vehicle flows in terms per mode rail, road and sea for STD and RCM

The *Samgods Model* application must be run for the specific commodity or commodity group (STAN group or all commodities) for both the current scenario and the scenario selected for comparison before it is possible to compare the outputs. To run the *Compare scenarios* application, do the following:

1) Select the *Compare Scenarios* application in the Applications window
2) In the Scenarios window, open the scenario that you want to compare to the base scenario by double clicking on it
3) Select the commodity class that you want to compare. It is mandatory to select a commodity class (0 for all commodities, a STAN number for a specific STAN group or the commodity number (1-35) for a specific commodity)
4) Select what you want to compare. The alternatives are *LOS matrices*, *Logistics Module*, *Assignment* or all of them
5) Update "Scenario's name to use in comparison:" catalog key with the name you want to use in the comparison against the current scenario
6) Update "Scenario folder for comparison:" giving information of folder and geodatabase name containing the scenario you want to compare
7) Click “Run”. At the end of the run, click “OK”.

The results from the comparison between scenarios are saved in their corresponding scenario folders, with the commodity class number indicated in the file name. The .MAT files for the OD matrices from the Logistics Module and LOS matrices will be saved directly in the scenario folder, while the networks from the Assignment step will be saved inside the output geodatabases. All output can be visualized from the Data section window, in Scenario Outputs\Compare (see Table 2).

Please note: It is the user’s responsibility to control whether the outputs to compare exist in the scenario folder. Control this in Scenario Outputs\Samgods Report\Existing Outputs in the Data Section window, for the base scenario and for the scenario that is selected for the comparison. If one or more outputs are missing, the run will be terminated with return code 2.

An example of values for the different catalog keys is shown in the following picture:

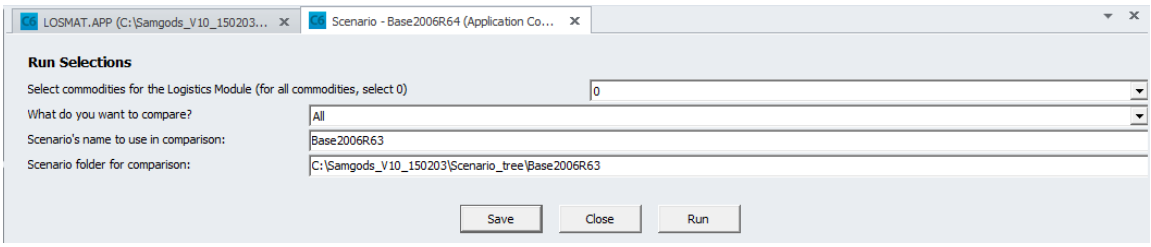


Figure 31 Catalog key values example.

4.8. Delete a scenario

Deleting a scenario requires two steps in different windows.

1) First step: Scenario manager window
    a) Select the scenario that you want to delete in the Scenarios window
    b) Double click on the scenario name. In the Scenario manager window, select the *Handling scenario* application
    c) Under the “Handling scenario” catalog key group, tick the catalog key “Do you want to delete the current scenario?”
    d) Disable all the other catalog keys in the catalog key group “Handling Scenario” (“Do you want to compact the geodatabase files?” – disable, “Select how you want to use the export function” – (3) Do Nothing, “Do you want to control the imported scenario?” – No)
    e) Because of software settings, all catalog keys must be set. However, the key “Where do you want to export the model (1) or scenario (2)?” will not be used in this case. A random character could be typed in
    f) Click “Run”
    g) During the execution, a warning window will prompt: ”Do you really want to delete the scenario {SCENARIO_SHORTNAME}?”. Selecting “No” means that the scenario will not be deleted. If “Yes” is selected, the scenario will be deleted
    h) At the end of the run, click “OK”
    i) Close the Scenario manager window by clicking “Close”
2) Second step: Scenarios window
    a) Right-click on the scenario name in the Scenarios window and select ”Delete”
    b) To the question “Ok to delete the data directories for this scenario and its children?”, click “Yes”;
    c) Run the *Compact* function, see Section 4.9 below.
3) Save the catalog by clicking on the saving icon (black floppy disk, above the Scenarios window)

Please note: If the scenario is in read-only mode (i.e., the scenario is locked), this step will have no effects on the scenario regarding the scenario specific tables. The scenario specific tables will remain in the main geodatabase.

4.9. Compress the geodatabase files

The *Compact* function compresses the files and deletes all the temporary edits stored in the geodatabase. Data that has been deleted previously are permanently deleted when the *Compact* function is run. This reduces the size of the geodatabase and cleans among the files that are stored in the geodatabase by only keeping the necessary data. Running the *Compact* function is required every time that a scenario is deleted or when several runs have been made, and it will influence:

- The main geodatabase containing all the **input** data (i.e., Input_data.mdb)
- The geodatabase containing all the **outputs** of a specific scenario in the scenario folder (i.e. OutputX_{SCENARIO_SHORTNAME}.mdb, where X is the commodity group – 0, 1-35 or a STAN group).

The choice to compact a specific **output** geodatabase is only related to the selected scenario. However, when the *Compact* function is employed, the **input** data (main geodatabase, Input_data.mdb) will also be compacted. Run the *Compact* function in the following way:

1) In the Scenarios window, double click on the scenario that you want to compact
2) In the Scenario manager window, select the *Handling scenario* application
3) Under “Run Selections” (catalog key “Select commodities for the Logistics Module (…)”), set the commodity or commodity group corresponding to the set of output that you want to compact
4) Under the “Handling scenario” catalog key group, tick the catalog key “Do you want to compact the geodatabase files?”
5) Disable all the other catalog keys in the “Handling scenario” catalog key group (Do you want to delete the current scenario? – disable, “Select how you want to use the export function” – (3) Do Nothing, “Do you want to check the imported scenario?” – No)
6) Because of software settings, all catalog keys must be set. However, the key “Where do you want to export the model (1) or scenario (2)?” will not be used in this case. A random character could be typed in
7) Click “Run”
8) At the end of the run, click “OK”

Tip: Run the *Compact* function every time a scenario is deleted or several runs have been made, to reduce the amount of data stored in the geodatabase.

4.10. Export and import a catalog

The Scenario Export function can be used to export a catalog into a new catalog, including a scenario that will be the base scenario in the new catalog. It can also be used to export a single scenario into an existing catalog – see the next chapter.

To export the entire catalog into a new catalog directory and create a new base scenario, the following is required:

1) In the Scenarios window, double click on the scenario that you want to use as the base scenario in the new catalog
2) In the Scenario manager window, select the *Handling scenario* application
3) For the catalog key “Select how you want to use the export function?”, select “(1) Do you want to export the model into a new folder using the current scenario as base?”
4) Disable the other catalog keys in the “Handling scenario” catalog key group (“Do you want to delete the current scenario?” – disable, “Do you want to compact the geodatabase files?” – disable, “Do you want to control the imported scenario?” – No)
5) To set the value for the catalog key “Where do you want to export the model (1) or scenario (2)?”, type in the destination folder in the editing box
6) To set the value for the catalog key “Name of the base scenario in the new model (1), (2)”, type in the new name you want to use for the current scenario, when it has been exported as the base scenario in the new catalog, in the editing box
7) Click “Run”
8) At the end of the run, click “OK”

Please note: A new folder has to be defined for the Scenario export function. If the destination catalog already exists, the user will be informed by a prompt saying “The model already exists”; “This might be an error. The process will be terminated. Check the folder”. In the Samgods GUI, it is never possible to overwrite an existing catalog.

To complete the export of a catalog properly by controlling that the scenario parameters in the new catalog correspond to the imported ones, the *Scenario Import* function must be run. The required actions are:

1) Close the old catalog by clicking on the x
2) Open the new catalog created during the export
3) Update the paths for the applications as described in Section 1.5 and run the *Installation* application (type in the new base scenario name according to the name specified in the *Scenario Export* function in the corresponding catalog key; please refer to Section 1.5 for further instructions)
4) The Scenario_Tree in the Scenarios window in the new catalog only contains one scenario, which has the name “Rename”. It should be renamed to the name that was specified when running the *Scenario Export* function. This is done by right-clicking on the scenario name and selecting “Rename”. The code should also be updated, which is done by right-clicking and selecting “Properties”. Define a short code that is similar to the scenario name
5) In the Applications window, select *Handling scenario* and then double click on the new scenario in the Scenarios window. Tick the catalog key “Do you want to check the imported scenario?” under the *“Handling scenario*” catalog key group
6) Disable all other catalog keys in the “Handling scenario” catalog key group (“Do you want to delete the current scenario?” – disable, “Do you want to compact the geodatabase files?” – disable, “Select how you want to use the export function” – (3) Do nothing)
7) Because of software settings, all catalog keys must be set. However, the key “Where do you want to export the model (1) or scenario (2)?” will not be used in this case. A random character could be typed in
8) Click “Run”
9) At the end of the run, click “OK”
10) Check the report in ***Scenario Outputs\Scenario_Import_function_Report\Report*** for the Import Phase in the Data Section window
11) If any scenario parameters need to be changed according to the report, change those catalog key values for the imported scenario, under “Scenario Parameters” in the *Handling scenario* application and run the application again. Check the report again and repeat if necessary.

Tip: Each time changes have been made to the catalog, such as creating a new scenario, creating new output data by running the model or deleting data, the catalog should be saved. This is done by clicking the save icon (the black floppy disk above the Scenarios window). It is recommended to do this often when working with the model.

4.11. Export and import a scenario

To export a scenario into an existing catalog already containing a base scenario, the following actions are required:

1) In the Scenarios window, double click on the scenario that you want to export. In the Applications scroll down menu in the Scenario manager window, select the *Handling scenario* application
2) For the catalog key “Select how you want to use the export function?”, select “(2) Do you want to export the current scenario into another model?”
3) Disable the other catalog keys in the “Handling scenario” catalog key group (“Do you want to delete the current scenario?” – disable, “Do you want to compact the geodatabase files?” – disable, “Do you want control the imported scenario?” – No)
4) To set the value for the catalog key “Where do you want to export the model (1) or scenario (2)?”, type in the path of the folder where the .cat file for the new catalog is located, in the editing box
5) In the field for the catalog key “Name of the base scenario in the new model (1), (2)”, type in the name of the base scenario in the destination catalog;
6) Click “Run”
7) At the end of the run, click “OK”

Please note: The exported scenario will have the same scenario name in the new catalog as in the catalog that it was exported from.

To complete the export of a scenario properly by controlling that the imported catalog key values correspond to the ones in the new catalog, the *Scenario Import* function must be run. The required actions are:

1) Close the catalog from where the scenario was exported (i.e., the one that is open) by clicking on the x
2) Open the catalog to where the scenario has been exported
3) Create a new scenario, with the same name as set in the export phase, in the catalog (right-click on Scenario_Tree in the Scenarios window and select “Add child”, type in the name and press Enter. Define the scenario code and click “OK”)
4) In the Scenario Manager window, select the *Handling scenario* application in the Scenario manager window. Tick the catalog key “Do you want to control the imported scenario?” under the “Handling scenario” catalog key group
5) Disable all other catalog keys in the “Handling scenario” catalog key group (“Do you want to delete the current scenario?” – disable, “Do you want to compact the geodatabase files?” – disable, “Select how you want to use the export function” – (3) Do nothing)
6) Because of software settings, all catalog keys must be set. However, the key “Where do you want to export the model (1) or scenario (2)?” will not be used in this case. A random character could be typed in
7) Click “Run”
8) At the end of the run, click “OK”
9) Control the report ***Scenario Outputs\Scenario_Import_function_Report\Report*** for the Import Phase in the Data Section window to see if any edits are necessary
10) Change any catalog key values listed in the report for the imported scenario, under “Scenario Parameters” in the *Handling scenario* application and run the application again. Check the report again and repeat if necessary

Tip: Each time changes have been made to the catalog, such as creating a new scenario, creating new output data by running the model or deleting data, the catalog should be saved. This is done by clicking the save icon (the black floppy disk above the Scenarios window). It is recommended to do this often when working with the model.

4.12. Produce PWC Matrices in Voyager format

To produce the PWC matrices in Voyager format, do the following:

1) Double click on a scenario (it does not matter which scenario) in the Scenarios window and select the *PWC_Matrices* application in the Scenario manager window
2) Select the year you want to convert in Voyager format among 2006, 2030 or 2030BnM using " Year of PWC matrices" catalog key
3) Click ”Run”
4) At the end of the run, click “OK”

The matrices are now available in the folder 01_Programs\LogMod\Input\PWC\{Year}\VY_F\, found in the Samgods folder (see Table 1 in Section 1.5). In order to display the matrices for a commodity via the Data Section window, do the following:

1) Double click on a scenario (it does not matter which scenario) in the Scenarios window and select the *Samgods Model* application in the Scenario manager window;
2) Select a commodity using the catalog key “Select commodities for the Logistics Module (…)”. Only the numbers 1-35 are allowed here (not 0 for all commodities or any STAN group);
3) Click “Save” to save the settings;
4) The matrices for the selected commodity are now available in the Data Section window, in Scenario Inputs\PWC_Matrices\PWC matrix for commodity.

4.13. Change matrix format

To export a matrix in CSV or DBF format, or as a table in a geodatabase (GDB format):

1) In the Scenarios window, double click on the scenario corresponding to the matrix you want to export
2) In the Scenario manager window, select the *Change matrix format* application and make appropriate selections for the desired matrix (see the details in Section 1.1)
3) Click “Run”
4) At the end of the run, click “OK”

The output is found in the scenario folder with a CSV or DBF extension or as a table inside a geodatabase, depending on the selections made.

4.14. Visualize the outputs

In the Data Section window, the results that are produced in all steps are available. Please refer to Section 2.3 for details.

4.15. General information on the GIS Window

The ArcMap GIS Project file (Input_data.mxd) is opened from the Data Section window by opening the folder Scenario Inputs\Editable data and double-clicking on the .mxd file. The .mxd file can also be visualized from the *Edit the data* application, by opening the scenario, clicking the

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“Next…” button to reach the second set of catalog keys and finally clicking the “Edit…” button for the ArcMap GIS Project File key. The map document (.mxd) contains the following information:

1) Details of all input data that can be visualized in a map (data with [Geodata] label) with the following layers (where the default values are indicated in parenthesis):
    a) Frequency_network (disabled) (i.e., frequencies of services between terminals, for more information on this network, see the appendix section 11.3)
    b) Nodes_commodities (disabled) (i.e., which commodities that can be handled at the terminals)
    c) Nodes (disabled)
    d) Ports_swe (disabled)
    e) Network – Link and Node layer (active)
    f) Samgods_zones (active).

A set of default legends () for the node and the link attributes for the layers:

- a) Nodes_commodities: Type of terminal
    - (1) Nodes: Type of terminal
    - (2) Port area
- b) Ports_swe: Swedish Ports
- c) Network:
    - i. Network_Node:

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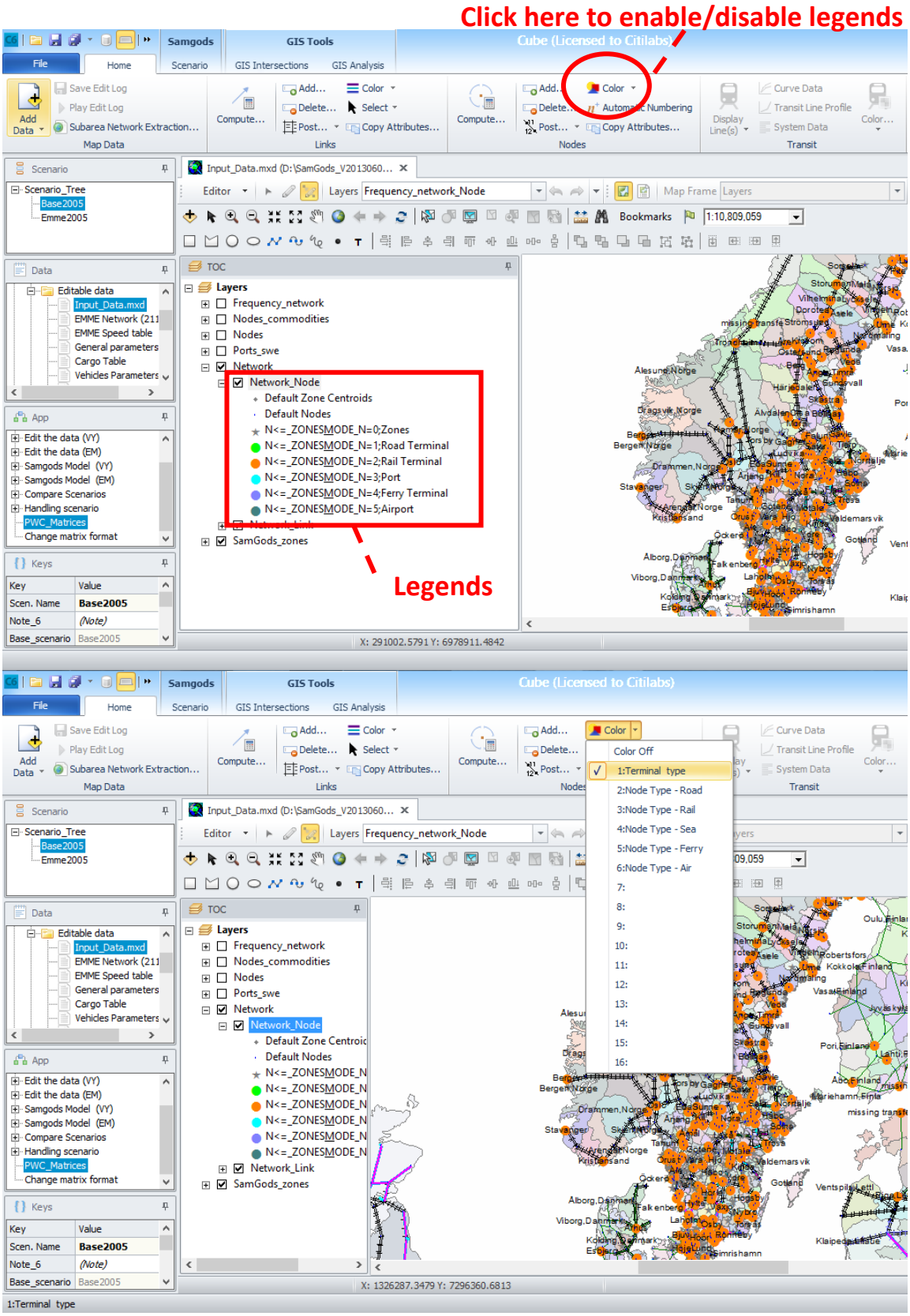

Figure 32 Enable the layer and select the set of legends as in the figure. Example of default legends, for the Network_Node layer.

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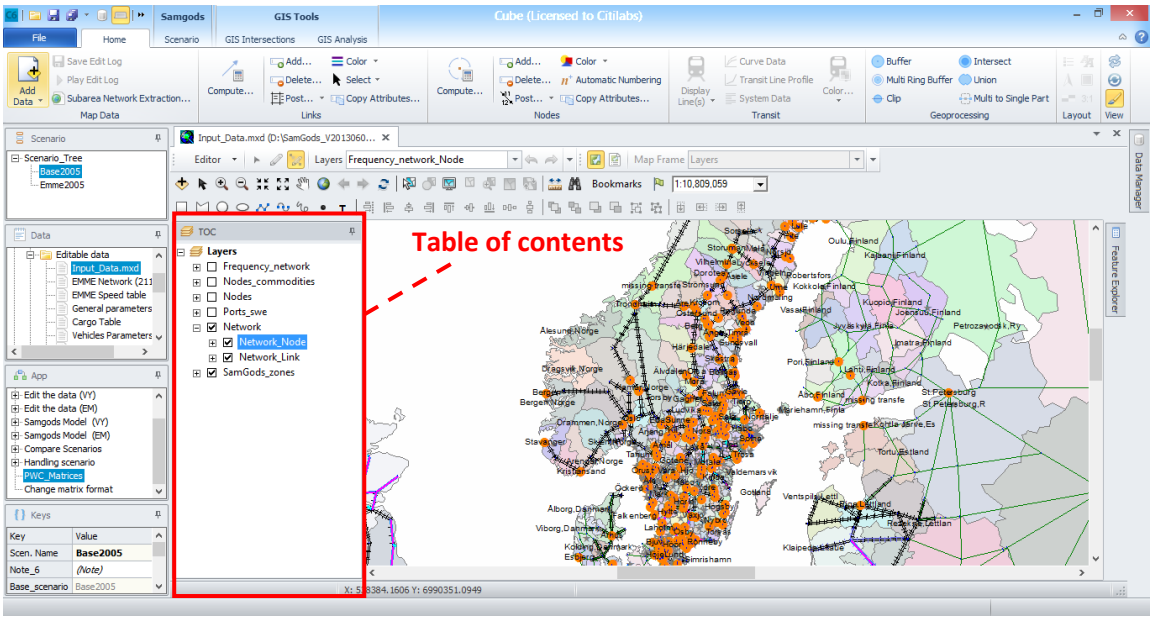

Figure 33 The Table of contents.

2) For the network node and link layers, a set of filter conditions to switch on/off specific modes are also available. To enable/disable the filters, right-click on the node/link layer in the TOC and select “Properties”. In the scroll down menu “Selection Group”, select the desired group and then tick the “Active” check box to activate the option. The filters are by default set as in the last session, which means that a filter can be active even if no check boxes are ticked. To be sure to turn all filters off, tick and then un-tick an “Active” check box. The available groups for the network node layer are:

   a) Road Network

   b) Rail Network

   c) Sea Network

   d) Ferry Network

   e) Air Network

   f) Zones

   The same groups are available for the link layer, except the last one. The advantages of enabling a filter are the possibilities to:

   - visualize only the selected entities
   - select and edit only the visualized entities (and thereby avoid selecting the wrong links)

The best way of using these filters is in conjunction with the default legends: First activate the desired filter(s) for the layer(s) you want to work with and then enable and/or edit the corresponding set(s) of default legends using the icons shown in Figure 27.

The layers ticked in the TOC are the ones that are visualized in the GIS window. A layer is selected by clicking on it in the TOC. By selecting Datasets -> Set Selectable Layers… it is possible to set which layers that allow selecting elements. E.g., if the Samgods_zones layer is selected in the TOC but not set as selectable, the zones are shown in the GIS map but cannot be selected with the Select features tool (see below). The default is that all layers are selectable. When editing the GIS data, the layer containing the data that is edited must be selected in the “Layers” drop down menu in the Editor toolbar (see below).

Each layer has an attribute table, which is accessed by right-clicking on the specific layer in the TOC. In the attribute table it is possible to view the attributes of each layer, but not to edit any values. Any edits must be made in the Feature Explorer window (or using the Compute function) and in Edit mode (see below for explanations).

More information on the GIS window can be found in the help section, accessed from the main toolbar: Help -> Cube Help -> Cube Base -> GIS Window.

4.15.1. Tools in the GIS window

To select/edit/modify the layers, the following tools are available from the interface:

- Select elements, (fixed) zoom in/out in the map, pan, full extent, refresh view, select features:

- Select/view elements via SQL queries based on the attributes in the layers: On the menu bar, select Datasets -> Select by Attributes… and type an SQL syntax, for example all railway nodes in the Stockholm region, in a node layer:

- The Editor toolbar, which is used when editing the network:

- Add/remove attributes in the layer's table (node or link table) by selecting Node (or Link) -> Attribute -> Add/Delete on the menu bar;
- Visualize the attributes for a specific selected element – after an element has been selected using the "Select Features" tool (see first bullet above), the attributes will be displayed in the Feature Explorer window, see Figure 34. In the Edit mode, it is also possible to edit and save the new values directly in the Feature Explorer window. To change to Edit mode, click on Editor -> Start Editing on the Editor toolbar;

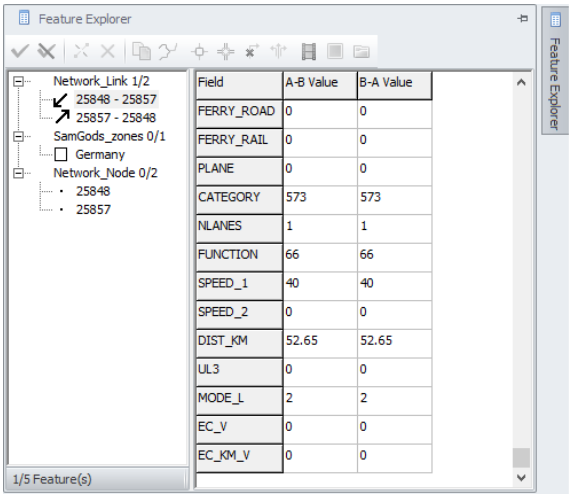

Figure 34 Feature Explorer window

- Modify values based on a condition. Under Link or Node (depends on the type of layer) on the menu bar, the “Compute” option is available when the session is in Edit mode. By selecting “Compute”, access is given to the Feature Class Attribute Calculation window, shown in Figure 35. In this window, it is possible to edit the values and apply a condition (in the example in Figure 35, the capacities for all ports in the Lysekil region are updated, more details on this specific example can be found in Section 5.7).

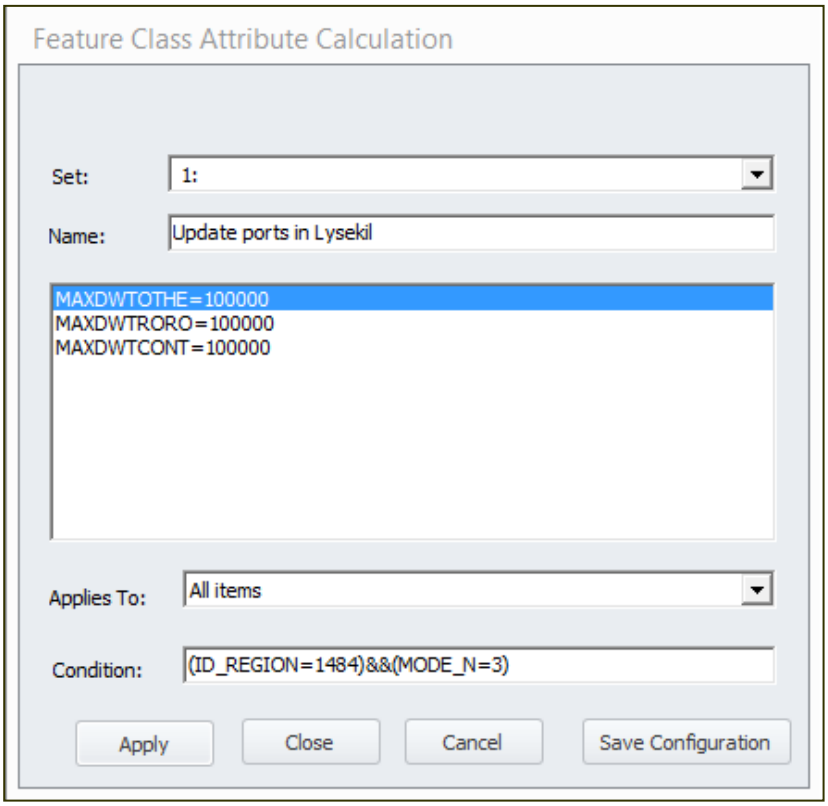

Figure 35 The Feature Class Attribute Calculation window.

4.15.2. Attributes available in the node and link layers

It is possible to select an element in a node layer using the following attributes:

- ID_COUNTRY;
- ID_REGION (primary key if used in combination with ID_COUNTRY). A list of the country and region codes can be found in the Data Section window, under Scenario Inputs\General tables\Zoning System;
- MODE_N (1 – Road terminal, 2 – Rail terminal, 3 – Port, 4 – Ferry terminal, 5 – Airport).

For example, to select all the nodes in a region, the user only needs to select the layer in the TOC and then specify the ID_REGION attribute using Datasets -> Select by attribute… on the main toolbar:

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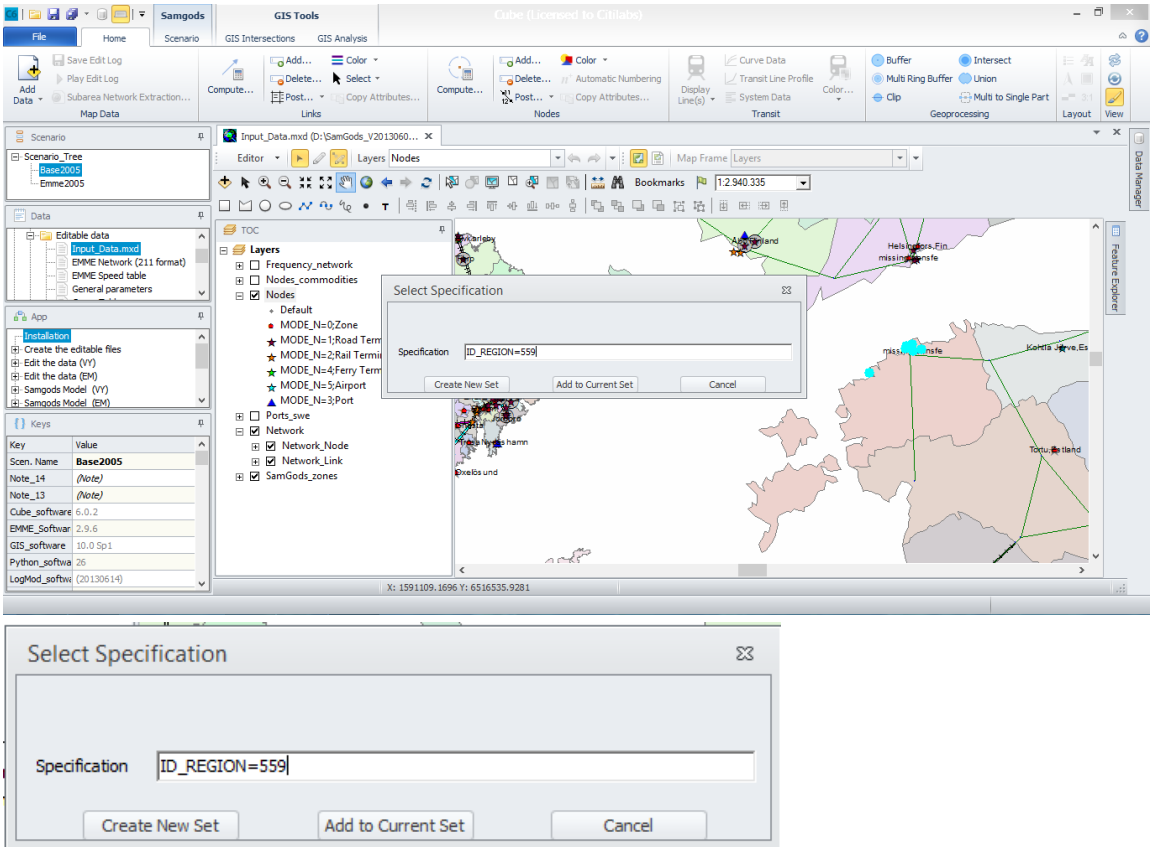

Figure 36 Select by attribute tool

To view all attributes possible to select, right-click in the blank field in the Select Specification window.

For the network link layer the attribute corresponding to MODE_N is MODE_L. To select all the links in a region, do the following:

1) Select the desired region in the map using the Select Features tool (as a suggestion, the Samgods_zones layer should be ticked in the TOC so that the regions are visible)
2) Activate the layer where you want to select elements, in this case the “Network_Link” layer, by clicking on it in the TOC
3) On the menu bar, select Datasets -> Select by Location…
4) In the Select by Location window, set the values indicated in Figure 37
5) Click “Apply”, and then “Cancel” when all specifications have been made

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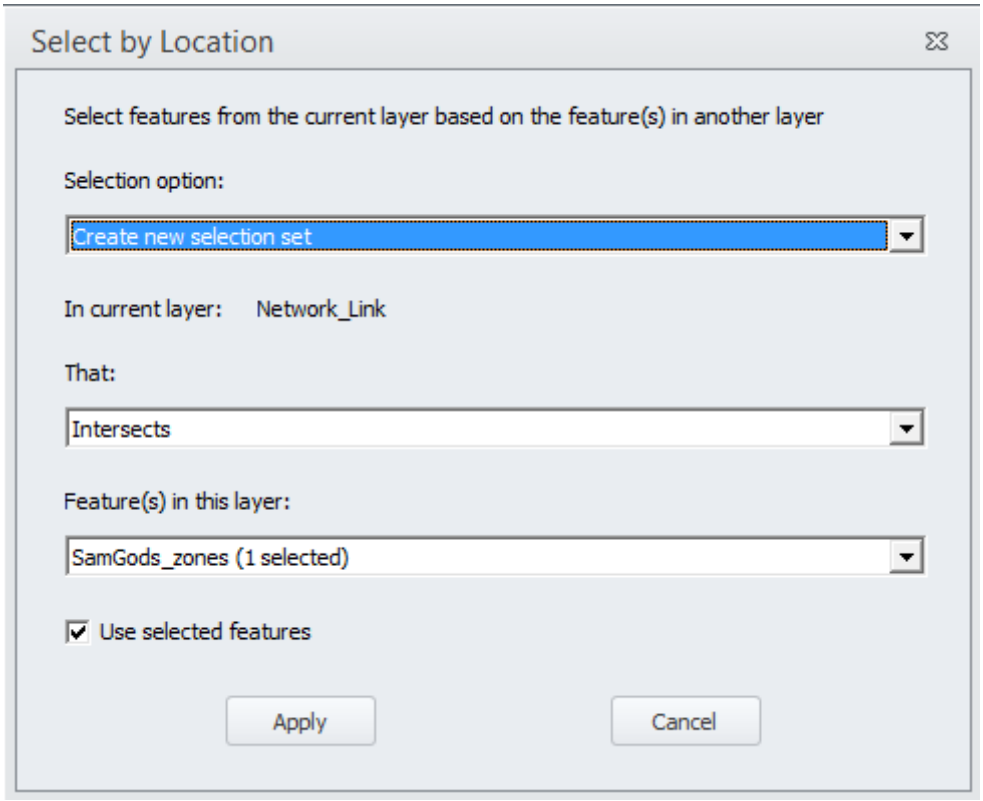


Figure 37 The Select by Location tool.

5. Scenario setup

As for Chapter 4, this chapter describes how to use the Samgods GUI in Voyager Standard user mode. The parameter settings etc. that are described are visible in Standard user mode – e.g. in developer mode all catalog keys are possible to set, in Advance Mode some extra catalog keys but not all as per developer mode.

After edits have been made to the scenario according to the instructions below, the changes must be saved to the main geodatabase before running the model. This should be done according to the instructions in Section 4.5.

If you are not sure on how to use the GIS window, the layers, filters and legends, we refer to Section 4 above for a short introduction.

5.1. Import EMME network

An option to made edits on the network in Emme environment is available in the GUI interface. In this paragraph the actions that must be performed are outlined ,and general suggestions on how to avoid inconsistencies in the model are provided.

In order to import an Emme network together the speed definition for links, do the following:

1) Select "Edit the data" and double click on scenario under Scenario Window;
2) Set the values for the following catalog keys:

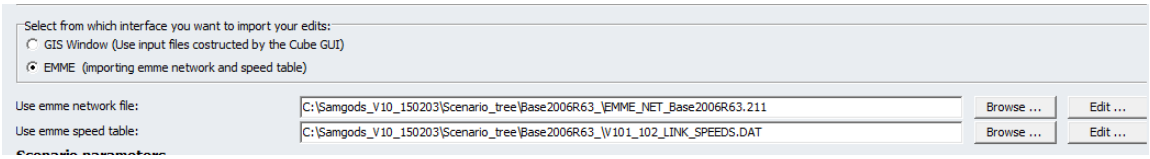


Figure 38 Catalg keys to import Emme network

   a) Change "Select from which interface you want to import your edits:" to "EMME (importing Emme network and speed table)
   b) Specify the location for Emme network using "Use Emme network file:" catalog key The file must have *.211 extension to be recognized by the system
   c) Specify the location for link speed file using "Use Emme speed table:" catalog key The file must have *.DAT extension to be recognized by the system
   d) From Emme network *.211 identify the number of zones present in the table (see below for details on this) and set the catalog key "Number of zones in network (see value in scenario network):" to that value
3) Click on "Run".

The main elements in this import are the number of zones and the file structure for the Emme network and the speed link table.

The Emme network in *.211 has two distinct parts, **t nodes init** and **t links init**. The records between those two strings represent the node table. An example has shown in the following picture:

```
1    c VOYAGER NETWORK  Date: 10-Feb-15 11:14 AM
2    c Project: Base2006R63
3    c Scenario   1
4    t nodes init
5    a*711400  1620.00  6601.00       1     114       0 0000
6    a*711401  1620.25  6599.62       1     114       1 0000
7    a*711402  1617.90  6600.30       1     114       1 0000
8    a*711403  1618.65  6601.87       1     114       1 0000
9    a*711500  1628.00  6603.00       1     115       0 0000
10   a*711700  1641.00  6598.00       1     117       0 0000
11   a*712000  1647.00  6581.00       1     120       0 0000
12   a*712300  1616.00  6589.00       1     123       0 0000
```

Figure 39 Node table

The values present in each record has a similar meaning to the attributes present in a Voyager network:

- a: just a label used in Emme program , not relevant for the system
- *: if present the record refers to a zone. if not present it is a regular node
- 711400: Emme number
- 1620.00: x coordinate
- 6601.00: y coordinate
- 1: ID_COUNTRY
- 114: ID_REGION
- 0: MODE_N
- 0000 : user field not relevant for the model.

During the import ID_COUNTRY, ID_REGION and MODE_N will be verified in terms of consistency with the base scenario. If one or all of them will be missed, in {SCENARIO_DIR}\REPORT_ED_{SCENARIO_CODE}.TXT will be listed the errors (see chapter 7 for list of messages and possible actions). The errors must be correct in the *.211 and the process must be rerun until no messages will be displayed in the report.

To identify the maximum number of zones in the Emme network browse along the node table until a first record without "*" in the second position has identified. For instance:

```
1123    a*974942  1486.00  5236.38     321      649       3 0000
1124    a*958412  1723.74  7514.23       1     2584       2 0000
1125    a   1002  1321.70  6168.80       1     1280       2 1002
1126    a   1003  1317.40  6168.50       1     1280       2 1003
```

Figure 40 Last zone in node table.

Since the text window in Cube gives the row number (number on the left hand side grayed), the number of zones will be simply identified as difference of the current row number and 5 (first record in the table containing a node record). In the example 1125-5 =1120.

This is the value that must be provided to the catalog key "Number of zones in network (see value in scenario network):".

The system will not perform checks on the link table rather than consistency with the node table. Therefore before use the network in Samgods the categories associated to the links must be checked and corrected. The CATEGORY attribute (6th field in the Emme link table, denoted link type) must be consistent to the list of allowed categories in A_LinkGategories.

The UL3 attribute (user link data number 3) in the link table (11th field in the Emme link table) has been used to specify a capacity constraint in sea mode. Therefore those sea links for which the user wants to apply a constraint, a number must be coded.

It is worth noting that the nodes and links are **not sorted in normal emme** output order from a Cube/Voyager. export **Introducing a link-based cost**

There are different ways to add taxes, tolls and extra costs to one or several links. All of them are added for each vehicle class separately. 6 attributes with different purposes are defined:

- Extra fixed cost per link or set of links (SEK)
- Extra kilometres based cost per link or set of links (SEK/km)
- Country tax: kilometres based tax per country (SEK/km)
- Link class tax: fixed tax per link, per link category (SEK)
- Link tax: fixed tax per link (SEK)
- Toll for bridges, fixed tax per link (SEK)

How to edit each one of them is described in the following paragraphs. The three types of taxes (country tax, link class tax and link tax) work together, so that only one of them can be applied to a specific link at once. In short the priorities are the following:
COUNTRY TAX <LINK CLASS TAX <LINK TAX

How the different taxes are prioritized in detail is described below, namely in the section about the link tax. The toll for bridges is added to any tax on a link. It can also be applied to road and rail links that are not bridges. All these four attributes (the three taxes together with the toll for bridges) are edited via tables.

Then there are the two extra cost attributes. They could represent any fee, tax or other cost and are added to any other taxes or tolls for the links where they are defined. They are edited via a GIS layer.

5.2.1. Extra cost on a specific link or set of links

In order to add a specific cost to a specific link in the network for a specific vehicle class, do the following:

4) Open the GIS file (Input_Data.mxd), in one of the two possible ways:
    e) Open the Scenario manager window by double clicking on the scenario name in the Scenarios window. In the Scenario manager window, select the *Edit the data* application. Click the “Next…” button and then “Edit…” for the catalog key “ArcMap GIS Project File”;
    f) Alternatively, select the scenario by clicking on it in the Scenarios window and open the file from the Data Section window, under Scenario Inputs\Editable data\Input_Data.mxd;
5) Select the Network_Link Layer in the TOC window;
6) On the menu bar, select Link -> Attribute -> Add;
7) In the first popup window, enter the name for the new attribute by considering the following:
    a) If you want to add an attribute as a fixed cost (independent of distance), the label name EC_VXXX, where XXX represents the vehicle type, should be used (in the network all the attributes depend on the vehicle type);

   b) If you want to add an attribute as a parametric cost depending on the distance, the label name EC_KM_VXXX should be used;

8) In the second popup window, fill in the variable type (numerical (N) or text (T));
9) Enter the specification for the next new attribute as in 5) and 6). When all attributes have been added, continue to 8);
10) Leave the attribute name blank (without typing anything) and click “OK”.

Please note: The label names for the two attributes are managed by two catalog keys in the *Edit the data* application:

- “Attribute name for the extra cost to a specific link [SEK]” – default: EC_V;
- “Attribute name for the extra cost to a specific link [SEK/km]” – default: EC_KM_V.

To change the defaults the user only needs to type the new label names in these catalog keys. If the defaults are changed, the new label names must be used when setting the attributes as described above, The vehicle type code has to be placed at the end of the attribute name, e.g.

- COST_KM101;
- FEES_201.

So if the user e.g. wants to use the attribute name “COST_KM101” for vehicle type 101, the catalogue key should be set to “COST_KM”. Examples of erroneous definitions (beginning with a number or containing blank entries) are:

- 105COST;
- 204 test;
- 204test.

Each link in the network will now have the structure displayed in Figure 41 below. The user can see this in the Feature Explorer window by selecting a link using the “Select Features” tool.

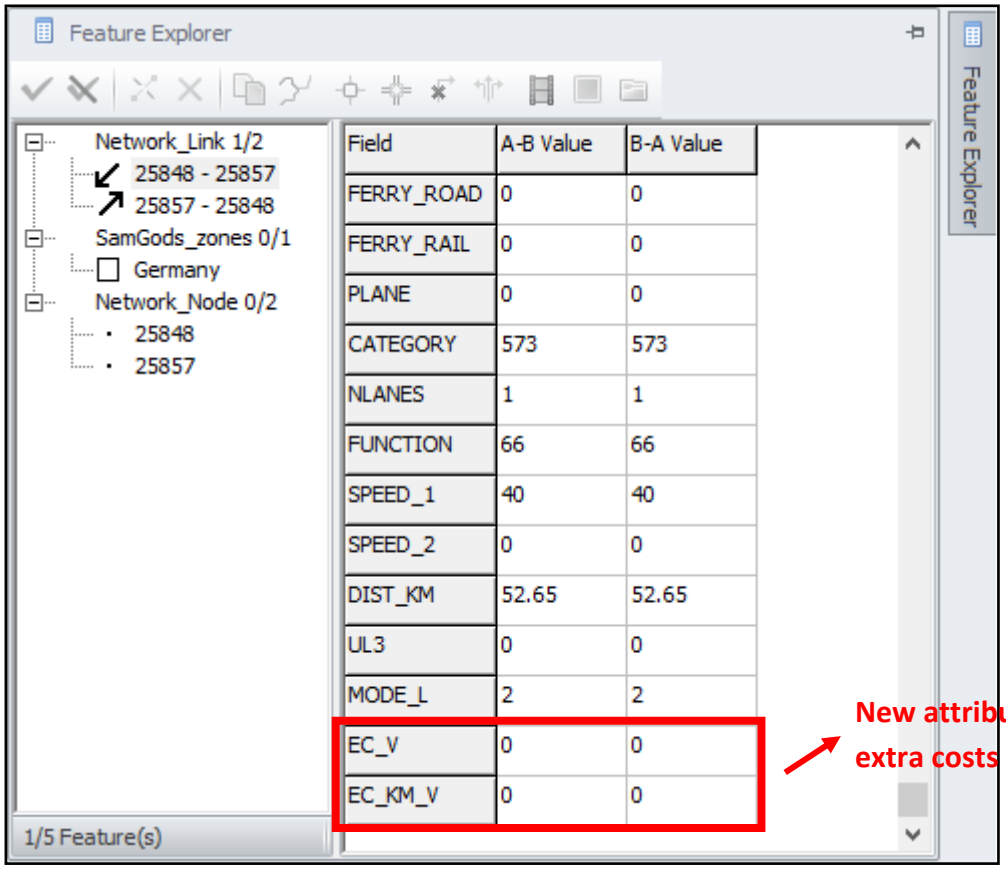


Figure 41 Feature Explorer window.

11) In the Editor toolbar, select Editor -> Start editing. In the “Layers” drop down menu select the “Network_Link” layer

- To edit a single link, do the following:

1) Use the “Select features” tool  to select the specific link
2) In the Feature Explorer window, type in the value of the tax or cost in the new attribute cell
3) Save the edit by clicking the green icon on the top left
4) Close the Feature Explorer window
5) In the Editor toolbar select Editor -> Stop Editing
6) To the question “Do you want to save your edits?”, click “Yes”
7) Close the GIS window by clicking on the X icon without saving the ArcGIS Map Document (*.mxd) (if any edits to the legends and/or the layout have been made, the map could be saved, otherwise this is not necessary).

- To edit a list of links based on attribute conditions, do the following:

1) Under the main toolbar, select Datasets -> Select by Attributes…
2) In the Select Specification window, right click in the blank field to see the attribute list (note: it only shows attributes from the active layer – to access other attributes, select another layer in the TOC), select the attribute for applying the condition (in the example in Figure 42, select all the links on mode 5 – air)

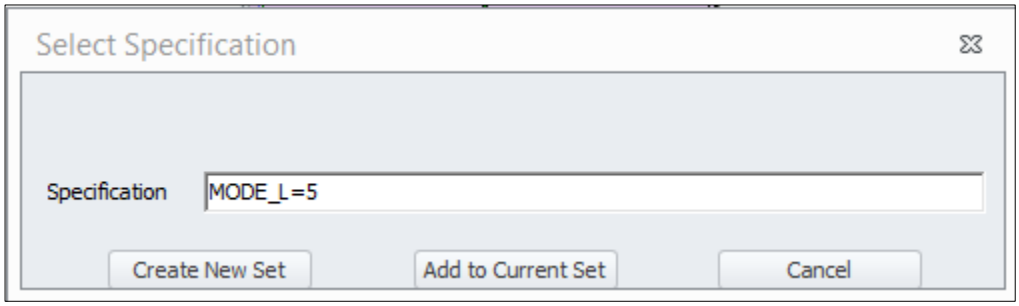


Figure 42 The Select Specification window.

3) Click “Create New Set”
4) Select Link -> Compute... in the menu bar to access the Link Attribute Calculation window, see Figure 43

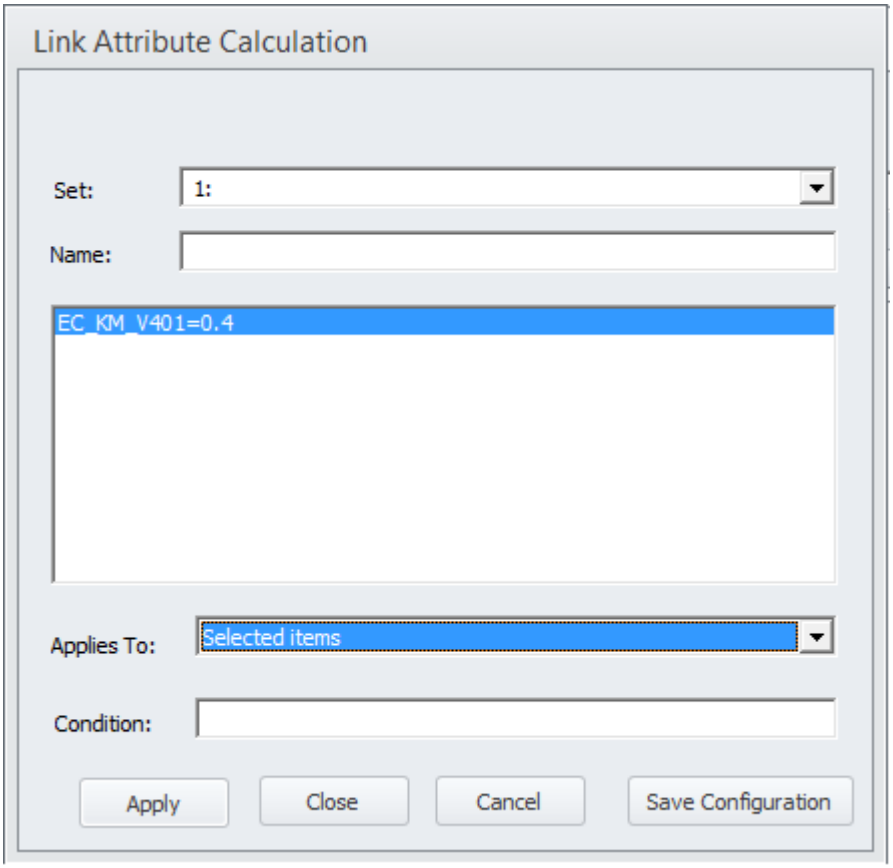


Figure 43 The Link Attribute Calculation window.

5) Fill in the fields, see Figure 43. To insert edits in the main field in the middle, right click and select “Insert”. A window, “Insert Equation”, pops up – right-click in the blank field and select the attribute you want to edit, e.g. EC_KM_V401 as in Figure 43, and type in “=” followed by the value. More attributes could be edited by repeating the procedure. In the “Applies To:” drop down menu, select “Selected items”
6) Click ”Apply”. An information window shows the total number of links updated. Click “OK” and then “Close”
7) Under the Editor toolbar, select Editor -> Stop Editing
8) To the question “Do you want to save your edits?”, click “Yes”

9) Close the GIS window by clicking on the X icon without saving the ArcGIS Map Document (*.mxd) (if any edits to the legends and/or the layout have been made, the map could be saved, otherwise this is not necessary).

- To edit a list of links based on a geographical selection, do the following:
  1) Select the “Samgods_zones” layer in the TOC
  2) In the main toolbar, select Datasets -> Select by Attributes…
  3) In the Select Specification window, right click in the blank field to see the attribute list (note: it only shows attributes from the active layer – to access other attributes, select another layer in the TOC), and select the attribute for applying the condition (in the example in Figure 44, select the Stockholm region). For a list of the region and country codes, open the table ***Scenario Inputs\General tables\Zoning Systems*** in the Data Section window

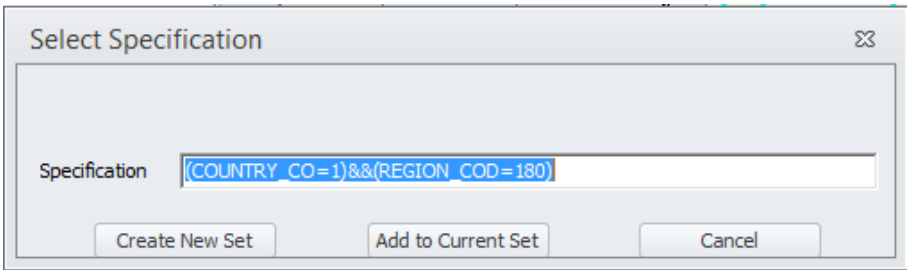


Figure 44 The Select Specification window.

4) Click “Create New Set”
5) Select the “Network_link” layer in the TOC
6) On the main toolbar, select Datasets -> Select by Location... to access the window in Figure 45 where appropriate changes can be done

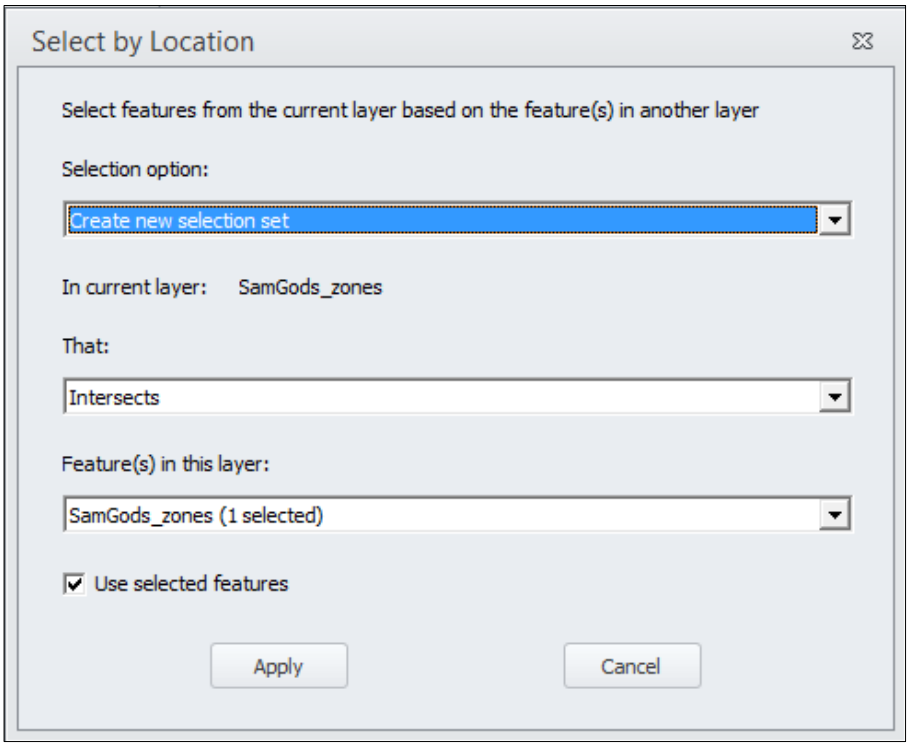


Figure 45 The Select by Location window.

7) Click “Apply”. An information window shows the total number of links selected. Click “OK” and then close the window by clicking “Cancel”
8) Select Link -> Compute on the main toolbar to access the Link Attribute Calculation window, see Figure 46

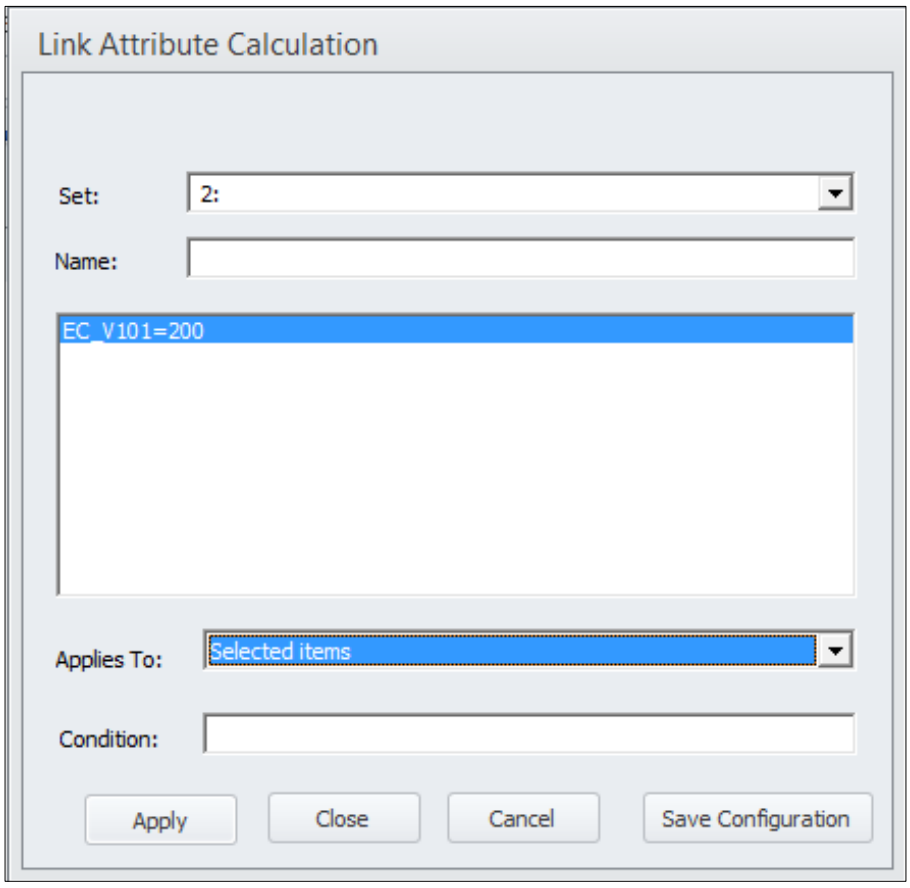


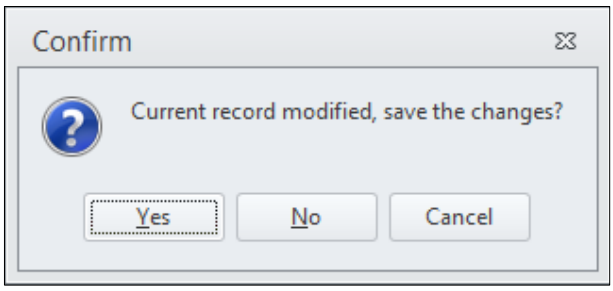
Figure 46 The Link Attribute Calculation window.

9) Fill in the fields. To insert edits in the main field in the middle, right click and select “Insert”. A window, “Insert Equation”, pops up – right-click in the blank field and select the attribute you want to edit, e.g. EC_V101 as in Figure 46, and type in “=” followed by the value. More attributes could be edited by repeating the procedure. In the “Applies To:” drop down menu, select “Selected items”
10) Click “Apply”. An information window shows the total number of links updated. Click “OK” and then “Close”
11) On the Editor toolbar, select Editor -> Stop Editing
12) To the question “Do you want to save your edits?”, click “Yes”
13) Close the GIS window by clicking on the X icon without saving the ArcGIS Map Document (*.mxd) (if any edits to the legends and/or the layout have been made, the map could be saved, otherwise this is not necessary).

5.2.2. Country tax – kilometer-based

The user can apply a country tax for road and rail modes, differentiated by the vehicle type. For the other modes (sea, ferry and air), the tax can only be differentiated between inside and outside of Sweden, since the links for these modes are not divided between other countries in the Samgods model. To edit the country tax, do the following:

1) Click the “Edit…“ button for the “Table with tax by country (SEK/km) [Table]”catalog key in the *Edit the data* application, or open the Scenario Inputs\Editable data\Tax by country Table from the Data section window, for the selected scenario
2) To modify existing values, just type a new value in the SEK_KM attribute and press Enter
3) To add a new tax, the user must know the country code (ID_COUNTRY). To access the country codes, please refer to the table ***Scenario Inputs\General tables\Zoning*** system in the Data section window
    a) Add a new row in the Tax by Country table by clicking the “+” icon;
    b) Type in the country code, the vehicle type and the SEK_KM value (the country name is not required)
4) Close the Tax by Country table by clicking on the X icon in the top right corner and click “Yes” to the question:



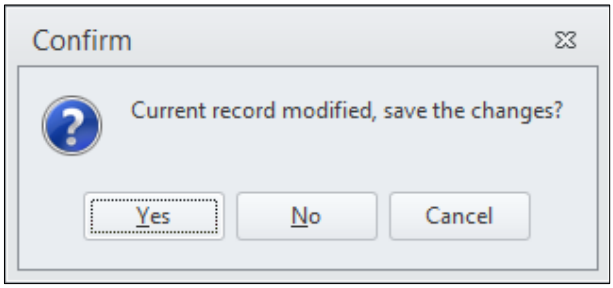
Please note: For sea, ferry and air modes (vehicles class numbers greater than 209) the user can only apply two country codes:

- ID_COUNTRY=1 for Sweden (as above);
- ID_COUNTRY=-1 for all countries outside Sweden.

5.2.3. Link class tax

The user can apply a tax per link for a specific category of links in the network. This is done in the following way:

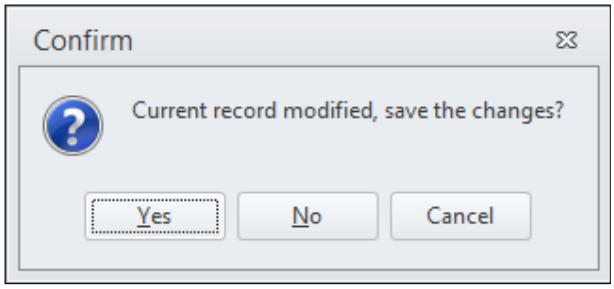
1) Click “Edit“ for the “Tax by Category (SEK) [Table]” catalog key in the *Edit the data* application or open Scenario Inputs\Editable data\Tax by Linkclass from the Data Section window for the specific scenario;
2) To modify existing values, just type in a new value in the SEK attribute and press Enter;
3) To add a new tax, the user must know the category (LINKTYPE). To access the category codes, open Scenario Inputs\General tables\LinkCategories values from the Data section window;
    a) Add a new row in the Tax by Link class table by clicking the “+” icon;
    b) Type in the LINKTYPE value, the vehicle type and the SEK value;
4) Close the Tax by Link class table by clicking on the X icon in the top right corner and click “Yes” to the question:



5.2.4. Link tax

The user can apply a tax for a specific link in the network. This is done in the following manner:

1) Click “Edit…“ for the “Tax by Link (SEK) [Table]” catalog key in the *Edit the data* application, or open Scenario Inputs\Editable data\Tax by Link from the Data section window for the specific scenario
2) To modify an existing value, just type in a new value in the SEK attribute and press Enter
3) To add a new tax, the user must know the start (A) and end (B) node for the link in the network. To visualize the network, open the Input_Data.mxd file, e.g. from the Data Section window. The A and B node numbers can be accessed e.g. by selecting the link with the Select Features tool and looking in the Feature Explorer window;
    a) Add a new row in the Tax by Link table by clicking the “+” icon
    b) Type in the A and B values (start and end node for the link), the vehicle class and the SEK value. In order to have the tax in both directions of the link, the link must be added twice, one row for each direction (where the A and B nodes are exchanged in the second row)
4) Close the Tax by Link table by clicking the X icon in the top right corner and click “Yes” to the question



Please note: Introducing a link with a zero tax value for a specific vehicle type has the effect that all the extra costs (in term of taxes) are set to zero. The same principle applies to the Tax by Link class table regarding the Country tax value.

The general rule applied in the model is that

TAX_COUNTRY <- TAX_LINKCLASS <- TAX_LINK

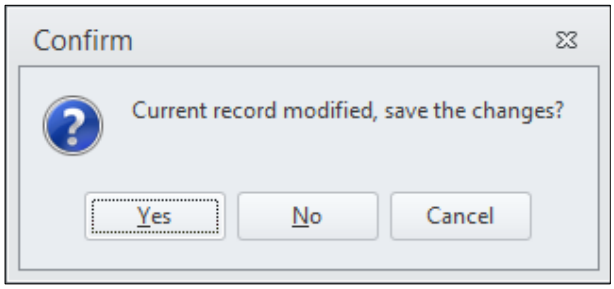
If several tax values are assigned to a specific link, e.g. one from the country table, another one from the link class table and a third one from the link table, each value will be overwritten by the subsequent value in the order above, i.e. the smaller scale always overrides the larger (disregarding the actual value of the tax).

Please observe that this rule does not apply to the Toll bridges table or the extra cost values in the network – they are added to any other taxes.

5.2.5. Toll bridges

In the network, there are a few bridges with fixed tolls. The Toll bridges table contains the values of the tolls. The user can modify them or add new bridge tolls in the following manner:

1) Click “Edit…“ for the “Toll for bridges (SEK) [Table]” catalog key in the *Edit the data* application, or open Scenario Inputs\Editable data\Toll bridges from the Data section window for the specific scenario
2) To modify an existing value, just type in a new value in SEK attribute and press Enter
3) To add a new toll, the user must know the start (A) and end (B) node for the link in the network. To visualize the network, open the Input_Data.mxd file, e.g. from the Data Section window. The A and B node numbers can be accessed e.g. by selecting the link with the Select Features tool and looking in the Feature Explorer window
    a) Add a new row in the Toll bridges table by clicking the “+” icon
    b) Type in the A and B values (start and end node for the link), the vehicle class and the SEK value. In order to have the tax in both directions of the link, the link must be added twice, one row for each direction (where the A and B nodes are exchanged in the second row)
4) Close the Toll bridges table by clicking the X icon in the top right corner and click “Yes” to the question:



5.3. Change the loading costs and times in terminals for different types of cargo

The costs and times for loading cargo inside the terminals are specified for different types of cargo – containers, general cargo non containers, dry bulk non containers and liquid bulk non containers.

1) Open the vehicle parameters table by clicking “Edit…” for the “General parameters of vehicle classes [Table]” catalog key in the *Edit the data* application, or open Scenario Inputs\Editable data\Vehicles Parameters from the Data section window for the specific scenario
2) For each vehicle class, edit the values for the attributes below by typing in the new value and the press Enter:
    - load time containers in hours/vehicle (not divided by type of commodity) – attribute CONT_LTI
    - load cost containers in SEK/tonne (not divided by type of commodity) – attribute CONT_LCO
    - load time general cargo non containers in hours/vehicle – attribute NC_LTI_GC
    - load time dry bulk non containers in hours/vehicle – attribute NC_LTI_DRY
    - load time liquid bulk non containers in hours/vehicle – attribute NC_LTI_LIQ

- load cost general cargo non containers in SEK/tonne – attribute NC_LCO_GC
- load cost dry bulk non containers in SEK/tonne – attribute NC_LCO_DRY
- load cost liquid bulk non containers in SEK/tonne – attribute NC_LCO_LIQ

3) Close the table by clicking the X icon in the top right corner
4) On request, click “Yes” to save the edits

5.4. Change vehicle data

Change vehicle parameters (e.g. cost per km and hour, capacity, etc,) in the Vehicles Parameters table the following way:

1) Open the Vehicles Parameters table by clicking the “Edit” button on the “General parameters of Vehicle classes [Table]” catalog key using the *Edit the data* application, or open Scenario Inputs\Editable data\Vehicles Parameters from the Data section window for the specific scenario (same table as in Section 5.3);
2) Edit the values for any attribute(s) by vehicle class;
3) Close the table by clicking the X icon in the top right corner;
4) On request, click “Yes” to save the edits.

In the vehicles Parameters table is also the parameter that governs whether the empty vehicle matrices will be produced or not. For each vehicle class it is possible to set the parameter “EMPTY_V” to 1 (i.e. produce empty vehicle matrices) or 0 (i.e. not produce empty vehicle matrices). If the user chooses not to produce the empty vehicle matrices, the matrices will instead be filled out with zeroes. For more information on the computation of empty vehicles, see appendix section.11.2.

5.5. Change parameters for specific commodities and vehicle types

In the following cases it is possible to define specific values for particular commodities or STAN group and vehicle type. The options available are:

- A CAPACITY value for commodity 15, denoted in the table as CAP_15;
- specific km costs and hour costs for commodity 17, denoted in the table as KMCOST_17 and HRCOST_17
- specific km costs for STAN groups 10 and 11 - attribute KMCOS10S11 (same parameter as KMCOST)
- load time containers in hours/vehicle (per STAN groups 10 and 11) – attribute COLTI10S11 (same parameter as CONT_LTI)
- load cost containers in SEK/tonne (per STAN groups 10 and 11) – attribute COLCO10S11 (same parameter as CONT_LCO)
- load time dry bulk non containers in hours/vehicle (per STAN groups 10 and 11) – NCLCD10S11 attribute (same parameter as NC_LTI_DRY)
    - load cost dry bulk non containers in SEK/tonne (per STAN groups 10 and 11) – attribute NCLTD10S11 (same parameter as NC_LCO_DRY)

OBJ	VEH_NR	DESCRIPTIO	LABEL	KMCOST_17	HRCOST_17	KMCOS10S1:	NCLCD10S11	NCLTD10S11	COLCO10S11	COLTI10S11	CAP
1	205	System train STAX 25	SYS25	104.09	3094	-1	-1	-1	-1	-1	
2	207	Wagon load train (short)	WG550	-1	-1	-1	18.125	21.75	61.625	21.75	
3	208	Wagon load train (medium)	WG750	-1	-1	-1	18.125	21.75	61.625	21.75	
4	209	Wagon load train (long)	WG950	-1	-1	-1	18.125	21.75	61.625	21.75	

Figure 47 Special settings for particular vehicle type.

For specific commodities and vehicle types (in the table 205, 207, 208, 209) the values applied will differ from those specified in the “General parameters of vehicle classes [Table]”. In principle this is implemented as an override function in which positive entries are used as revised values, and negative values indicate that the standard values should be used, Thus, in the table **only the revised values** that the user wants to apply should be entered. For the values that the use wants to maintain from the general table value **-1** must be coded..

1) Open the vehicle parameters table by clicking “Edit…” for the “Specific parameters of Vehicle Classes in some commodities [Table]” catalog key in the *Edit the data* application, or open Scenario Inputs\Editable data\Vehicle Parameters Exceptions from the Data section window for the specific scenario
2) For each vehicle class, edit the values for the attributes (KMCOST_17, HRCOST_17, KMCOS10S11, NCLCD10S11, NCLTD10S11, COLCO10S11, COLTI10S11, CAP_17)
3) Add a new vehicle class (from the existing vehicle classes in the general table) and edit the attributes
4) Close the table by clicking the X icon in the top right corner
5) On request, click “Yes” to save the edits

5.6. Change the average value (SEK) of the commodities

1) Open the commodity table by clicking on “Edit” on the “Commodity data [Table]” catalog key using the *Edit the data* application, or open Scenario Inputs\Editable data\Cargo Table from the Data section window, for the specific scenario
2) Edit the values by commodity class for: VALUE_SEKT (SEK/Tonne)
3) Close the table by clicking the X icon in the top right corner
4) On request, click “Yes” to save the edits.

5.7. Change capacity in ports

The user can change the values for the following port parameters:

- MaxDwtCont (maximum deadweight tonnage, container vessel)
- MaxDwtRoRo (maximum deadweight tonnage, ro/ro vessel)
- MaxDwtOthe (maximum deadweight tonnage, other vessels)

This is done in the following way:

1) Click “Edit” on the “ArcMap GIS Project File” catalog key using the *Edit the data* application, or open Scenario Inputs\Editable data\Input_Data.mxd from the Data section window for the specific scenario
2) Select the “Nodes” layer in the TOC window and tick the check box if it is not already ticked
3) Start an Edit session (select Editor -> Start Editing on the Editor toolbar)
4) Select the “Nodes” layer in the “Layers” scroll down menu on the Editor toolbar

5) Select the terminal(s) by using the Select Features tool, or by setting a selection condition (e.g., rail terminals: MODE_N=2 in Sweden). For instructions on how make a selection based on attributes, please refer to Section 0
6) Select Node -> Compute and type in the equations by right-clicking in the largest field (in the middle) and select “Insert” (e.g., MAXDWTRORO=100000, see Figure 48. To see the available parameters, right-click in the blank field in the Insert Equation window) and select which items the edits should apply to (all or selected). Click “Apply”. When finished, click “Close”

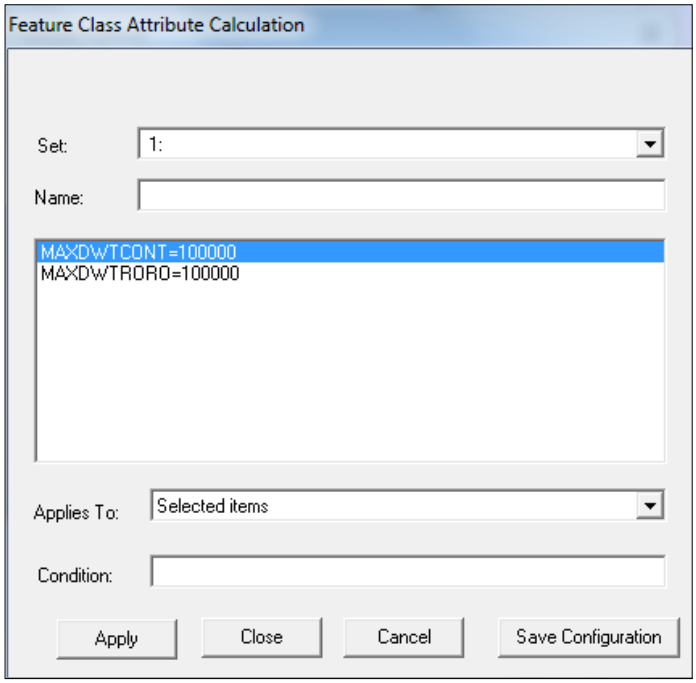


Figure 48 The Feature Class Attribute Calculation window.

7) On the Editor toolbar, select Editor -> Stop Editing
8) To the question “Do you want to save your edits?”, click “Yes”
9) Close the GIS window by clicking the X icon without saving the ArcGIS Map Document (*.mxd) (if any edits to the legends and/or the layout have been made, the map could be saved, otherwise this is not necessary).

5.8. Change capacity in Trollhätte canal (also denoted Vänern canal)

The user can change the values for the following port parameters specifically for Vänern canal:

- MaxDwtCont (maximum deadweight tonnage, container vessel);
- MaxDwtRoRo (maximum deadweight tonnage, ro/ro vessel);
- MaxDwtOthe (maximum deadweight tonnage, other vessels).

This is done in the following way:

1) Click “Edit” on the “ArcMap GIS Project File” catalog key using the *Edit the data* application, or open Scenario Inputs\Editable data\Input_Data.mxd from the Data section window for the specific scenario
2) Select the “Nodes” layer in the TOC window and tick the check box if it is not already ticked
3) Start an Edit session (select Editor -> Start Editing on the Editor toolbar)
4) Select the “Nodes” layer in the “Layers” scroll down menu on the Editor toolbar

5) Select the terminal(s) by using the Select Features tool, or by setting a selection condition (e.g., Varner ports: PORTAREANR=14). For instructions on how make a selection based on attributes, please refer to Section 4

6) Select Node -> Compute and type in the equations by right-clicking in the largest field (in the middle) and select “Insert” (e.g., VANERNCAN=4001, see Figure 48. To see the available parameters, right-click in the blank field in the Insert Equation window) and select which items the edits should apply to (selected). Click “Apply”. When finished, click “Close”

Figure 49 The Feature Class Attribute Calculation window.

7) On the Editor toolbar, select Editor -> Stop Editing

8) To the question “Do you want to save your edits?”, click “

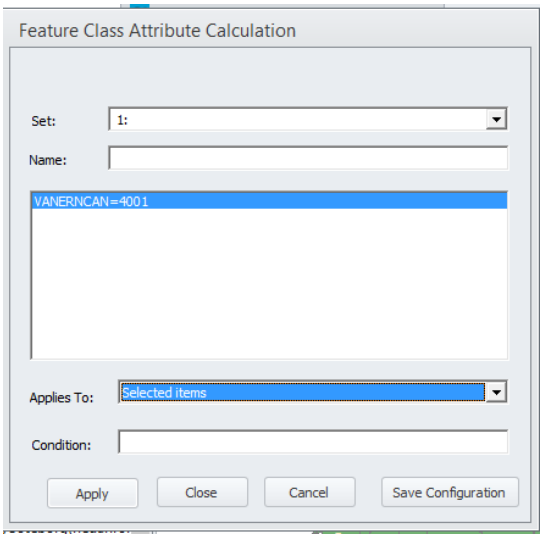


Figure 50 The Feature Class Attribute Calculation window.

9) Close the GIS window by clicking the X icon without saving the ArcGIS Map Document (*.mxd) (if any edits to the legends and/or the layout have been made, the map could be saved, otherwise this is not necessary).

5.9. Transoceanic impedances for small ports

The current model provides a tool to avoid transshipments between small domestic ports and international ports. The nodes table has a new attribute, called TRANOCEFAC, that has a value 10 for domestic ports that represent an impedance applied to the times in case a movement between the small port and a transoceanic port is selected. For details on the implementation refer to document listed in Section 10.7. To modify the set of ports or the default value (10) the following steps could be performed:

This is done in the following way:

1) Click “Edit” on the “ArcMap GIS Project File” catalog key using the *Edit the data* application, or open Scenario Inputs\Editable data\Input_Data.mxd from the Data section window for the specific scenario

2) Select the “Nodes” layer in the TOC window and tick the check box if it is not already ticked

3) Start an Edit session (select Editor -> Start Editing on the Editor toolbar)

4) Select the “Nodes” layer in the “Layers” scroll down menu on the Editor toolbar

5) Select the terminal(s) by using the Select Features tool, or by setting a selection condition (e.g. MODE_N=3&ID_COUNTRY=1 will select all the domestic ports). For instructions on how make a selection based on attributes, please refer to Section 4
6) Select Node -> Compute and type in the equations by right-clicking in the largest field (in the middle) and select “Insert” (e.g., TRANOCEFAC=10, see Figure 48. To see the available parameters, right-click in the blank field in the Insert Equation window) and select which items the edits should apply to (selected). Click “Apply”. When finished, click “Close”

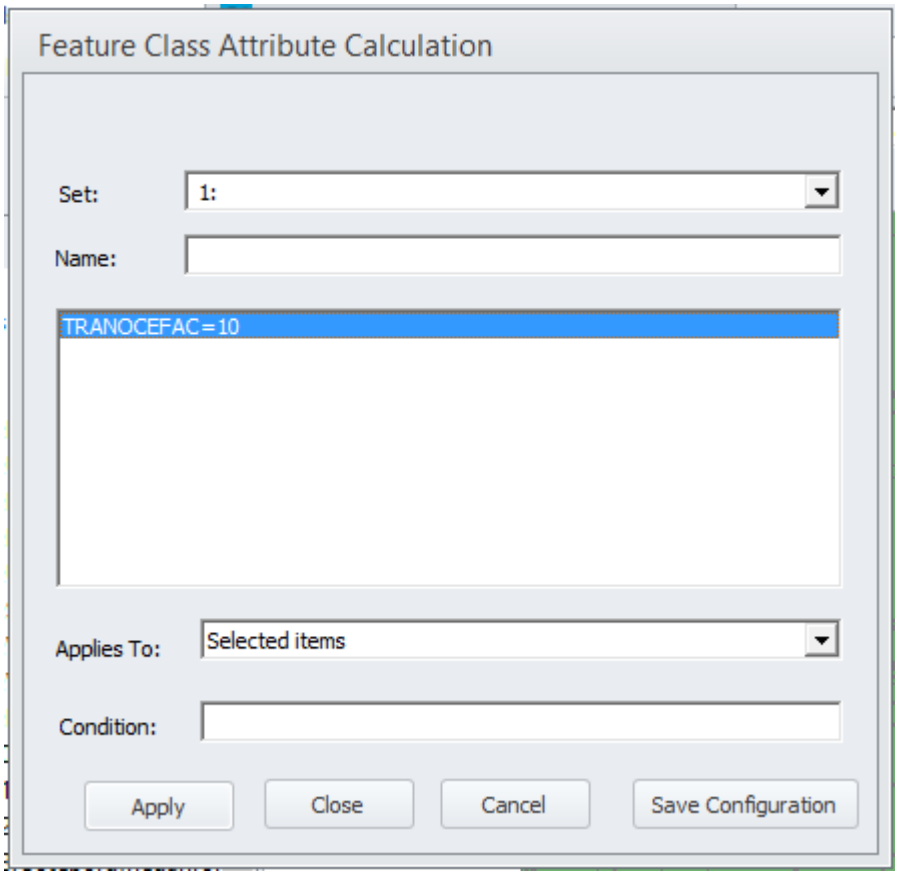


Figure 51 The Feature Class Attribute Calculation window.

7) On the Editor toolbar, select Editor -> Stop Editing
8) To the question “Do you want to save your edits?”, click “Yes”
9) Close the GIS window by clicking the X icon without saving the ArcGIS Map Document (*.mxd) (if any edits to the legends and/or the layout have been made, the map could be saved, otherwise this is not necessary)

5.10. Introduce new infrastructure

When adding new infrastructure it is recommended to use the filter function as described below. Then only links and nodes with specific modes and/or categories are shown in the GIS window. However, a new link has category = 0. When having created a new link, the attributes, including the link category, could be edited directly as described below. However, if the editing of the link is interrupted, e.g. by selecting another element or closing the Feature Explorer window before the edits are finished, the new link can become invisible in the map because of the filter. In order to be able to select it again and continue the edits, the filter must be disabled.

The edits made are not always visible at once in the Feature Explorer. In order to see exactly which edits that have been made for a selected link, close the Feature Explorer and open it again to refresh it.

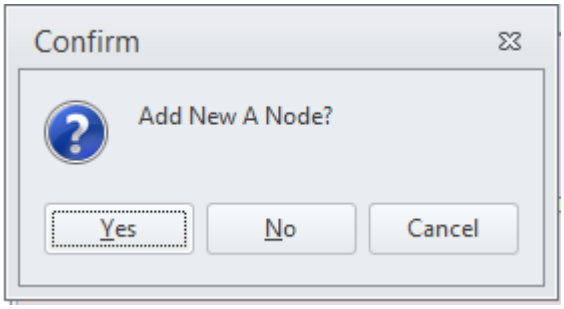
5.10.1. New roads

1) Click “Edit” on the “ArcMap GIS Project File” catalog key using the *Edit the data* application, or open Scenario Inputs\Editable data\Input_Data.mxd from the Data section window for the specific scenario
2) Activate the filter for the road mode both in the network node and the link layers by right-clicking on the respective layer in the TOC, selecting “Properties” and tick the “Active” check box for road mode
3) Select the Network_Link layer in the TOC
4) Select the node default legend “2:Node type – Road” in the menu accessed by clicking on the left downwards-pointing arrow: 

5) Start an edit session (click Editor -> Start editing)
6) Select the Network_Link layer in the “Layers” drop down menu

> **Tip:** Instead of specifying the new link from the beginning, as described in this paragraph, it is possible to select an existing nearby link, with attributes similar to the new link, and in the Feature Explorer window use the copy function. Click  , and then create the new link as described below and change only the attributes that differ from the other link. In this way it is easier to avoid making mistakes when specifying the attributes.

7) Select the pencil icon
8) Draw the new link. This is done by clicking where the new link should start and for each new click on the map, a new vertex is created. At the end of the link, double-click
9) The following window will appear if new a node is added (i.e. if the link does not start and end in existing nodes):



10) Click “Yes” and then select a node value greater than 2000 (values up to 1999 are only for terminals and zones), see Figure 52
11) Click “OK”

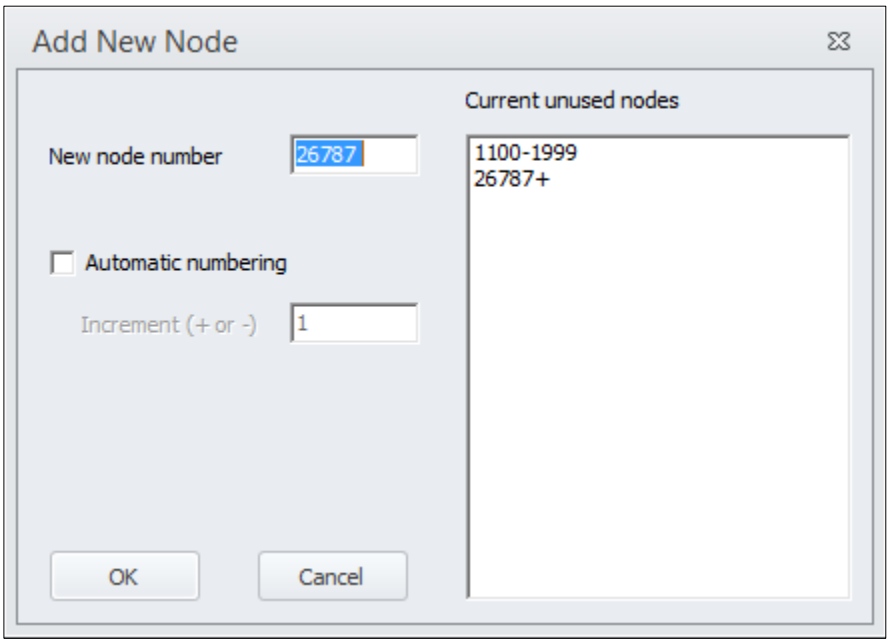
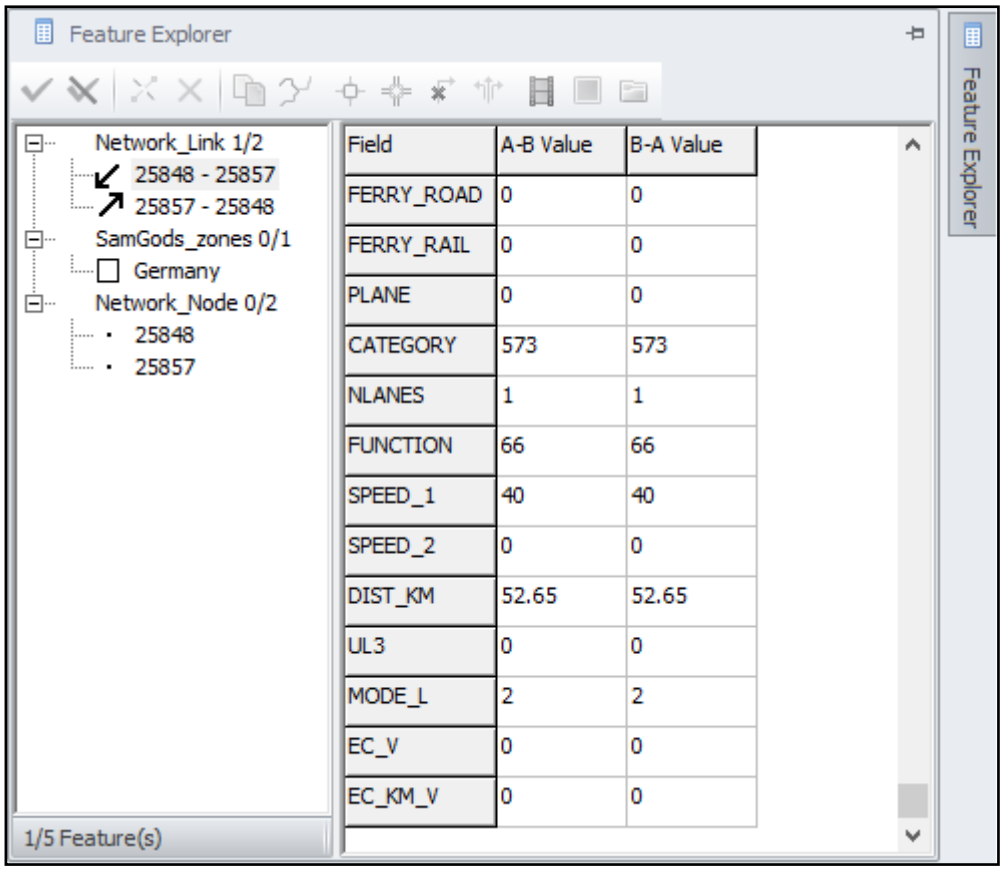
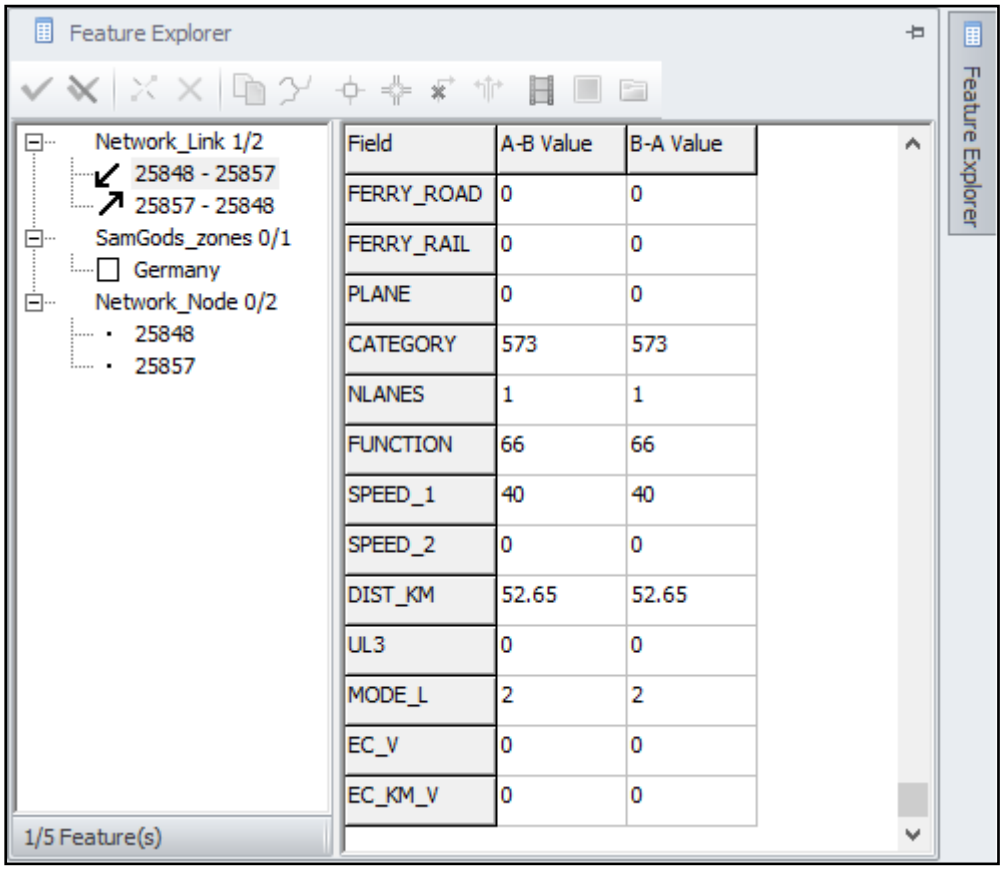


Figure 52 The Add New Node window.
In the Feature Explorer window (see



12) Figure 41), specify the following values. In order to assign the same values to both directions (A to B and B to A), make sure that both ways are selected in the Feature Explorer window.



Field	A-B Value	B-A Value
FERRY_ROAD	0	0
FERRY_RAIL	0	0
PLANE	0	0
CATEGORY	573	573
NLANES	1	1
FUNCTION	66	66
SPEED_1	40	40
SPEED_2	0	0
DIST_KM	52.65	52.65
UL3	0	0
MODE_L	2	2
EC_V	0	0
EC_KM_V	0	0

Figure 53 Feature explorer window.

a) ALL_M=1 (always equal to 1, which means that it is an open link)

b) LORRY_40T=1 (1 if open for vehicle types 102, 103 and 104, 0 otherwise)

c) LORRY_60T=1;(1 if open for vehicle type 105, 0 otherwise)

d) CAR=1 (1 if open for vehicle type 101, 0 otherwise)

e) Leave all the other modes as zero

f) CATEGORY: type the category number – see available numbers and descriptions in the Data Section window, under Scenario Inputs\General tables\Link Categories

g) NLANES: number of lanes in each direction

h) FUNCTION: speed flow curve – see V101/102 tables in the Data Section window under Scenario Input/General tables (values between 1 and 50, 61 only for connectors and other modes)

i) SPEED_1:speed in km per hour for vehicle class 101

j) SPEED_2: speed in km per hour for vehicle classes 102, 103, 104 and 105

k) DIST_KM: update using the SHAPE_LENGTH value using Link -> Compute tool as displayed in Figure 54 (note that “Selected items” must be selected in the “Applies To:” field)

l) MODE_L=1, because it is a road link

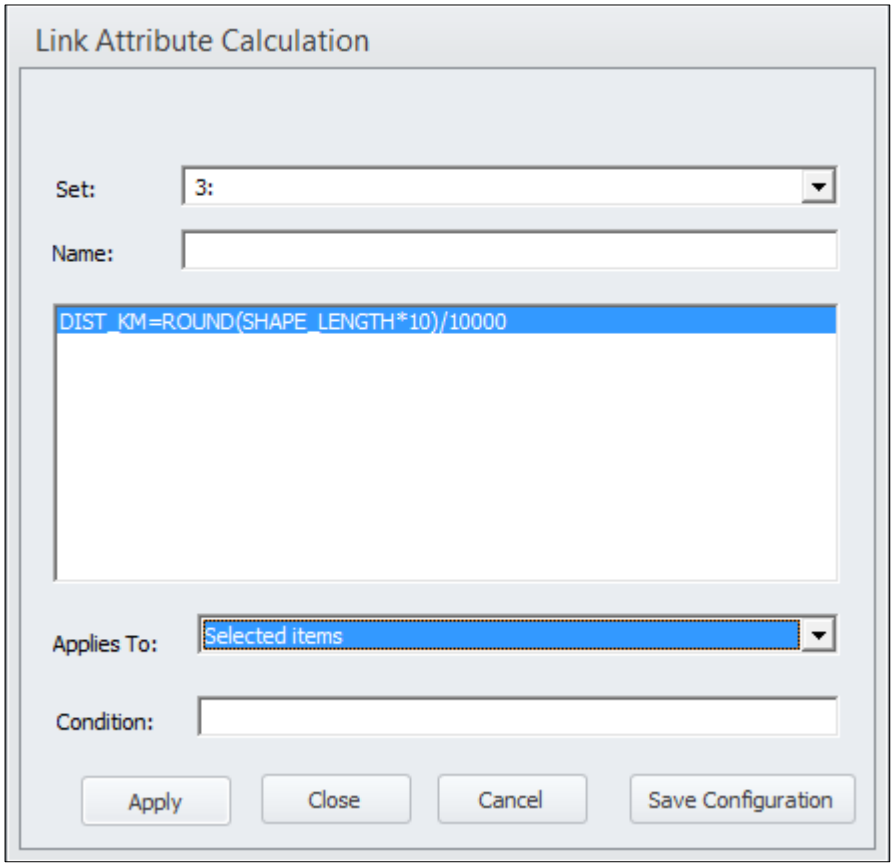


Figure 54 The Link Attribute Calculation window.

Please note: It is recommended to round the distance values to avoid excessive number of digits after the comma.

13) Select in the Feature Explorer window the node or nodes created (they can be found to the left of the table of attributes). Answer “Yes” to the question whether the edits should be saved. Edit the following attributes:
    a) ID_COUNTRY and ID_REGION: the values are easily identified using the zoning system feature class. Select the zone and it will be visualized in the Feature Explorer window with the attributes for the zone (this is preferably done before starting to edit the new link/node, since selecting the zone will un-select the new link and node). As an alternative, the table “Zoning System”, found in Scenario Inputs\General tables in the Data Section window, can be consulted
    b) MODE_N=1 because it is a road node
    c) All the other attributes will be filled in automatically by the model
14) On the Editor toolbar, select Editor -> Stop Editing
15) To the question “Do you want to save your edits?”, click “Yes”
16) Close the GIS window by clicking the X icon without saving the ArcGIS Map Document (*.mxd) (if any edits to the legends and/or the layout have been made, the map could be saved, otherwise this is not necessary).

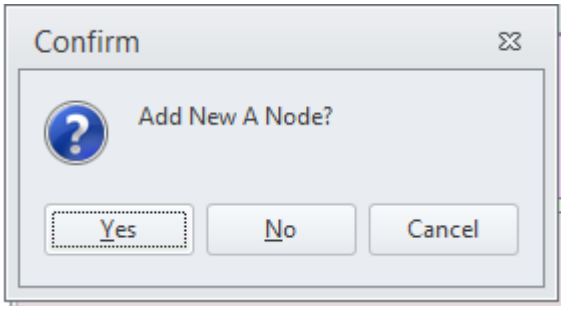
5.10.2. New railroad

1) Click “Edit” on the “ArcMap GIS Project File” catalog key using the *Edit the data* application, or open Scenario Inputs\Editable data\Input_Data.mxd from the Data section window for the specific scenario
2) Activate the filter for the rail mode, both in the network node and the link layer by right-clicking on the respective layer in the TOC, selecting “Properties” and tick the “Active” check box for rail mode
3) Select the Network_Link layer in the TOC
4) Select the node default legend “3:Node type-Rail”, in the menu accessed by clicking the left downwards pointing arrow: 

5) Start an edit session (select Editor -> Start Editing)
6) In the “Layers” drop down menu, select the Network_Link layer

Tip: Instead of specifying the new link from the beginning, as described in this paragraph, it is possible to select an existing nearby link, with attributes similar to the new link, and in the Feature Explorer window use the copy function. Click  , and then create the new link as described below and change only the attributes that differ from the other link. In this way it is easier to avoid making mistakes when specifying the attributes.

7) Select the pencil icon
8) Draw the new link. This is done by clicking where the new link should start and for each new click on the map, a new vertex is created. At the end of the link, double-click
9) The following window will appear if a new node is added (i.e. if the link does not start and end in existing nodes):



10) Click on “Yes” and then select a node value greater than 2000 (values between 1120 and 1999 are only for terminals and zones), see Figure 55

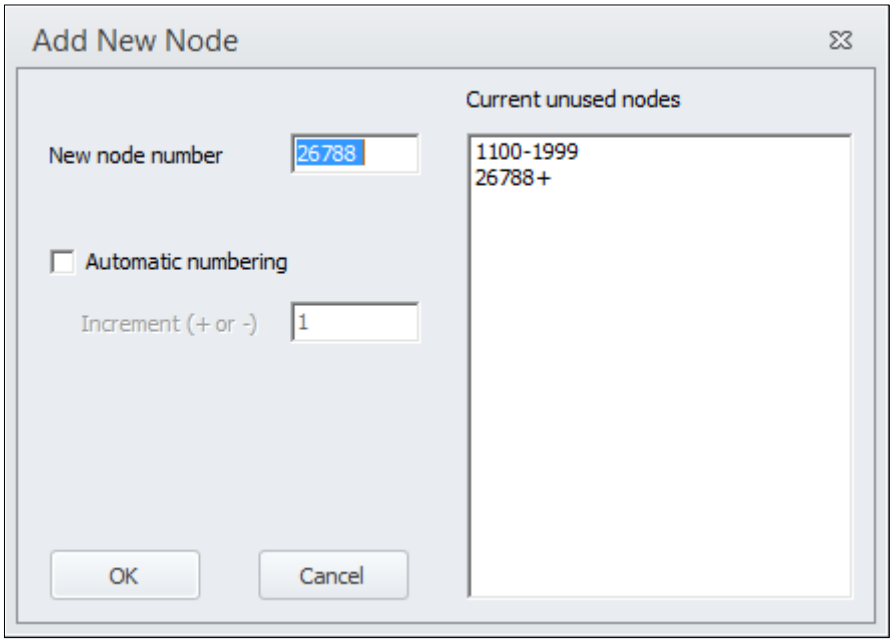


Figure 55 The Add New Node window.

11) Click “OK”
12) In the Feature Explorer window, specify the following values. In order to assign the same values to both directions (A to B and B to A), make sure that both ways are selected in the Feature Explorer window.
    a) ALL_M=1 (always equal to 1, which means that it is an open link)
    b) COMBI=1 (1 if open for vehicle type 201, 0 otherwise)
    c) FEEDER1=1 & FEEDER2=1 (1 if open for vehicle type 202, 0 otherwise)
    d) STAX225=1 (1 if open for vehicle type 204, 0 otherwise)
    e) STAX25=1 (1 if open for vehicle type 205, 0 otherwise)
    f) STAX30=1 (1 if open for vehicle type 206 , 0 otherwise)
    g) WAGONLOAD=1 (1 if open for vehicle type 207,208,209, 0 otherwise)
    h) CATEGORY: type the category number – see available numbers and descriptions in the Data Section window, under Scenario Inputs\General tables\Link Categories
    i) NLANES: number of lanes in each direction
    j) FUNCTION=61 (always this value except for road mode)
    k) SPEED1: Speed in km/h
    l) SPEED2=0
    m) DIST_KM: update using the SHAPE_LENGTH value using Link -> Compute tool as displayed in Figure 56 (note that “Selected items” must be selected in the “Applies To:” field)
    n) MODE_L=2, because it is a rail link

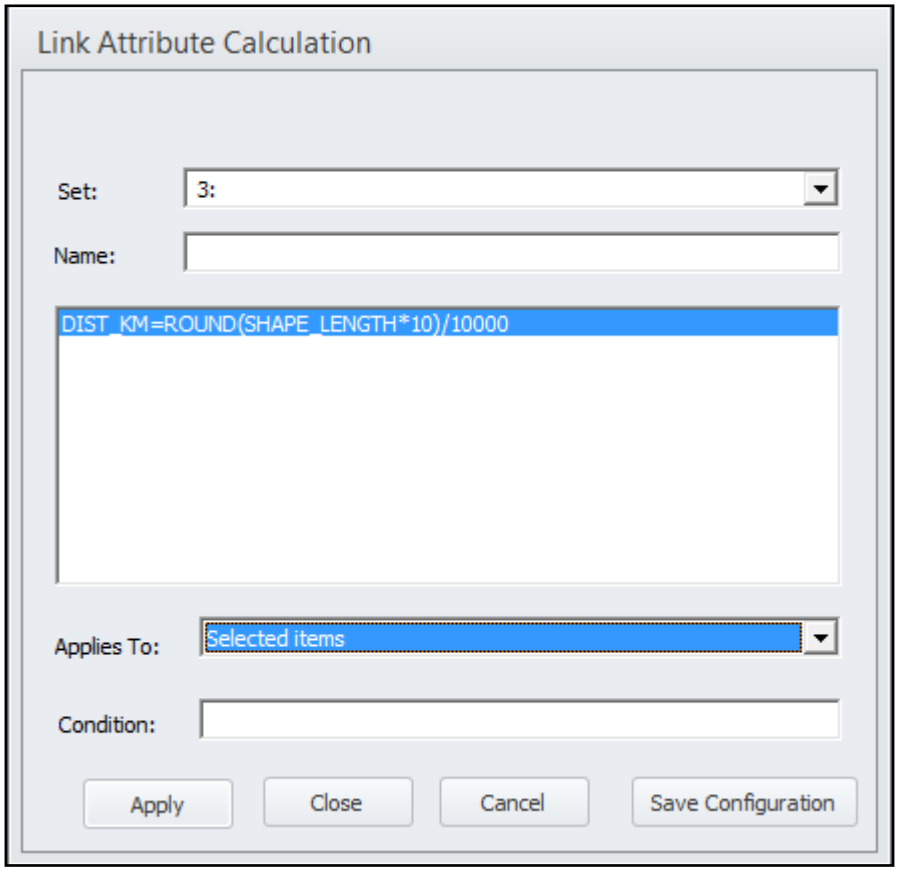


Figure 56 The Link Attribute Calculation window.

Please note: it is recommended to round the distance values to avoid excessive number of digits after the comma.

13) Select in the Feature Explorer window the created node or nodes (they can be found to the left of the table of attributes). Answer "Yes" to the question whether the edits should be saved. Edit the following attributes:
    a) ID_COUNTRY and ID_REGION: the values are easily identified using the zoning system feature class. Select the zone and it will be visualized in the Feature Explorer window with the attributes for the zone (this is preferably done before starting to edit the new link/node, since selecting the zone will un-select the new link and node). As an alternative, the table "Zoning System", found in Scenario Inputs\General tables in the Data Section window, can be consulted
    b) MODE_N=2 because it is a rail node
    c) All the other attributes will be automatically filled by the model
14) On the Editor toolbar, select Editor -> Stop Editing
15) To the question "Do you want to save your edits?", click "Yes"
16) Close the GIS window by clicking the X icon without saving the ArcGIS Map Document (*.mxd) (if any edits to the legends and/or the layout have been made, the map could be saved, otherwise this is not necessary).

5.10.3. New sea, ferry and air links

New links for these modes could also be added, in a similar manner as for the road and rail links.

An important exception is about the UL3 link attribute for sea and ferry links.

UL3 represents the maximum vessel capacity allowed on a sea or ferry link. The value coded in this attribute will ban vessel types where the capacity of the vessel exceeds the value UL3.

The vessel capacity is recorded in the general parameters for vehicles (attribute CAPACITY) and it will compare with UL3 prior the LOS calculation. Two cases are possible:

- If UL3 $\geq$ CAPACITY: the specific vessel type will be able to use the link;
- if UL3 < CAPACITY the specific vessel type will not use the particular link.

5.10.4. New terminals

The terminals are represented inside the network as zones[3]. They could be distinguished from the actual zones by their node number, which does *not* end with 00 ("actual" zones here means starting and ending points for trips, whereas terminals are intermediate steps. Actual zones could also be terminals, in the case of Direct Access. The actual zones have NORIG numbers that end with 00).

To add a new terminal, different actions are required depending on the mode of the terminal. The new terminal needs to be added in three layers: the Network layer, the Nodes_commodities layer, and the Nodes layer.

Road terminal

Network layer:

1) Click "Edit" on the "ArcMap GIS Project File" catalog key using the *Edit the data* application, or open Scenario Inputs\Editable data\Input_Data.mxd from the Data section window for the specific scenario
2) Activate the filter for road mode both in the network node and link layer (please refer to Section 04.15 for instruction on how to do this)
3) Select the node default legend "2:Node type – road" (see Section 4.15)
4) Select the Network_Node layer in the TOC
5) Start an edit session (on the Editor toolbar, select Editor -> Start Editing)
6) In the "Layers" drop down menu, select the Network_Node layer
7) Select the pencil icon
8) Add the new node by clicking on the location and selecting a node number between the highest zone number and 2000 (select a number less than 2000 in the range specified in the window "Current Unused Numbers")
9) Click "OK"
10) In the node table in the Feature Explorer window, type in the following information:
    a) ID_COUNTRY and ID_REGION: the values are easily identified using the zoning system feature class. Select the zone and it will be visualized in the Feature Explorer window with the attributes for the zone (this is preferably done before starting to edit the new node, since selecting the zone will un-select the new

[3] The zone numbering referred to are Swedish zone number system used in emme networks and in the logistics model. For a conversion to Cube/Voyager node number a node-to-node map is required. All zone numbers in emme format starts with node numbers above 700000, whereas all corresponding node numbers in Cube/Voyager are less than 2000.

node). As an alternative, the table “Zoning System”, found in Scenario Inputs\General tables in the Data Section window, can be consulted

b) MODE_N=1, because it is a road terminal

11) In order to change the number of zones for the entire network, right-click on the Network layer in the TOC and select “Properties”. Change the Highest Zone No. to the number of the just added terminal and click “OK”, see Figure 57

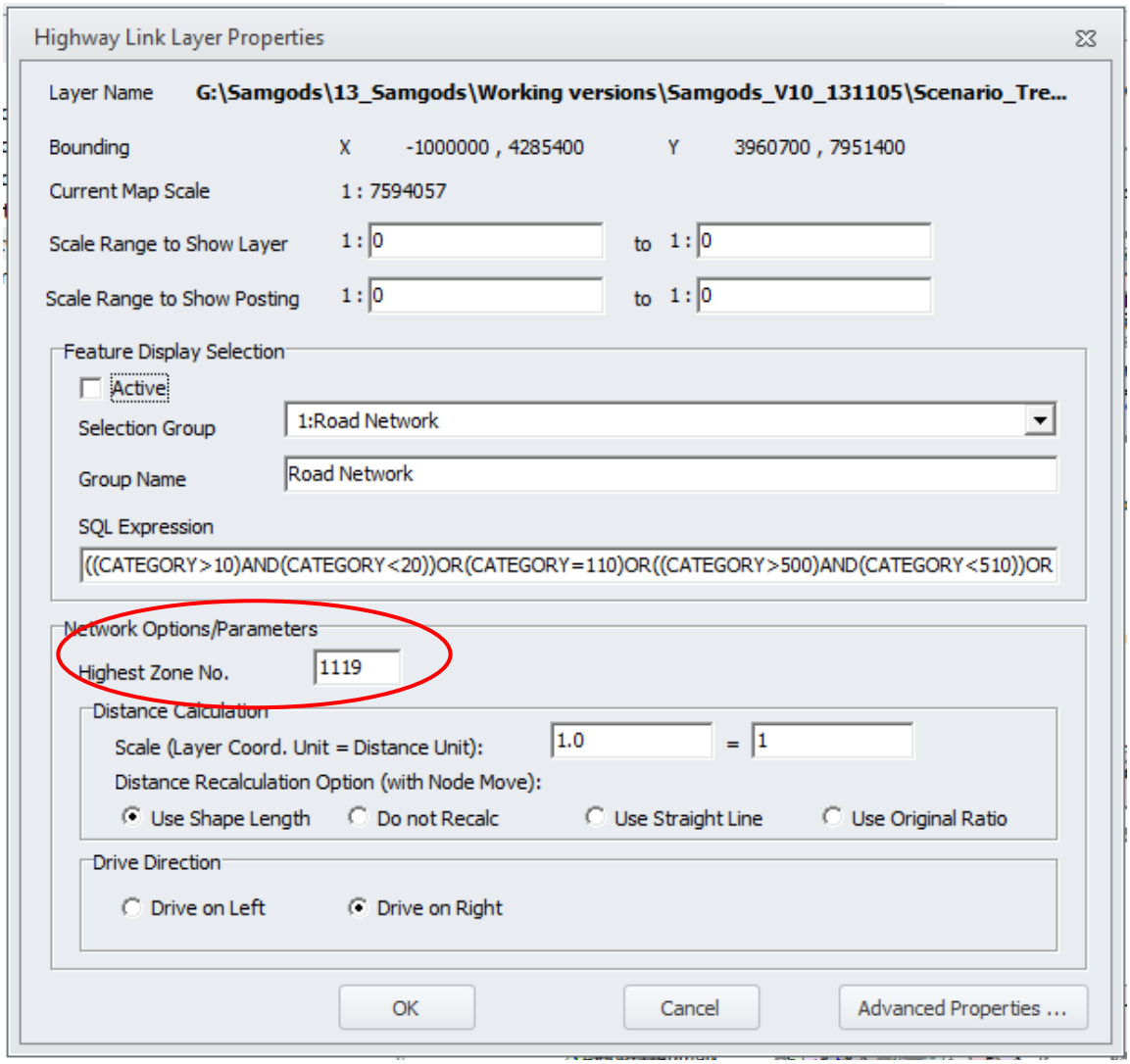


Figure 57 How to change the number of zones for the entire network.

12) Select the Network_Link Layer in the “Layers” drop down menu. To the question whether the changes should be saved, answer “Yes”. Using the new node as a starting node, draw a link connector from the node to the road network, as described in the New roads section above. Then type in the following information in the Feature Explorer window. In order to assign the same values to both directions (A to B and B to A), make sure that both ways are selected in the Feature Explorer window:

a) ALL_M=1 (always equal to 1, which means that it is an open link)

b) LORRY_40T=1 (1 if open for vehicle types 102, 103 and 104, 0 otherwise)

c) LORRY_60T=1 (1 if open for vehicle type 105, 0 otherwise)

d) CAR=1 (1 if open for vehicle type 101, 0 otherwise)

e) Leave all the other modes as zero

f) CATEGORY=110 or 201 (see available numbers and descriptions in the Data Section window, under Scenario Inputs\General tables\Link Categories);

g) NLANES=1

h) FUNCTION=61

i) SPEED_1=50

j) SPEED_2=0

k) DIST_KM: update using the SHAPE_LENGTH value using Link -> Compute tool as displayed in Figure 58

l) MODE_L=1 because it is a road link

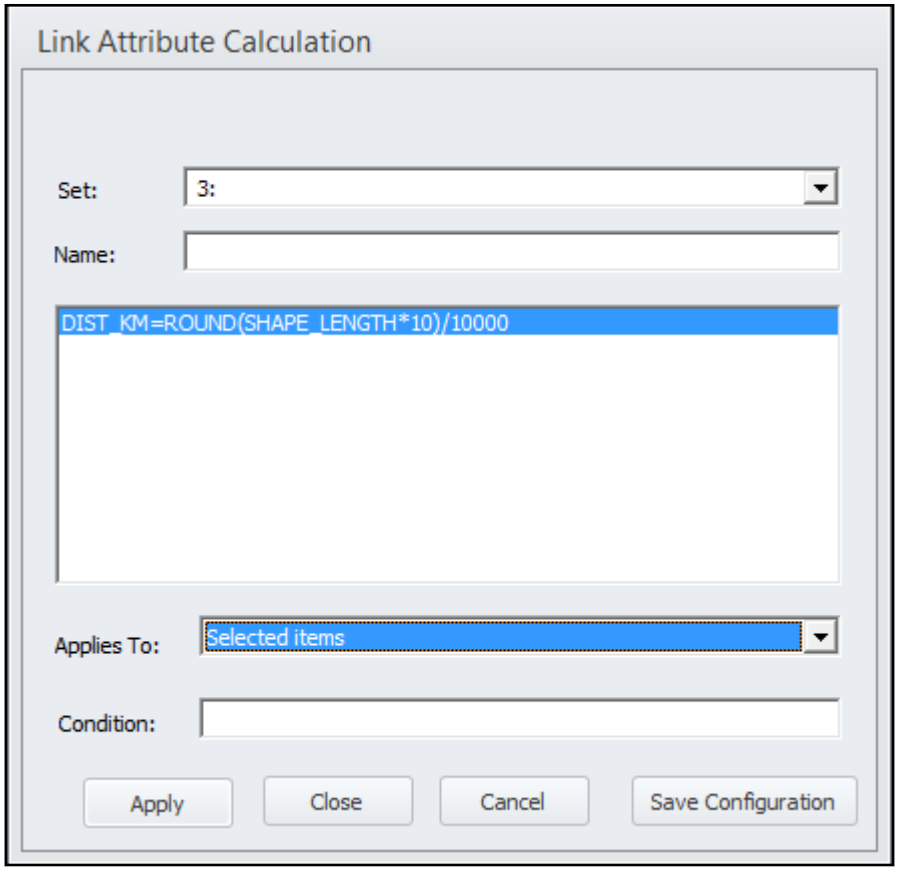


Figure 58 The Link Attribute Calculation window.

Please note: it is recommended to round the distance values to avoid excessive number of digits after the comma

Nodes_commodities layer:

1) In the “Layers” drop down menu, select the Nodes_commodities layer. Answer “Yes” to the question whether to save the changes to the selected feature
2) Tick and select the Nodes_commodities layer in the TOC
3) Add a new node by clicking in the map and give it exactly the same node number as the terminal (it doesn’t matter if it is located in another position; it is only the node number that is important). The node number is specified by assigning it to the attribute “N”

4) Type in the TRANSF_TYPE value – for a terminal with transfer road to road, TRANSF_TYPE=1 (a list of the transfer types is located in the Data section window in Scenario Input\General tables\Transfer type of terminal)
5) For each commodity, disable (0) or enable (1) transfer at the terminal
6) If there is another transfer type (e.g., transfer road-train – for road mode, possible values for transfer type is 1 to 6) to edit, add the same node again in the same way as for the previous transfer type, by setting the same node number and change all the other values for the specific case

Nodes layer:

1) In the “Layers” drop down menu, select the Nodes layer. On request, answer “Yes” to save the changes made
2) Tick and select the Nodes layer in the TOC
3) Add a new node with exactly the same node number as the terminal, in the same manner as in the Nodes_commodities layer
4) Define the following attributes:
   - If a zone has direct access to the terminal, ZONET=the number of zone. If no zone has direct access, define ZONET=0
   - DOMESTIC=1 if the terminal is Swedish, 0 otherwise;
   - C_TECH_FAC and T_TECH_FAC=1
5) On the Editor toolbar, select Editor -> Stop Editing. Answer “Yes” to the question(s) whether to save the changes made

All the three node layers will now have the new terminal. Figure 59 below shows the Feature Explorer window for the three layers, displaying some of the attributes of the terminal.

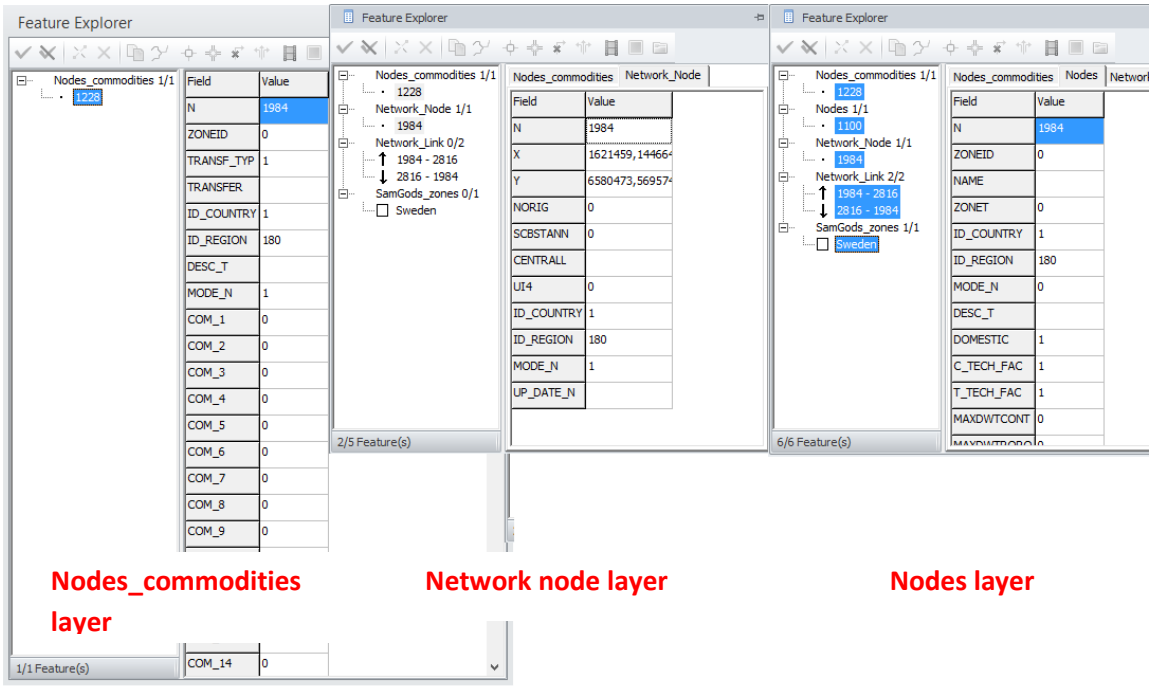


Figure 59 Feature Explorer windows for the Nodes_commodities layer, the Network_Node layer and the Nodes layer, all displaying the attributes of the new terminal.

Rail terminal

The required actions for adding a rail terminal are similar to the ones for a road terminal. Of course the attributes specific to the mode should be set for rail and railway vehicles instead of for road. The attributes that differ from the case with the road terminal are:

- MODE_N = 2
- Possible values for TRANSF_TYPE (please refer to the table Scenario Inputs\General tables\Transfer Type at terminals in the Data Section window)
- CATEGORY=211 for the rail link connection

The terminal must have a rail link to connect it to the rail network and a road link to connect it to the road network, see Figure 55 (if there is direct access from a zone to the terminal, the road connector is not mandatory). Please refer to the instructions for a new road terminal and for how to add a new railroad.

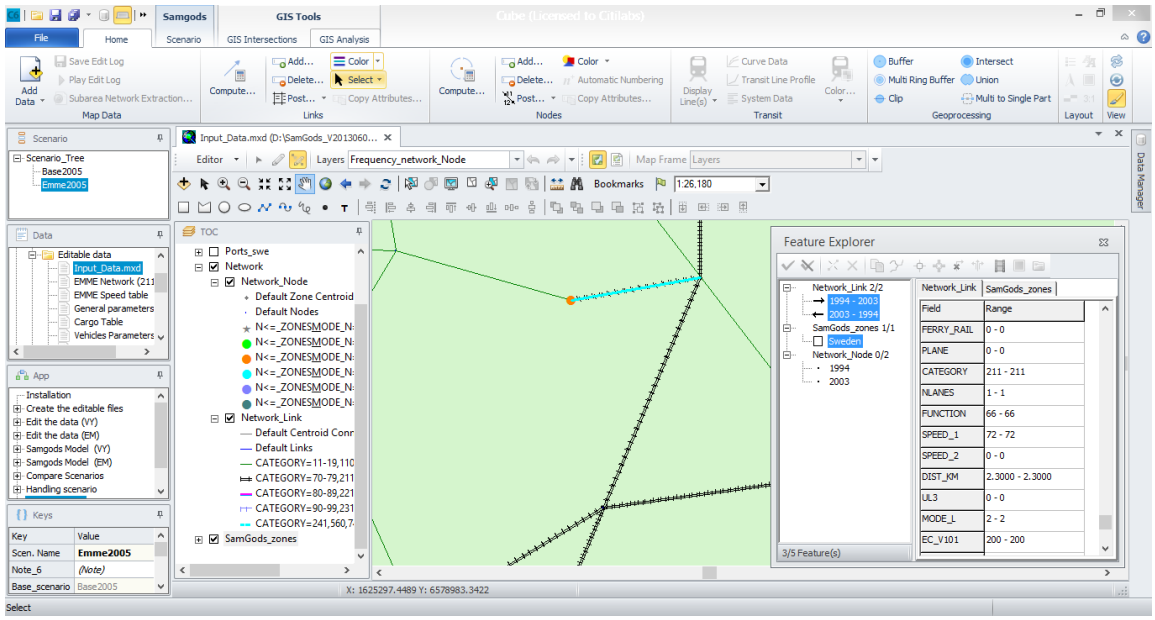


Figure 60 Nodes layer illustration for rail terminal, connected to the rail network by a rail link and to the road network by a road link.

Sea terminal

A new sea terminal is added in the same way as a rail terminal (except for the mode specific attributes), except that the Ports_swe layer also must be edited, by adding the new terminal to it in a similar way as in the Nodes_commodities layer. The attributes necessary to edit in the Ports_swe layer are

- N = the same number as in the other three layers
- MODE_N = 3
- The pilot fees for each one of the vehicle types

Ferry terminal

A new ferry terminal is added in the same way as a rail terminal (except for the mode specific attributes).

Air terminal

A new air terminal is added in the same way as a rail terminal (except for the mode specific attributes).

5.11. Change speed on different links

1) Click “Edit” on the “ArcMap GIS Project File” catalog key using the *Edit the data* application, or open Scenario Inputs\Editable data\Input_Data.mxd from the Data section window for the specific scenario
2) Select the Network Link Layer in the TOC
3) Start an edit session (Editor -> Start editing)
4) Select the Network Link layer in the “Layers” drop down menu on the Editor toolbar
5) Make a selection (one or several links) and change the speed values in the Feature Explorer window based on the selection made. For each mode, the speed is managed in a different way, see below

5.11.1. Road Mode

1) Activate the filter for Road Mode (please refer to Section 4.15 for instructions)
2) If SPEED_1 and SPEED_2 for a link/links inside Sweden are equal to 0, the default values in the general tables will be applied. The default values for the base speed are in the delay tables in the Data Section window, Scenario Inputs\General tables\V101/V102 speed flow curves (V101 – applied to class 101, V102 – applied to classes 102-105)
3) The SPEED_1 field is defined as km per hour for vehicle class 101
4) SPEED_2 defines the speed for all other road vehicle classes (102-105)
5) Select a single link using the Select Features tool or select a group of links using Datasets -> Select by attributes… or Select by location… (see Section 4.15 0 for instructions). Edit the values directly in the Feature Explorer window or using Link -> Compute
6) When all edits have been made, , select Editor -> Stop Editing on the Editor toolbar
7) On the request “Do you want to save your edits?”, click “Yes”
8) Close the GIS window by clicking on the X icon at the top right corner, without saving the ArcGIS Map Document (*.mxd) (if any edits to the legends and/or the layout have been made, the map could be saved, otherwise this is not necessary)

5.11.2. Rail Mode

1) Activate the filter for Rail Mode (please refer to Section 0 for instructions);
2) Select a single link using the Select Features tool or select a group of links using Datasets -> Select by attributes… or Select by location… (see Section 0 for instructions). Edit the speed value in the SPEED_1 attribute (in km/h) directly in the Feature Explorer window or using Link -> Compute (the SPEED_2 attribute is only used for road mode and should be set to 0 for all other modes)
3) On the Editor toolbar, select Editor -> Stop Editing
4) On the request “Do you want to save your edits?”, click “Yes”
5) Close the GIS window by clicking on the X icon at the top right corner without saving the ArcGIS Map Document (*.mxd) (if any edits to the legends and/or the layout have been made, the map could be saved, otherwise this is not necessary).

5.11.3. Sea Mode – enclosed waterways (CATEGORY=80 in Sweden and 540 outside Sweden)

1) Activate the filter for Sea Mode (please refer to Section 4.15 for instructions)
2) Select a link or set of links with CATEGORY=80 or 540, using the Select Features tool or Datasets -> Select by attributes… or Select by location… (see Section 4.150 for instructions). Edit the speed value in the SPEED_1 attribute (in km/h) directly in the Feature Explorer window or using Link -> Compute (the SPEED_2 attribute is only used for road mode and should be set to 0 for all other modes)
3) For the other sea categories, the default values in the Vehicles Parameters table are applied (see the next section)
4) On the Editor toolbar, select Editor -> Stop Editing
5) On the request “Do you want to save your edits?”, click “Yes”
6) Close the GIS window by clicking on the X icon at the top right corner without saving the ArcGIS Map Document (*.mxd) (if any edits to the legends and/or the layout have been made, the map could be saved, otherwise this is not necessary)

5.11.4. Sea Mode – All the other categories

1) Open the Vehicles Parameters table by clicking “Edit…” for the “General parameters of Vehicle Classes [Table]” catalog key using the *Edit the data* application or open Scenario Inputs\Editable data\Vehicles Parameters from the Data Section window for the specific scenario
2) Edit the speed values in the SPEED attribute for the vehicle types 301-317
3) Close the table by clicking on the X icon at the top right corner
4) On request, click “Yes” to save the edits

5.11.5. Ferry Mode

1) Activate the filter for Ferry Mode (please refer to Section 4.15 for instructions)
2) Select a single link using the Select Features tool or select a group of links using Datasets -> Select by attributes… or Select by location… (see Section 0 for instructions). Edit the speed value in the SPEED_1 attribute (in km/h) directly in the Feature Explorer window or using Link -> Compute (the SPEED_2 attribute is only used for road mode and should be set to 0 for all other modes)
3) On the Editor toolbar, select Editor -> Stop Editing
4) On the request “Do you want to save your edits?”, click “Yes”
5) Close the GIS window by clicking on the X icon at the top right corner without saving the ArcGIS Map Document (*.mxd) (if any edits to the legends and/or the layout have been made, the map could be saved, otherwise this is not necessary)

5.11.6. Air Mode

1) Activate the filter for Air Mode (please refer to Section 4.15 for instructions)
2) Select a single link using the Select Features tool or select a group of links using Datasets -> Select by attributes… or Select by location… (see Section 4.15 for instructions). Edit the speed value in the SPEED_1 attribute (in km/h) directly in the Feature Explorer window or using Link -> Compute (the SPEED_2 attribute is only used for road mode and should be set to 0 for all other modes)

3) On the Editor toolbar, select Editor -> Stop Editing
4) On the request “Do you want to save your edits?”, click “Yes”
5) Close the GIS window by clicking on the X icon without saving the ArcGIS Map Document (*.mxd) (if any edits to the legends and/or the layout have been made, the map could be saved, otherwise this is not necessary)

5.12. Edit the capacities for rail links

The Rail Capacity Management process requires input in terms of the number of trains per day allowed on each domestic link (a link flow capacity). This information is provided via the capacity link table. In this section are described the steps to update this table:

1) Click “Edit” on the “Table with rail capacity [Table]” catalog key using the *Edit the data* application, or open Scenario Inputs\Editable data\RailCapacity table from the Data section window for the specific scenario
2) Sort the table on the attribute ID_LINK clicking on the attribute name
3) Browse to the end of the table
4) Add a new empty record clicking on the button 
5) Edit the A and B numbers for the new link in Voyager format
6) Edit the ID_LINK value as the first available from the list (e.g. if the last record has 388, use 389);
7) Edit the ORIGCAP as number of trains per day bidirectional (e.g. total number of trains in both the direction)
8) Add another new empty record clicking on the button 
9) Edit the A and B numbers where A is the B value introduced in the previous record and B is the A value introduced in the previous record (basically each time two records must be introduced, one with A->B and one with B->A)
10) Edit the ID_LINK using the same value as previous record (e.g. 389)
11) Edit the ORIGCAP value using the same value as previous record
12) Close the table by clicking the X icon in the top right corner;
13) On request, click “Yes” to save the edits.

Important note!

The links present in capacity table MUST be consistent with the links present in the network. This consistency is related to:

- a rail link in the capacity table must be present in the network
- a domestic rail link in the network must have a capacity value in the rail capacity table
- the links must be always bidirectional, therefore two records must always be present
- the ID_LINK must be sequential and no gaps are allowed
- two links with same node numbers (A to B and B to A) must have the same ID_LINK

The user has all these checks already available in the "Edit the data" application. During the run report #8 will be produced under Report_ED_{Scenario_shortname}.txt. It is strongly recommended to check this file prior to running the Samgods model.

6. Advanced user options

The advanced user rights have been specified for users having a good familiarity with the model and that require a more complex set up in terms of functionalities. In this chapter each functionality is described.

6.1. Consolidation factors

The consolidation factors in can be specified using two different levels:

- First level: using the catalog keys catalog keys 21st and 22nd in Table 7:
- Lower bound for consolidation factor (new) (applied to all commodities)
- Upper bound for consolidation factor (new) (applied to all commodities)
- Second level: CONSOL<Mode> table under Input_data.mdb and contains the lower and upper bound for consolidation factor by sub-mode and per specific STAN groups, using catalog key 7th in Table 17

The value provided at the first level will be overridden by the values present at the second level.

In the current model some extra consolidation factor are provided for STAN groups 2, 8 and 9.

The table has the following values:

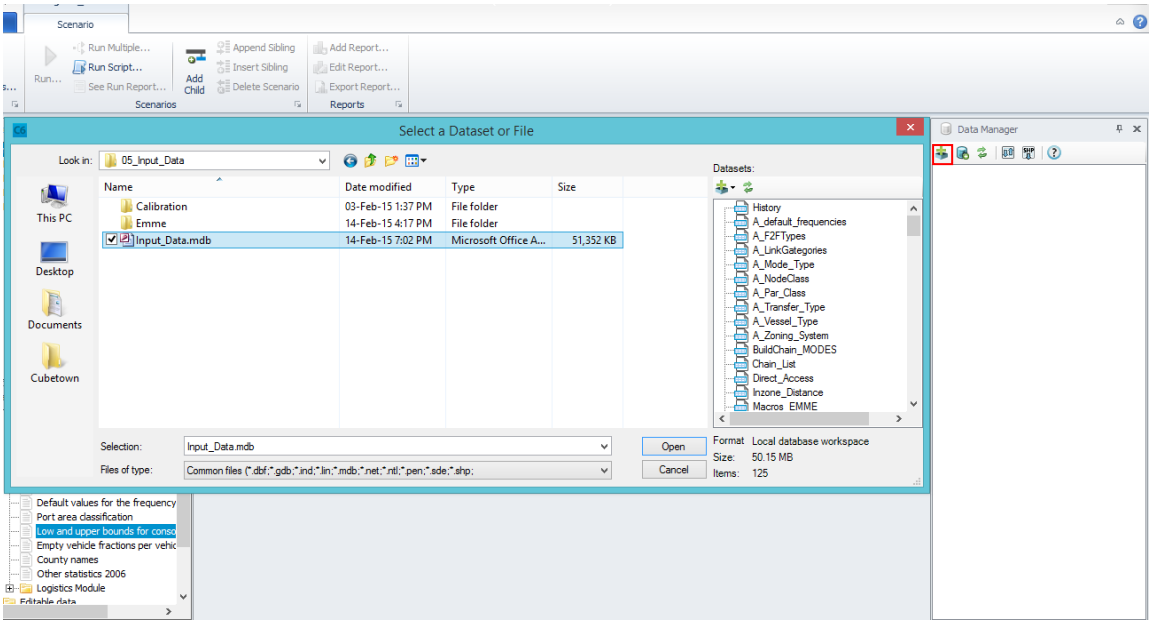
ID	MODE_C	CONSOL_L	CONSOL_U	Mode	CONSOL_L2	CONSOL_U2	CONSOL_L8	CONSOL_U8	CONSOL_L9	CONSOL_U9
1	A	0.03	0.24	Road	0.03	0.24	0.03	0.24	0.03	0.24
2	B	0.02	0.3	Road	0.02	0.3	0.02	0.3	0.02	0.3
3	C	0.05	0.3	Road	0.05	0.3	0.05	0.3	0.05	0.3
4	D	0.56	0.88	Rail	0.61	0.98	0.61	0.98	0.61	0.98
5	E	0.56	0.88	Rail	0.61	0.98	0.61	0.98	0.61	0.98
6	F	0.56	0.88	Rail	0.61	0.98	0.61	0.98	0.61	0.98
7	G	0.56	0.88	Rail	0.61	0.98	0.61	0.98	0.61	0.98
8	H	0.56	0.88	Rail	0.61	0.98	0.61	0.98	0.61	0.98
9	I	0.66	0.98	Rail	0.71	0.98	0.71	0.98	0.71	0.98
10	T	0.66	1	Rail	0.71	1	0.71	1	0.71	1
11	U	0.66	0.98	Rail	0.71	0.98	0.71	0.98	0.71	0.98
12	J	0.01	0.25	Sea	0.01	0.25	0.01	0.25	0.01	0.25
13	K	0.01	0.25	Sea	0.01	0.25	0.01	0.25	0.01	0.25
14	L	0.01	0.25	Sea	0.01	0.25	0.01	0.25	0.01	0.25
15	M	0.01	0.25	Sea	0.01	0.25	0.01	0.25	0.01	0.25
16	N	0.01	0.25	Sea	0.01	0.25	0.01	0.25	0.01	0.25
17	O	0.01	0.25	Sea	0.01	0.25	0.01	0.25	0.01	0.25
18	P	0.15	0.9	Sea	0.15	0.9	0.15	0.9	0.15	0.9
19	Q	0.15	0.9	Sea	0.15	0.9	0.15	0.9	0.15	0.9
20	R	0.15	0.8	Air	0.15	0.8	0.15	0.8	0.15	0.8
21	S	0.1	0.35	Road	0.1	0.35	0.1	0.35	0.1	0.35

Figure 61 Default CONSOL<Mode> values and per STAN 2, 8 and 9.

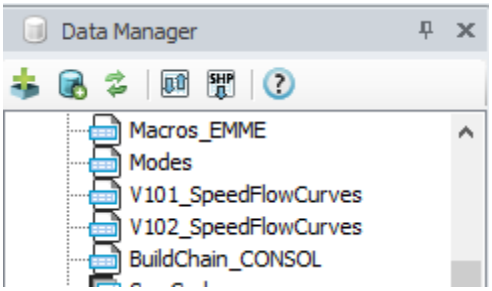
The steps to perform if the Advanced user wishes to modify these values using a different set are:

1) Open Data Manager from Cube Interface 

clicking on the icon in the red rectangle;
2) Open Input_data.mdb in data manager:



3) Select BuildChain_CONSOL in data manager window



4) Right click and select "Copy"
5) Select Input_Data,mdb in Data Manager window, right click and select "Paste"
6) Refresh Data Manager window clicking on 
7) Browse to BuildChain_CONSOL_1 (this is the copied table from BuildChain_CONSOL) and double click on it. Made desired changes and close the window clicking on X
8) Select Samgods application and scenario under scenario window
9) Double click on scenario name to open the scenario window
10) Click next until reach the catalog key Consolidation factors table
11) Click on "Browse" , select in the left window Input_Data.mdb and in the right window BuildChain_CONSOL_1
12) Click on OK
13) Click "Save"

With the above changes the Samgods application is ready for the run.

For an exhaustive description on how those parameters work in the logistic module see document listed in Section 10.3 pg. 32.

6.2. Wait time for prompt messages

In some applications some prompt windows will pop up during the execution. The prompt windows always require an action from the user since the process will be in pause until a choice

will be made within a determined time (10 minutes). The prompt windows give information on the run, normally warnings and failure messages.

The advanced user has the option to modify these settings and cutting down the wait time to a few seconds when he/she wishes to run several scenarios in sequence.

To change the waiting time perform the following steps:

1) Select "Create the editable files" application and "Scenario_Tree" scenario under scenario window
2) Double click on scenario name to open the scenario window
3) Under " Wait time for prompt messages during execution (default 10 minutes=600 secs):" catalog key type 1 (1 will be 1 second)
4) Click "Save"
5) Click "Close"

6.3. Locking solutions option for Rail Capacity Management

A new feature allows locking the transport chain solutions for a set of large flows in particular. This is done by specifying the cases that need special attention in a text file.

An example of its structure is:

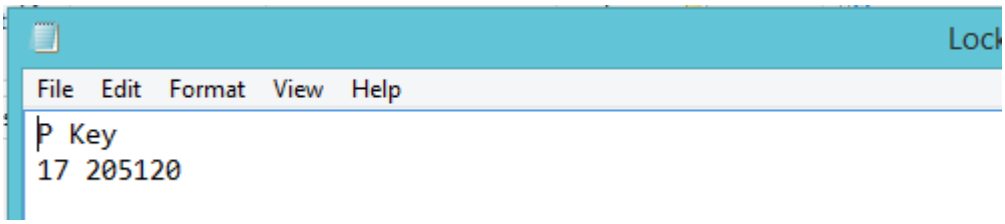


Figure 62 LockedSTDLogMod.txt file example.

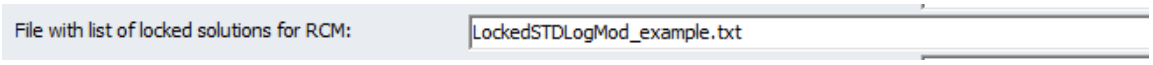
The values provided are:

- P: commodity group (in the example 15 commodity)
- Key: transport chain solution number in ChainChoi15_01.out

The transport chains listed in this file will be excluded in the evaluation of the new alternatives during the Rail Capacity Management process. Their impact on the rail capacity consumption is of course still accounted for in the LP-model..

To specify a different set of locked solution the user should:

1) Create a new text file in Notepad (or any other editing software);
2) Provide the list of commodities and Key he/she wishes to lock
3) Place the new file under {CATALOG_DIR}\01_Programs\LogMod\RCM
4) The file's naming convention must follow the general rules for scenario naming (no blank, special characters, etc.)
5) Select Samgods application and scenario under scenario window
6) Double click on scenario name to open the scenario window
7) Click next until reach the catalog key "File with list of locked solutions for RCM:"
8) Edit the file name in the edit box:



9) Click "Save"
10) Click "Close

6.4. Empty vehicle fractions

The Extract procedure reads the output files from LogMod and RCM and produces the OD matrices for tonnes and number of loaded and empty vehicles respectively. It comprises a stepwise linear function for deriving the number of empties as fraction of the loaded vehicles.

The applied curve is shown below:

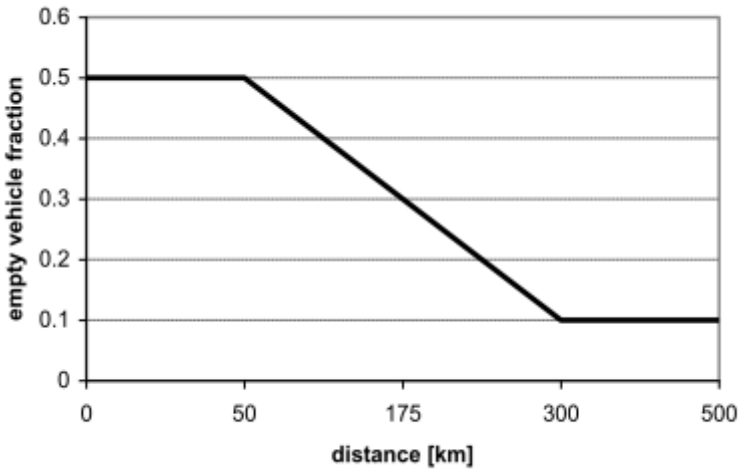


Figure 63 Curve of empty vehicle fractions.

From version 1.0 of the logistics model the curve could be specified via the interface updating the table " Empty vehicle fractions per vehicle type and distance" under data panel (Scenario Inputs\General tables\). The structure of the table is as follow:

OBJECTID	ID	VEH_NR	DIST1	EMPFAC1	DIST2	EMPFAC2	ASYM
1	1	101	50	0.5	300	0.1	50
2	2	102	50	0.5	300	0.1	50
3	3	103	50	0.5	300	0.1	50
4	4	104	50	0.5	300	0.1	50
5	5	105	50	0.5	300	0.1	50
6	6	201	0	0.2	0	0	99999
7	7	202	0	0.79	0	0	99999
8	8	204	0	0.56	0	0	99999
9	9	205	0	0.56	0	0	99999
10	10	206	0	1	0	0	99999
11	11	207	0	0.45	0	0	99999
12	12	208	0	0.45	0	0	99999
13	13	209	0	0.45	0	0	99999
14	14	301	50	0.5	300	0.1	50
15	15	302	50	0.5	300	0.1	50
16	16	303	50	0.5	300	0.1	50
17	17	304	50	0.5	300	0.1	50
18	18	305	50	0.5	300	0.1	50

Figure 64 Input table for empty vehicle fractions.

The attributes in the table represent the points of the curve the user wants to apply:

- DIST1: first distance (km) where will be applied the EMPFAC1 value (with a flat distribution)
- DIST2: second distance (km) where will be applied the EMPFAC2 value (with a linear function between EMPFAC1 and EMPFAC2 for distances between DIST1 and DIST2)
- If DIST1 and DIST2 are zero, a constant level curve with the value EMPFAC1 will be applied.

The above attributes in other words shape the function used in the extract procedure. The attribute ASYM provides a threshold distance above which asymmetric flows will generate empty vehicles. The asymmetric part is determined as the absolute value of the difference in the loaded flows in pairwise, opposite OD-relations. To illustrate the calculation consider an OD-relation (the asymmetric part is *abs(120 – 100) = 20*):

- Distance = 70 km
- OD-flow ij= 120 vhcls
- DO-flow ji = 100 vhcls
- Empty vehicle fraction at 70 km = 0.1

If ASYM=50 the distance (70) is above the threshold value so asymmetric flows will generate empty vehicles (according to empties := symmetric term + asymmetric term):

- OD-flow empties ji = 0.1*100
- DO-flow empties ij = 0.1*120 + 20

6.5. Restart from failure

In the event of a crash during a Samgods run different actions could be performed by the user depending on the crashed application.

The model failure can occur under different circumstances:

- hard disk space insufficient to save output
- locked mdb that prevents move data in Input_data.mdb (if the geodatabase has been open in GIS interface or is MS Access the .ldb file could reside in the system and protect the mdb in read mode)
- failure in running in the LP solution with LP_solve.exe
- wrong settings for some keys.

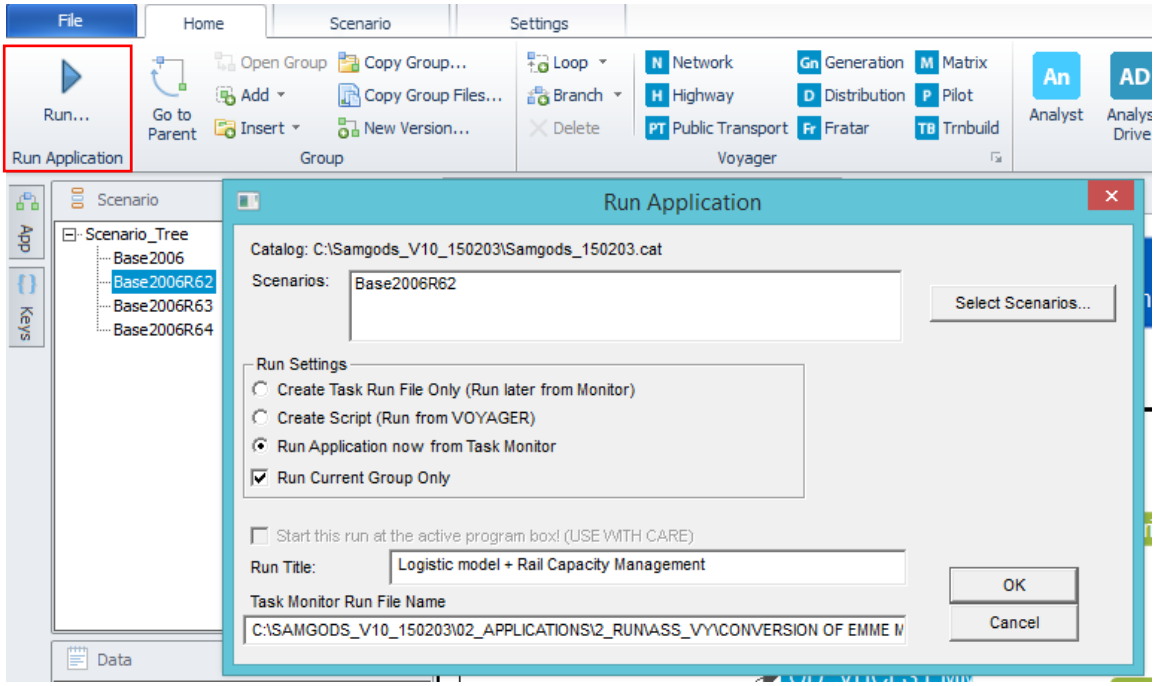
If the failure happens in Standard LogMod or in some of its sub steps (LOS, Logistic Module, Assignment, Report) it is possible to rerun the process until the next sub step and after that run each remaining sub step selecting " Run only one step, or run all steps" with the appropriate value.

For instance if the process crashes in "Logistics module\Save Reports" group it is required to run this and next sub group "Assignment\Conversion From Logmod to VY". The instructions below must be performed for those two groups with the same execution order shown in the interface (first Save Reports, second Conversion From Logmod to VY). After this the Assignment , Report, Rail Capacity Management steps will be run separately.

To rerun a specific subgroup the following actions must be undertaken from the Cube interface:

Advanced user options - Restart from failure

1) Select the scenario that failed
2) Open the application that failed



3) Click on "Run" (see icon in red rectangle in following picture)
4) On "Run Application" window select "Run Application now from Task Monitor'
5) Tick "Run Current Group Only"
6) Click on "OK"

The single subgroup will be run.

7. Log reports

In this chapter, log reports from running some of the applications are presented. The reports include messages that help the user to better analyze and understand the results.

7.1. Edit the data application

The *Edit the data* log report is created when the *Edit the data* application is run. Possible messages inside the log report file Report_ED_{Scenario_shortname}.txt under the scenario specific folder, or accessible from the Data section window under Scenario outputs\Edit the data Report, are listed and explained in Table 29.

Number of message inside the log report	**Purpose**	**Example of messages**	**Message explanation**
#1	Inform whether the scenario is editable or not	Report #1 – the scenario is still editable.	The scenario is in editable mode.
		Report #1 – the scenario is locked.	Changed the scenario into read only mode. It is not possible to change it back from the interface.
#2	Verify the Port_swe table	Report #2: the terminal *N(6.0) TERMINAL N(6.0)* is not a sea terminal!! Please check the ”Ports Sweden” layer.	The terminal number that is not a sea terminal is printed out. In the Ports_swe table there should be only sea terminals. If the terminal is not a port, it will not be saved in the table.
	Verify if a domestic port has the PortArea number specified	Report #2: the terminal *N(6.0) is missing the Port Area attribute.* *Please associate a port area number. See table "A_Port_areas" for the attribute names*	Each domestic port must be allocated to a port area since some calibration parameters are associated to this attribute. It is also used for reporting procedures. Correct the PortArea number with appropriate number.
#3	Information on the number of zones	Report #3: the number of zones is *MAX NETWORK(5.0)*	Maximum number of zones in the highway network
#3	Verify the coherence between network and nodes	Report #3: the number of zones is not the same in the network and the node table. In the network there are *MAX NETWORK(5.0)* and in the nodes table *MAX NODES(5.0)*. Please check the Scenario network.	In this step the application updates the variable ZONES_M inside the general tables and gives the report. MAX NETWORK(5.0) is the variable used to count the maximum number of zones in the network MAX NODES(5.0) is the variable used to count the maximum number of zones in the node s table. During the run they will be

			substitute by the zone node numbers.
#4	Verify the coherence between tables	Report #4: Please add the node *ZONE(6.0)* to the node table.	The zone is in the network but not in the nodes table.
		Report #4: Please add the node *ZONE(6.0)* to the network.	The zone is in the nodes table but not in the network.
		Report #4: Please add the sea terminal *ZONE(6.0)* to the network.	The sea terminal is in the Node_Terminals but not in the network.
		Report #4: Please add the commodity node *ZONE(6.0)* to the network.	The node is in the Nodes_commodities table but not in the network.
		Report #4: Please add the frequency node *ZONE(6.0)* to the network.	The node is in the Frequency_Data_Node table but not in the network.
		Report #4: Please add the frequency node *ZONE(6.0)* to the network.	The node is in the Frequency_Data_Link table but not in the network.
#5	Verify the numbering system	Report #5 – numbering system. Node / Code_error / Description	Header of the message
		N / 1 / Missed the mode! – must be correct!	Missed the mode for node N – must be correct in the node table
		N / 2 / Missed the ID COUNTRY or the ID REGION code – must be correct!	Missed the ID_COUNTRY or the ID_REGION code in the node table for node N
#6	View the errors during the creation of NORIG numbers for the zones	List of errors during the creation of SCBSTANN for the zones	Header of the message NORIG is the emme node number and its specification comes from a set of rules when edits are made in GIS interface. From Emme network it is the value already present.

		The node is without MODE_N. Please check the data.	The mode for the zone is missing
		The node has no values available. Please check the data.	There are no node numbers available for the zone
#7	View the errors during the creation of NORIG numbers for the nodes	List of errors during the creation of NORIG for the nodes	Header of the message
		No more node numbers are available. Please check the data	There are no node numbers available for the node
#8	Check the consistency of rail capacity table with Rail Network	Report#8: There are mistakes in the rail capacity table. Please check the rail capacity table. The link A B ID_LINK is not a rail link	The link listed is not a rail link. Check the node numbers A and B in the rail network and identify the proper node number. (NOTE: the links must be only Swedish links).
		The link A B ID_LINK is not present in the network.	The link listed is not present in the rail network. Two possible actions are: 1) amend the A and B nodes because the link is in the network; 2) add the link in the network because the link is missing.
		The link A B is in the rail capacity table but has not any capacity	The links listed in the rail capacity table MUST have a capacity value greater than zero. The capacity is number of BIDIRECTIONAL trains per day.
		The ID_LINK sequence is wrong. for the following links: A B A B ...	Links with opposite direction but same node number MUST have same ID_LINK. Example: 2001-2000 and 2000-2001
		The ID_LINK sequence is wrong.	The ID_LINK must start from 1 to the highest number. No gaps could be present.

Table 29 Reports for *Edit the data* application.

7.2. Samgods Model application

The Existing Outputs log report is created when the *Samgods Model* application is run. The messages inside the log report file Report_SG_{Scenario_shortname}.txt under the scenario specific folder, or accessible from the Data Section window in Scenario outputs\Samgods Report\Existing Outputs, are listed and explained in Table 30.

Number of message inside the log report	**Purpose**	**Example of messages**	**Message explanation**
#1	Analyze inconsistencies between input data in different runs	The output *OUTPUT* for the commodity *ID_COM(2.0)* was created with a different Input data. Please check the scenario data. The previous run has *DATE_E* and the current run has *DATE_L*.	Warning that the input data has been modified between the last run and the current run.
	List of output files	The results have been computed by Voyager. The output under path is available.	List of all available output files and their locations.

Table 30 Reports for the *Samgods Model* application.

7.3. Handling scenario application

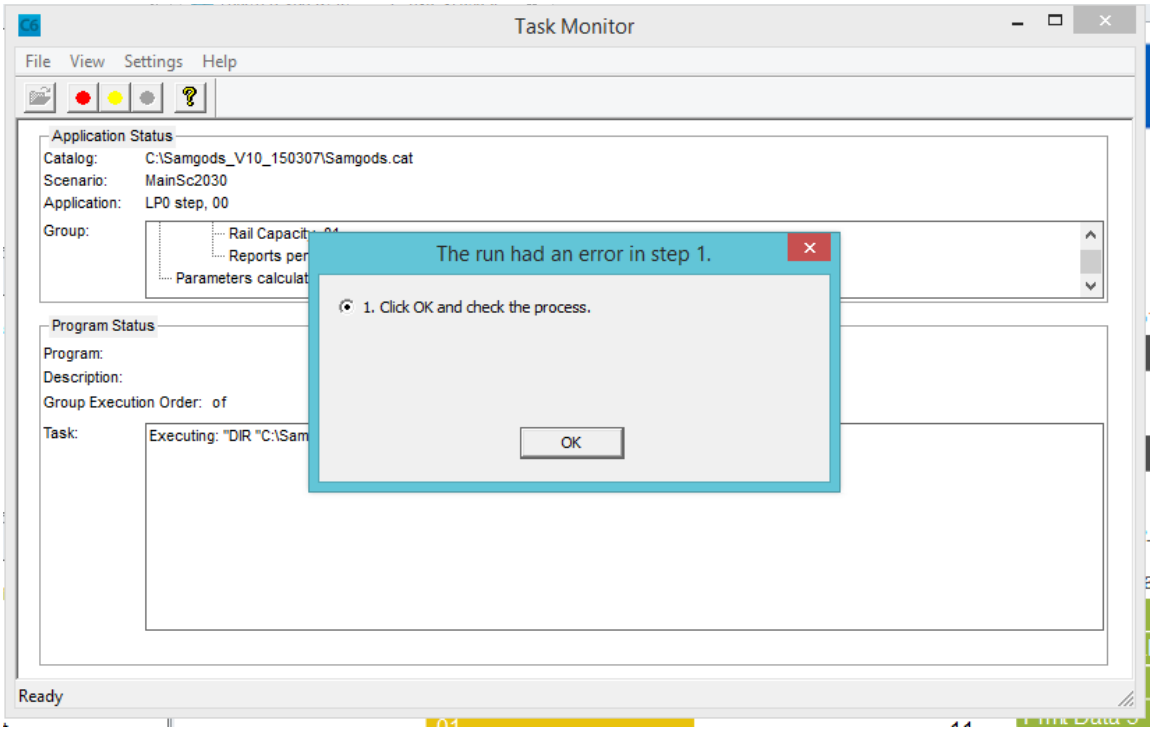
The Report for the import phase is created when the Import function in the *Handling Scenario* application is run. The messages inside the log report file Report_HL_{Scenario_shortname}.txt under the scenario specific folder, or accessible from the Data Section window under Scenario Outputs\Import function Report\Report for the import phase, are listed in Table 31.

Possible messages	**Required actions**
All the catalog keys have the correct value. No actions are requested.	Nothing
List of catalog keys that have to be changed and how.	Change the listed catalogue keys for the imported scenario under “Scenario Parameters” in the *Handling Scenario* application and run the application again. Check the report again.

Table 31 Reports for the *Handling scenario* application.

8. Check-list when errors occur

- Do you have the required administrative rights to install and run the Samgods GUI?
- Is the model user role correct? Model Standard user is typically used when running scenarios etc., while Model developer typically is used during installation and setting up the system. Model Advanced user is used when some main parameters in the model setup should be changed for sensitivity tests
- What is the ReturnCode no? ReturnCode 2 is a fatal error – view the error report
- Is the name of the scenario correct? Geodatabase format does not allow:
    - Begin the name with numbers (i.e., 01_scenario is not allowed, but scenario_01 is OK)
    - Special characters (like space " " or -,+, **n f t**)
    - Too long names
- Spaces, use underscore ("_") instead.
- Some errors (regarding delimiter problems with "." and ",") could be solved by setting the National settings for the PC to British
- If the logistics module stops operating, the reason could be that the execution is split up into too many processors. RAM per processor should be at least 1.5 GB. The number of processors to use is set in the interface, via a catalog key in the *Samgods model* application, see Section 3.5
- Warning messages as the picture below:



will interrupt the model run (with Return Code =3). They refer to the LP setup (made by a set of batch files called in sequence). In this case a failure is occurred in MPS.jar program or LP?solve.exe program. To debug the problem refers to documents listed in Section 10.1 and 10.2

9. Maps on outputs

The model produces outputs that can be classified into two main groups:

- tabular reports
- geodatabase networks

The first group can be visualized via Cube interface, Access or ArcMap. The second group can be visualized via Cube interface or ArcMap. In this chapter we will provide the procedure to create maps for the second group.

9.1. List of networks

The available networks are:

ID	Data panel	Name	Notes
1	Scenario Outputs\Samgods Report\Assignment	Road Assigned Network	
		Rail Assigned Network	
		Sea Assigned Network	
		Air Assigned Network	
2	Scenario Outputs\Samgods Report\Reports	Assigned Network	
3		Bidirectional tons per mode STD	
4	Scenario Outputs\RCM Report\Assignment	Road Assignment Network (RCM)	
		Rail Assignment Network (RCM)	
		Sea Assignment Network (RCM)	
		Air Assignment Network (RCM)	
5	Scenario Outputs\RCM Report\Reports	Assigned Network	
6		Report #15b Rail Capacity Network	Only for RCM
7		Bidirectional tons per mode RCM	

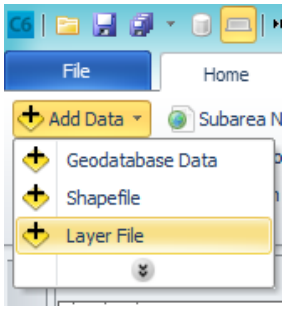
Table 32 Geodatabase networks in output.

9.2. Create a map

To create a map in GUI interface:

1) Select the scenario from which you want to create a map
2) Select from data panel the geodatabase network you want to visualize (in the example Report #15b Rail Capacity Network) and double click on it
3) The GIS window will be open having in TOC only the network (named Rail_BiDir)

4) Clicking on "Add data>Geodatabase Data" add background layer placed under



{CATALOG_KEY}\Input_Data.mdb\Samgods_zones. This is used only for cosmetic purposes

5) Clicking on "Add data>Shapefile" add background shapefile placed under {CATALOG_KEY}\03_Gis_Data. This is used only for cosmetic purposes

6) In the TOC drag and drop Rail_BDir on the top of all the layers

7) Untick the network node layer (Rail_BDir_node)

At this point the map will looks like:

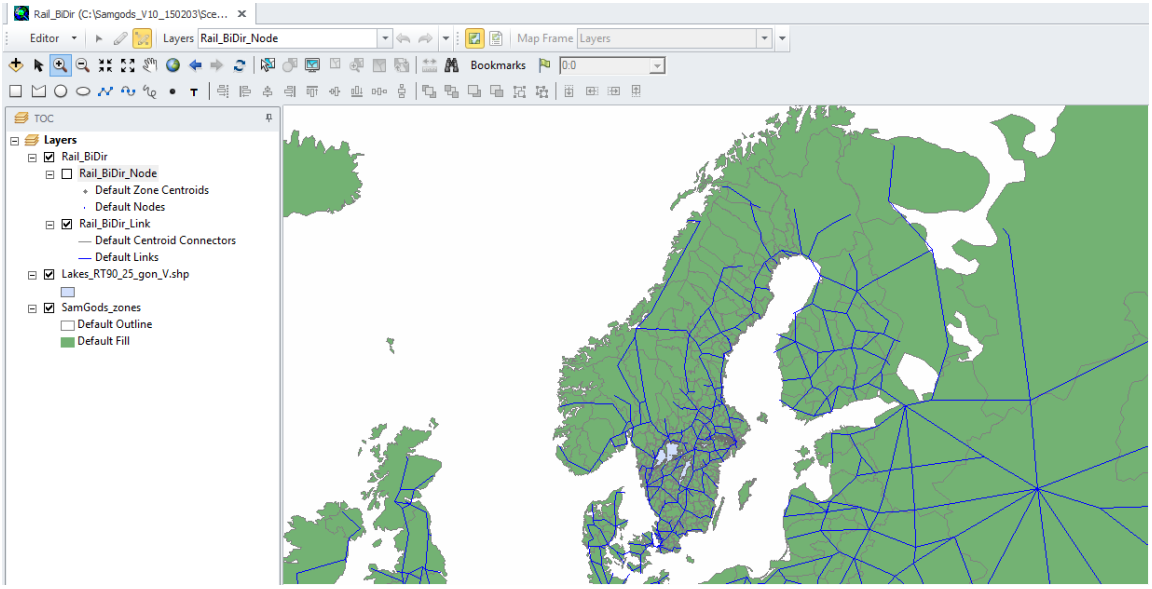
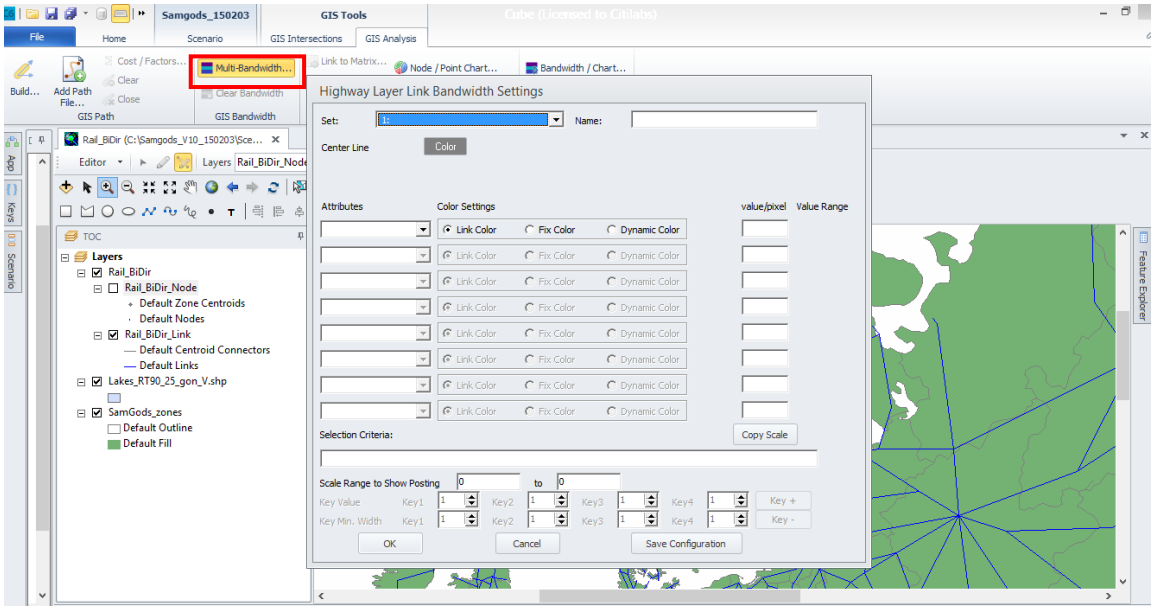


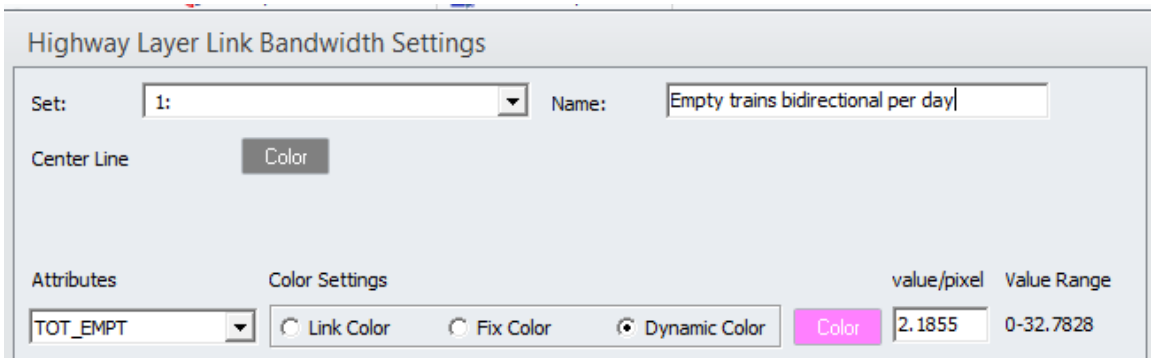
Figure 65 Map with geodatabase network and general layers.

8) Click on GIS Analysis tab in the interface and click on Multi-Bandwidth tool



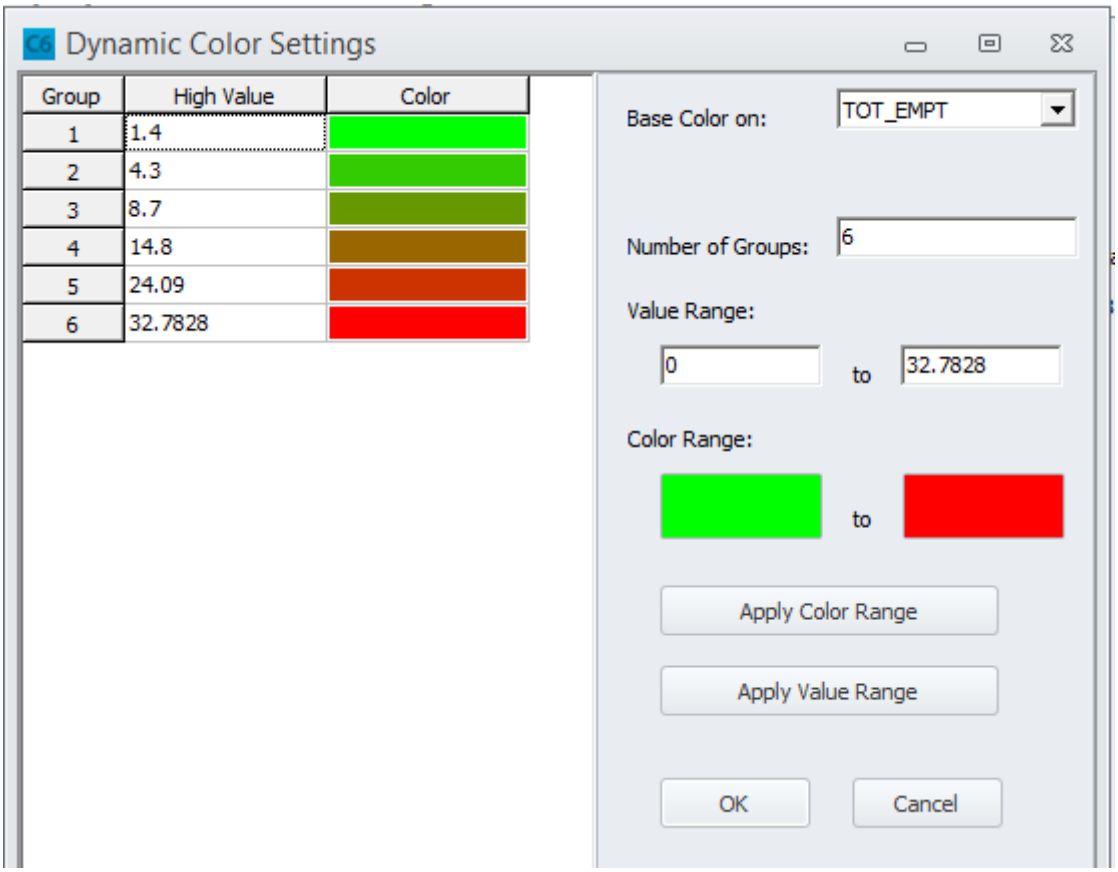
9) The Highway Layer Link Bandwidth Setting window will pop up. Select the attribute to visualize in the map (TOT_EMPT) and Dynamic Color in the dialog screen. This option allows specification of different colors for different value ranges for the selected attribute

10) Enter in the Name input frame, the name of the map (in the example Empty trains



bidirectional per day)

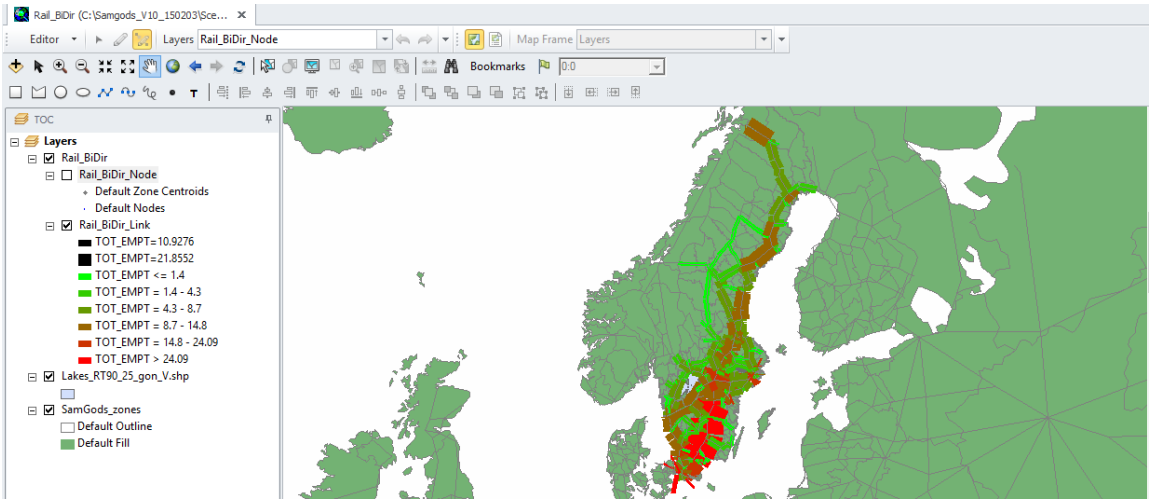
11) Click on "Color" and specified in the following window: Number of groups (6), the Color Range clicking on colored icon (green and red). Click on Apply Color Range and Apply Value Range. Accommodate the High Value in the range of values per desired class. Click on OK



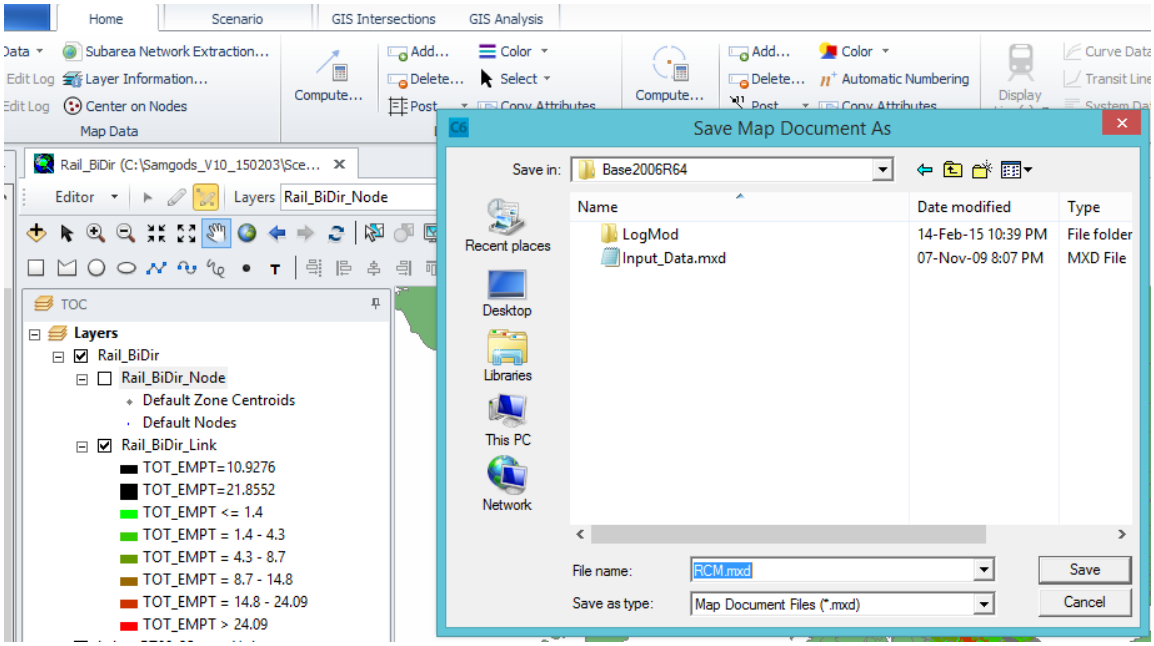
12) Click on OK

13) Click on OK

The resulting map will be:



14) Click on X to close the map, the system will prompt if it is necessary save the map giving a location and a name. Select the scenario folder and give the name "RCM.mxd".



9.3. Copy existing maps in new scenarios

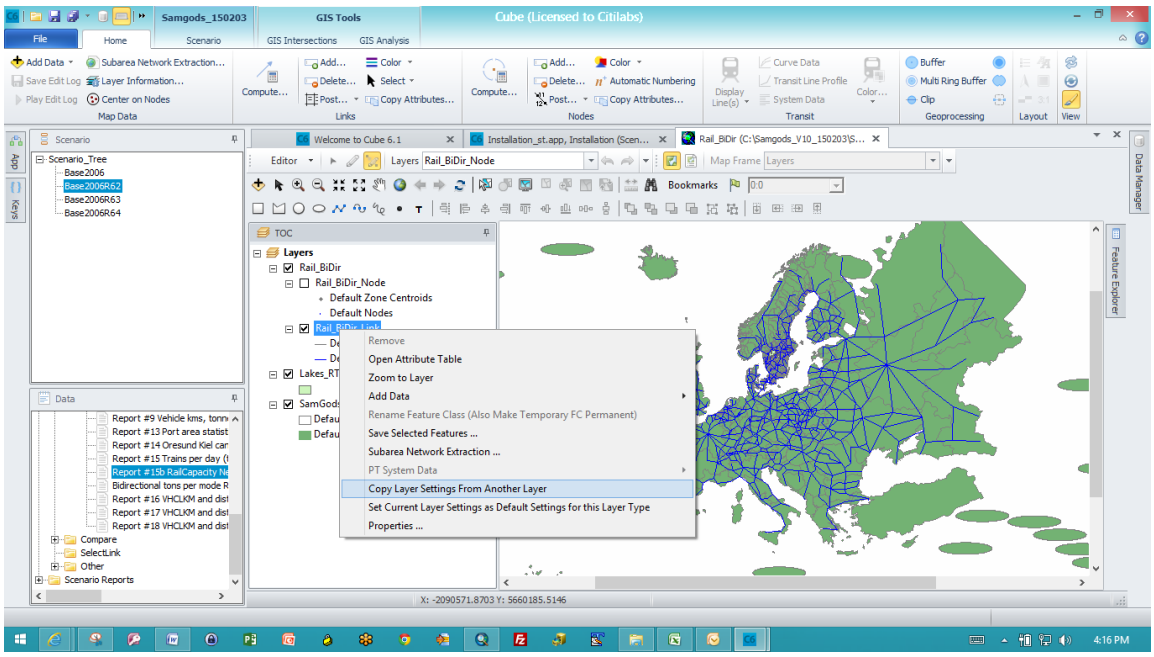
The practice to start from scratch is not recommended and will be extremely time consuming. A useful option is to inherit/copy all the settings specified with Multi-Bandwidth (or any tool in the graphical interface) from one scenario to another scenario by copying those settings from the vpr file.

The vpr file, normally created and saved alongside the output.mdb, takes the name of the geodatabase which it refers to. In Samgods model its name is output{Commodity}_{Scenario_shortname}.vpr and it is placed under the scenario folder. If it is not present, it means that no maps are yet specified for the scenario.

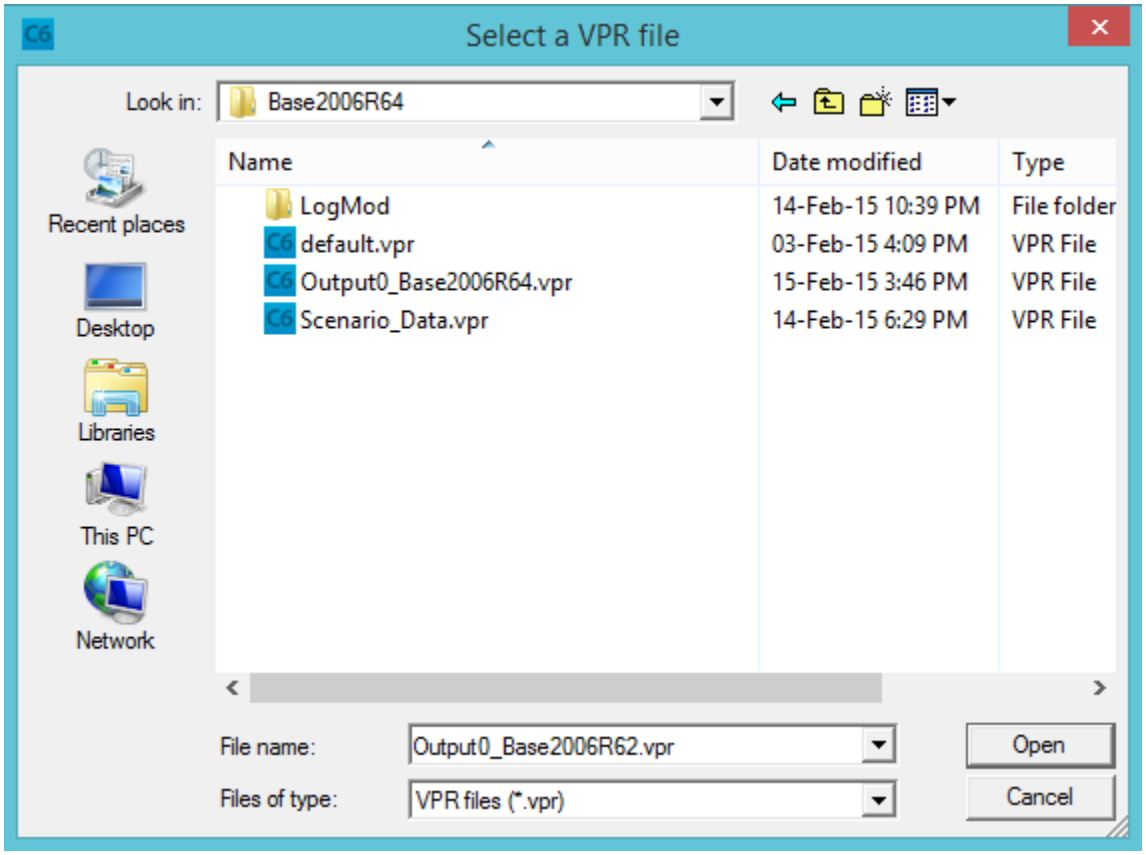
The vpr file saves all the settings specified in the mxd document which refer to elements loaded according to the TOC.

To import in a new scenario the legends, Multi-Bandwidths, labels specified in another scenario proceed in the following manner:

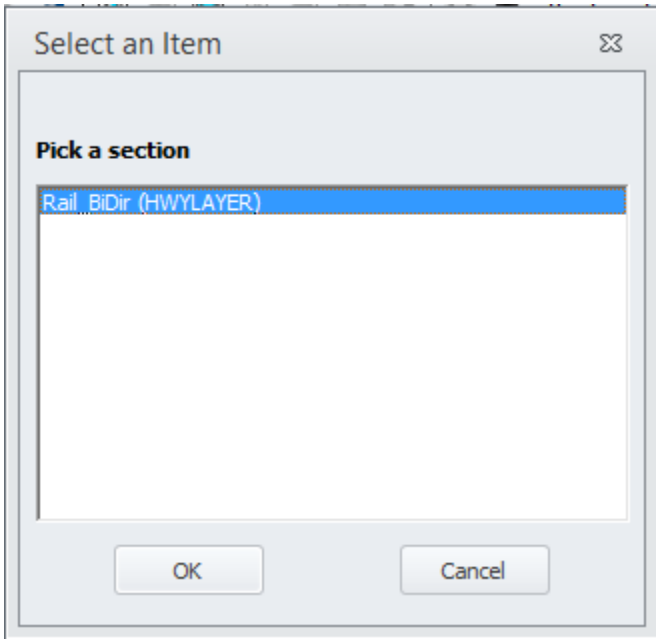
1) Perform step 1 to step 7 for the current scenario
2) Right click on RailBdir_Link layer
3) On the window select "Copy Layer Settings From Another Layer"



4) Select the Vpr file from scenario having the map you want to use (in the example Base2006R64 folder and Output0_Base2006R64.vpr file)



5) Select the layer having the same name of the current network (e.g. Rail_BDir)



6) Click on GIS Analysis tab in the interface and click on Multi-Bandwidth tool. The legend specified in the other network will be prompted automatically.
7) Click on OK
8) Click on X to close the map, the system will prompt if it is necessary save the map giving a location and a name. Select the scenario folder and give the name "RCM_64.mdx".

9.4. Attributes names for maps

The available attributes that could be visualize in a map for networks 1,2,4,5 in Table 32 are listed under 11.4.2. Here the attributes in networks 3,6 and 7 in Table 32 are listed.

Attribute	Meaning	Network
TOT_ROAD_TM_BD	Bidirectional tonne flows on road in millions	Loaded_Bid_STD (Bidirectional tonnes per mode STD) Loaded_Bid_RCM (Bidirectional tonnes per mode RCM)
TOT_RAIL_TM_BD	Bidirectional tonne flows on rail in millions	
TOT_SEA_TM_BD	Bidirectional tonne flows on sea in millions	
TOT_EMPT	Bidirectional empty train flows per day	Rail_Bdir (Report #15b Rail Capacity Network)
TOT_ASS	bidirectional per day total train flows (empty + loaded	
TOT_LOAD	Bidirectional number of loaded trains per day	
CAP	Bidirectional capacity [#trains/day]	
FLAG_OVCAP	1 if over capacity load of 1 train/day, otherwise 0	
FLAG_PER	1 if over capacity load of 1%, otherwise 0	
FLAG_TOT	1 if FLAG_PER=1 or FLAG_OVCAP=1	
DIFF_VC	Differences in number of trains over capacity	

Table 33 Attributes in geodatabase networks.

10. References

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11. Appendices

11.1. Dimensions in the model

The following tables are copied from the program documentation (reference no.1 on previous page, Appendix A).

Table A-1: Overview of commodity types:

Nr	Commodity	Aggregate commodity	Average shipment size
1	Cereals	Dry bulk	41.0
2	Potatoes, other vegetables, fresh or frozen, fresh fruit	Dry bulk	3.8
3	Live animals	Dry bulk	3.8
4	Sugar beet	Dry bulk	0.3
5	Timber for paper industry (pulpwood)	Dry bulk	41.2
6	Wood roughly squared or sawn lengthwise, sliced or peeled	Dry bulk	9.2
7	Wood chips and wood waste	Dry bulk	122.8
8	Other wood or cork	Dry bulk	43.4
9	Textiles, textile articles and manmade fibres, other raw animal and vegetable materials	General cargo	0.2
10	Foodstuff and animal fodder	General cargo	1.8
11	Oil seeds and oleaginous fruits and fats	Liquid bulk	14.1
12	Solid mineral fuels	Liquid bulk	164.5
13	Crude petroleum	Liquid bulk	19 739.1
14	Petroleum products	Liquid bulk	103.1
15	Iron ore, iron and steel waste and blast-furnace dust	Dry bulk	4212.2
16	Non-ferrous ores and waste	Dry bulk	135.9
17	Metal products	General cargo	12.9
18	Cement, lime, manufactured building materials	Dry bulk	7.2
19	Earth, sand and gravel	Dry bulk	20.5
20	Other crude and manufactured minerals	Dry bulk	29.1
21	Natural and chemical fertilizers	Dry bulk	55.6
22	Coal chemicals	Liquid bulk	3.2
23	Chemicals other than coal chemicals and tar	Dry bulk	3.1
24	Paper pulp and waste paper	Dry bulk	173.9
25	Transport equipment, whether or not assembled, and parts thereof	General cargo	1.7
26	Manufactures of metal	General cargo	0.9
27	Glass, glassware, ceramic products	General cargo	1.1
28	Paper, paperboard; not manufactures	Dry bulk	23.3
29	Leather textile, clothing, other manufactured articles than paper, paperboard and manufactures thereof	General cargo	0.6
30	Mixed and part loads, miscellaneous articles	General cargo	No PWC flow for this commodity
31	Timber for sawmill	Dry bulk	40.9
32	Machinery, apparatus, engines, whether or not assembled, and parts thereof	General cargo	18.2
33	Paper, paperboard and manufactures thereof	General cargo	0.3

34	Wrapping material, used	Dry bulk	0.6
35	Air freight (2006 model)	General cargo	2.9

Table A-2: Overview of vehicle type numbers, and aggregate modes for container transport and non-container transport.

Aggregate mode		ModeNr	VhclNr	Vehicle type
Containers	Heavy lorry	A	104	Lorry HGV 25-40 ton
			105	Lorry HGV 25-60 ton
	Kombi train	D	201	Kombi train
	Feeder train	E	202	Feeder/shunt train
	Wagonload train	F	203	Wagon load train
	Direct Sea	J	301	Container vessel 5 300 dwt[1]
			302	Container vessel 16 000 dwt[1]
			303	Container vessel 27 200 dwt[1]
			304	Container vessel 100 000 dwt[1]
			305	Other vessel 1 000 dwt
			306	Other vessel 2 500 dwt
			307	Other vessel 3 500 dwt
			308	Other vessel 5 000 dwt
			309	Other vessel 10 000 dwt
			310	Other vessel 20 000 dwt
			311	Other vessel 40 000 dwt
			312	Other vessel 80 000 dwt
			313	Other vessel 100 000 dwt
			314	Other vessel 250 000 dwt
			315	Ro/ro vessel 3 600 dwt
			316	Ro/ro vessel 6 300 dwt
			317	Ro/ro vessel 10 000 dwt
	Feeder vessel	K	301	Container vessel 5 300 dwt
			315	Ro/ro vessel 3 600 dwt
			316	Ro/ro vessel 6 300 dwt
	Long-Haul vessel	L	303	Container vessel 27 200 dwt
			304	Container vessel 100 000 dwt
			317	Ro/ro vessel 10 000 dwt
Non-Containers	Light Lorry	B	101	Lorry light LGV, ≤ 3,5 ton
			102	Lorry medium 3,5-16 ton
			103	Lorry medium16-24 ton
	Heavy lorry	C / S[13]	104	Lorry HGV 25-40 ton
			105	Lorry HGV 25-60 ton

[13] Consolidated heavy lorry is coded as mode S in the chains file. Consolidation in heavy lorries is only available on an intermediate leg in a chain with at least three legs.

	Feeder train	G	202	Feeder/shunt train
	Wagonload train	H	203	Wagon load train
	System train	I	204	System train STAX 22,5
		T	205	System train STAX 25
		U	206	System train STAX 30
	Direct Sea	M	305	Other vessel 1 000 dwt
			306	Other vessel 2 500 dwt
			307	Other vessel 3 500 dwt
			308	Other vessel 5 000 dwt
			309	Other vessel 10 000 dwt
			310	Other vessel 20 000 dwt
			311	Other vessel 40 000 dwt
			312	Other vessel 80 000 dwt
			313	Other vessel 100 000 dwt
			314	Other vessel 250 000 dwt
			315	Ro/ro vessel 3 600 dwt
			316	Ro/ro vessel 6 300 dwt
			317	Ro/ro vessel 10 000 dwt
	Feeder vessel	N	315	Ro/ro vessel 3 600 dwt
			316	Ro/ro vessel 6 300 dwt
	Long-Haul vessel	O	317	Ro/ro vessel 10 000 dwt
	Road Ferry	P	318	Road ferry 2 500 dwt
			319	Road ferry 5 000 dwt
			320	Road ferry 7 500 dwt
	Rail Ferry	Q	321	Rail ferry 5 000 dwt
	Plane	R	401	Freight airplane

Table A-3: Transport chains used for Sweden

Number	Potential Chain	Explanation
1	A	Direct transport by heavy lorry, using containers (see Table 3)
2	ADA	Heavy lorry, Kombi train - heavy lorry, with containers
3	ADJA	Etc.
4	ADJDA	
5	ADKL	
6	AJ	
7	AJA	
8	AJDA	
9	AKL	
10	APA	
11	B	
12	BR	
13	BRB	
14	BS	
15	BSB	
16	C	
17	CGH	
18	CGHC	
19	CGHM	
20	CH	
21	CHG	
22	CHGC	
23	CM	
24	CMC	
25	CMI	
26	CMT	
27	CMU	
28	CPC	
29	CUM	
30	GH	
31	GHC	
32	GHG	
33	GHM	
34	GHMI	
35	GHMT	
36	GHMU	
37	GHQH	
38	HC	
39	HG	
40	HGC	
41	I	
42	IM	

Number	Potential Chain	Explanation
43	IMC	
44	IMHG	
45	J	
46	JA	
47	KL	
48	LK	
49	LKA	
50	LKDA	
51	M	
52	MC	
53	MHG	
54	MHGC	
55	MI	
56	MT	
57	MU	
58	RB	
59	SB	
60	T	
61	TM	
62	TMC	
63	TMGH	
64	U	
65	UM	
66	UMC	
67	UMGH	

11.2. Empty vehicles description

The computation of the empty vehicles matrices in the current version of the model is based on a non-linear, non-separable model. Therefore the output in terms of empty vehicle flows in general will depend on the set of commodities included in the logistics model simulations. The flows of empty vehicles will be correctly estimated only if the model is run for all commodities. An exception to this observation is the set of user defined empty vehicle modelling functions introduced in December 2014, in which empty train flows are modeled as strictly proportional to the number of loaded trains. With this setting the rail empty flows are strictly proportional to the loaded flows, and the results can be aggregated to total volumes from any disaggregated level.

To obtain between scenarios comparable results it is therefore recommended that the model is run for all commodities. There are two cases:

- EMPTY_OK: the catalogue key for selecting the commodity group is set to 0, which means that all commodities are selected for the logistics model simulation; This 0 is also added to the vehicle OD-matrix names as for example OD_Tonnes201_0.314, which during the railway capacity management procedure are renamed to OD_Tonnes201_STD.314, where STD stands for STanDard logistics model.
- EMPTY_ERROR: all other cases, i.e. the model is run for one commodity or STAN group only. In this case the empty vehicle flows will in general be according to non-separable relationships.

The program originally gives three kinds of output matrices: The number of empty vehicles, the total number of (loaded and empty) vehicles and the number of tonnes transported. In the EMPTY_ERROR case, the total number of vehicles will be incorrect as well. This issue is dealt with in two ways, presented below.

1: Compute the number of loaded vehicles.

Instead of producing the total number of vehicles (empty + loaded), the program now produces the number of loaded vehicles. This is done by default, by computing

the number of loaded vehicles = total number of vehicles – number of empty vehicles

in an intermediate step in Cube, after the logistics model. This operation will always give the correct result, since the estimated number of empty vehicles (with any errors) is subtracted from the total number of vehicles in all OD relations (containing the same errors). The output in the current version is thus made up by the three types of matrices:

- Number of loaded vehicles (always correct values);
- Number of empty vehicles (comparable and correct only in case EMPTY_OK);
- Tonnes (correct values).

Furthermore, the total number of vehicles will be computed (by adding the empty and loaded vehicles outputs) in the case EMPTY_OK. For the other case – EMPTY_ERROR – the total number of vehicles will be replaced by zeros in order to reduce the risk of using incorrect values. This gives the extra output

- Total number of vehicles (correct in case EMPTY_OK, set to zero otherwise).

The output in terms of total number of vehicles appears in some of the tables, but not in any of the networks. Generally, in the outputs, the number of vehicles always refers to the number of loaded vehicles, if nothing else is said.

2: Skip estimation of the empty vehicles

The user is given the option to not produce the empty vehicle matrices at all. The choice is made by setting the attribute

EMPTY_V = 1 to produce empty vehicle matrices, or

EMPTY_V = 0 to not produce empty vehicle matrices.

The attribute is set for each vehicle class separately, in the table “Vehicle Parameters” (see Section 5.4). If EMPTY_V=0, the empty vehicle matrices will be filled with zeroes.

Summarizing all the possibilities, we have the following cases and the result in each case:

	EMPTY_V=0	**EMPTY_V=1**
EMPTY_OK	Empty vehicles = 0 Total vehicles = loaded vehicles	Empty vehicles ≠ 0 Total vehicles = empty + loaded
EMPTY_ERROR	Empty vehicles = 0 Total vehicles = 0	Empty vehicles ≠ 0 Total vehicles = 0

Table 34 All different cases for the empty and total vehicles calculation.

The empty vehicles calculation was designed for lorries, but is used for all vehicles as described above.

11.3. Frequency network

The frequency networks are saved and can be displayed as GIS maps in the Samgods model and could be edited as any other GIS layers, using the Compute function or the Feature Explorer window. However, editing these layers in the GIS window is rather difficult and slow. New terminals are given default frequencies, so that the user does not have to edit the frequency networks unless any specific frequencies should be changed. The reason for saving the frequency data as GIS layers instead of a matrix is that it saves hard disk space. The user just has to think of the node layer as the diagonal elements of the imagined frequency matrix (giving the frequencies within zones) and the link layer as the non-diagonal elements, giving the frequencies between zones. By default, the frequency network layers are initially filtered to show only the links and nodes connected to Stockholm.

11.4. Variable names and their meaning

Below, some of the variable names in different tables in the interface are listed and explained. Table 2 in Section 2.3 also gives information to help to understand the contents of the tables.

11.4.1. Variables in the output tables

In the output tables, different variable names appear. Below Table 36 is giving the variables, their meaning and in which data set (in the Data Section window) they appear. These data sets are found in Scenario Outputs\Samgods Report\Logistics Module\OD Covered and Scenario Outputs\Samgods Report\Reports.

Generally, the following abbreviations are used, separated by an underscore sign:

NV	Number of vehicles
KM	Kilometer
TON	Tonne
TKM	Tonne Kilometer
VKM	Vehicle Kilometer
DOM	Domestic
DTOT	Total domestic (domestic + domestic part of international)
INT	International
TOT	Total (in the sense total domestic + international)
L	Loaded (vehicle)
E	Empty (unloaded vehicle)
A	All (in the sense loaded + empty vehicles)

Table 35 Abbreviations used for variable names

Data set	**Variable**	**Meaning**
Output by vehicle type	NV_DTOT	Number of vehicles, total domestic
Output by vehicle type	NV_INT	Number of vehicles, international
Output by vehicle type	NV_TOT	Number of vehicles, total
Output by vehicle type, Output by chain	KM_DTOT	Number of kilometers, total domestic
Output by vehicle type, Output by chain	KM_INT	Number of kilometres, international
Output by vehicle type, Output by chain	KM_TOT	Number of kilometres, total
Output by vehicle type, Output by chain	TON_DTOT	Number of tonnes, total domestic
Output by vehicle type, Output by chain	TON_INT	Number of tonnes, international
Output by vehicle type, Output by chain	TON_TOT	Number of tonnes, total
Output by vehicle type, Output by chain	TKM_DTOT	Number of tonne kilometres, total domestic
Output by vehicle type, Output by chain	TKM_INT	Number of tonne kilometres, international

Data set	Variable	Meaning
Output by vehicle type, Output by chain	TKM_TOT	Number of tonne kilometres, total
Output by vehicle type	ALF_DOM	Average loading factor, domestic
Output by vehicle type	ALF_INT	Average loading factor, international
Output by vehicle type	ALF_TOT	Average loading factor, total
Output by vehicle type	AVDIST_DOM	Average distance, domestic
Output by vehicle type	AVDIST_INT	Average distance, international
Output by vehicle type	AVDIST_TOT	Average distance, total
Output by chain	COST_DOM	Logistic cost, domestic
Output by chain	COST_DTOT	Logistic cost, total domestic
Output by chain	COST_INT	Logistic cost, international
Output by chain	COST_TOT	Logistic cost, total
Output by chain	AC_TKM_DOM	Average cost per tonne kilometre, domestic
Output by chain	AC_TKM_INT	Average cost per tonne kilometre, international
Output by chain	AC_TKM_TOT	Average cost per tonne kilometre, total
Report #1	NV_A_TOT	Number of vehicles, loaded + empty, total domestic + international
Report #1	NV_A_DTOT	Number of vehicles, loaded + empty, total domestic
Report #1	VKM_A_TOT	Number of vehicle kilometres, loaded + empty, total domestic + international
Report #1	VKM_A_DTOT	Number of vehicle kilometres, loaded + empty, total domestic
Report #1	NV_L_TOT	Number of loaded vehicles, total domestic + international
Report #1	NV_E_TOT	Number of empty vehicles, domestic + international
Report #1	VKM_L_TOT	Number of loaded vehicle kilometres, domestic + international
Report #1	VKM_E_TOT	Number of unloaded vehicle kilometres, domestic + international
Report #1	NV_L_DTOT	Number of loaded vehicles, total domestic
Report #1	NV_E_DTOT	Number of empty vehicles, total

Data set	Variable	Meaning
		domestic
Report #1	VKM_L_DTOT	Number of loaded vehicle kilometres, total domestic
Report #1	VKM_E_DTOT	Number of empty vehicle kilometres, total domestic
Report #4	TON_DTOT	Number of tones, total domestic
Report #4	TON_INT	Number of tones, international
Report #4	TON_TOT	Number of tones, dom. + int.
Report #4	TKM_DTOT	Number of tonne kilometres, total domestic
Report #4	TKM_INT	Number of tonne kilometres, international
Report #4	TKM_TOT	Number of tonne kilometres, total domestic + international
Report #9	VKM_L_ROAD	Number of loaded vehicle kilometres, road mode
Report #9	VKM_E_ROAD	Number of empty vehicle kilometres, road mode
Report #9	VKM_A_ROAD	Number of vehicle kilometres, empty + loaded vehicles on road
Report #9	TKM_ROAD	Number of tonne kilometres on road
Report #9	VKM_L_RAIL	Number of loaded vehicle kilometres, rail mode
Report #9	VKM_E_RAIL	Number of empty vehicle kilometres, rail mode
Report #9	VKM_A_RAIL	Number of vehicle kilometres, empty + loaded vehicles on rail
Report #9	TKM_RAIL	Number of tonne kilometres on rail

Table 36 Variable names used in the output files in the folders Scenario Outputs\Samgods Report\Logistics Module\OD Covered and Scenario Outputs\Samgods Report\Reports in the Data Section window

11.4.2. Variables in the assigned networks

Below, some of the variables found in the attribute tables of the assigned networks are listed and explained. The outputs in terms of assigned networks are found in the folders Scenario Outputs\Samgods Report\Assignment (assigned networks per mode), Scenario Outputs\Samgods Report\Reports (assigned network with all modes) and Scenario Outputs\Compare\Assignment (differences between the current scenario and the base scenario in loaded vehicle flows for all modes). In the assigned networks (except the compared vehicle flows, see below), the rule for the variable names is the following:

Each vehicle type has a label (the labels are found in the table Scenario Inputs\Editable data\Vehicles Parameters in the data Section window). For example, vehicle class 101 has the

label LGV3. For each vehicle class there are three attributes in the network, which for the example for LGV3 are LGV3 (only the label), LGV3T (label + T) and LGV3E (label + E). LGV3 then gives the number of loaded LGV3 vehicles per year on the link, LGV3T gives the number of tonnes transported by LGV3 vehicles per year and LGV3E gives the number of empty (unloaded) LGV3 vehicles per year. There is one exception from this rule and that is the attribute FS_TRAIN, which cannot be found in the Vehicles Parameters table. FS_TRAIN is the sum of the attributes FEEDV and FEEDW which are two separated assignments for vehicle class 202 (Feeder/shunt train).

Except the attributes for each vehicle class, there are also aggregated numbers in the networks (for air mode there are no aggregated numbers, since there is only one vehicle type for air mode (label FLYG)):

Variable	**Meaning**
TOT_ROAD	Total number of loaded road vehicles
TOT_RAIL	Total number of loaded rail vehicles
TOT_SEA	Total number of loaded sea vehicles
TOT_ROAD_T	Total numbers of tonnes transported by road vehicles
TOT_RAIL_T	Total numbers of tonnes transported by trains
TOT_SEA_T	Total numbers of tonnes transported by sea vehicles
TOT_ROAD_E	Total number of empty road vehicles
TOT_RAIL_E	Total number of empty rail vehicles
TOT_SEA_E	Total number of empty sea vehicles
VOLTO	Total number of loaded vehicles
TONTO	Total number of tonnes transported
EMPTO	Total number of empty vehicles
Table 37sea vehicles	
VOLTO	Total number of loaded vehicles
TONTO	Total number of tonnes transported
EMPTO	Total number of empty vehicles

Table 38 Variable names in the assigned networks and their meanings.

For the compared assigned network, only the loaded vehicle flows are included and they are represented by the vehicle class label, with the prefix DIF. For the example used above, the variable DIF_LGV3 gives the difference in number of loaded LGV3 vehicles, between the current scenario and the base scenario. Also there are differences in aggregated loaded vehicle flows, represented by e.g. DIF_ROAD and DIF_VOLTO (the latter gives the compared flows summed for all vehicle types).

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