MANUAL FOR THE SOCIOECONOMIC BENEFITS OF CLIMATE INFORMATION SERVICE FOR DISASTER RISK REDUCTION IN AFRICA MODEL

Version 1.0

FOR:
AFRICAN CLIMATE POLICY CENTRE
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MANUAL FOR SEB MODEL FOR CIS DRR ON VENSIM PLATFORM

1. BACKGROUND

The African Climate Policy Centre (ACPC) of the United Nations Economic Commission for Africa (UNECA) under the Weather Information and Climate Services (WISER) programme has developed a framework that assesses the economic and social benefits of climate information services compared to the costs of investments.

The framework will essentially build a business case for ongoing investment in CIS by showing the impacts of integrating climate information into the policy and resource allocation process. By turning the outcomes of CIS investment into monetary terms, the framework illustrates whether the benefits of policies outweigh the amount of money invested in them. In this way, it is easier for policy makers to justify current and future investment in CIS.

The Socio-economic Benefits (SEB) Framework presents the steps required for the effective identification and use of indicators to support a sectoral and integrated analysis of SEB in CIS. The steps presented are largely more relevant to climate vulnerability assessment, while others are more useful for adaptation and policy formulation/assessment. The steps that lead to the implementation of an integrated Cost Benefit Analysis (CBA), where social, economic and environmental impacts – as well as policy outcomes− are considered.
CBA considers three main analytical components: investment, avoided costs and added benefits. The integrated CBA includes the economic valuation of environmental consequences.

Following development of the framework, the next stage is customising it for specific sectors, starting with agriculture and disaster risk reduction. This tailoring of the framework will facilitate closer examination of the economic benefit of applying CIS at sector level. This will enable decision makers to make better informed strategies for averting climate-induced disasters; or taking advantage of favourable climatic conditions to help grow their economies.

The model output will provide a basis for integrating CIS into disaster risk reduction DRR. This will involve developing and disseminating climate information and prediction products systems that can enable the tracking of hydro-meteorological hazards ahead of time. This will contribute to enable, so that Disaster Risk Managers capacitated in applying;’ CIS can to put in place measures to avert potential weather- and climate-induced disasters. The process will also map out patterns of hydro-meteorological disasters into the future. This will enable planners to invest resources in the areas that are currently more susceptible to flooding and droughts so that, for instance, roads, bridges, dams and housing structures are designed to be as climate proof as possible.

2. VENSIM PLATFORM

The SEB model was developed on Vensim Platform. Vensim, designed by Ventana Corp., is a visual modelling tool that allows you to conceptualize, document, simulate, analyse, and optimize models of complex dynamic systems. Vensim provides a flexible approach to creating models by allowing you to include ideas, build diagrams and, when appropriate, move into a formal simulation model.

For Advanced Modelling, you need Vensim PLE Plus, Vensim DSS and Vensim Pro because you can use arrays in the equation editor. Vensim Model Reader is just for running models, it does not have the capabilities to designing models. The Model Reader can however read arrays.

 Models can be imported from other applications, providing the user with Vensim's powerful analysis and optimization tools. Modelling starts with causal loop diagrams (CLD), equations, or stock and flow diagrams. Below is an example of a CLD.

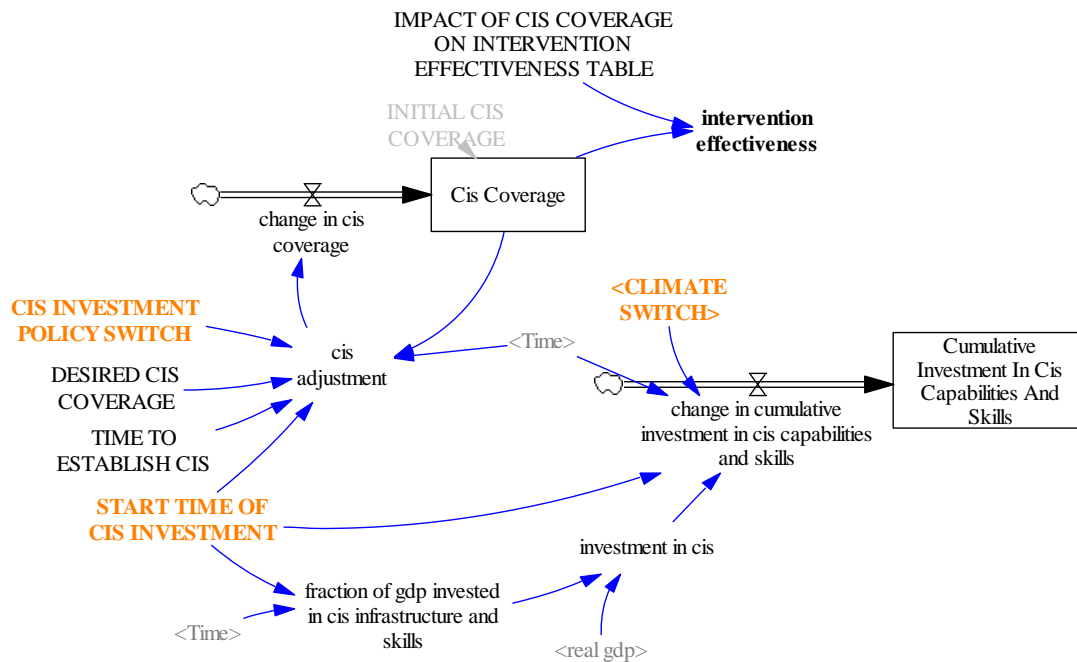**Figure 2.1: Structure in use to represent CIS coverage in the CIS SEB model**

The diagram consists of:

  i. Rates, for example change in CIS coverage
  ii. Stock, for example CIS coverage
  iii. Variables, for example cis adjustment

Causal relationships are relationships that show how variables in a Vensim model affect each other. They are interpreted by Causal Loop diagrams. An arrow going from A to B indicates that A

causes B. Causal loop diagrams can be very helpful in conceptualizing and communicating structures. By connecting words with arrows, relationships among system variables are entered and recorded as causal connections. Causal relationships can help you analyse your model throughout the building process, looking at the causes and uses of a variable, and also at the loops involving the variable.

Using Figure Figure 4.3 as an example, CIS adjustment is affected by the following variables:

    i.   CIS Investment Policy Switch;
   ii.   Desired CIS Coverage;
  iii.   Time to Establish CIS;
  iv.   Start Time of CIS Investment;
   v.   Time (time step set for the model); and
  vi.   CIS coverage.

On the other hand, CIS adjustment affects the rate of change in CIS coverage. All these variables are represented by equations. A variables equation is made by assessing the relationship between the variables surrounding it and itself.

For example:

    i.   Rate of change in CIS coverage = CIS adjustment;
   ii.   CIS coverage = rate of change in cis coverage, etc.;
  iii.   Fraction of GDP invested in CIS infrastructure and skills = if then else (Time > start time of CIS investment, 0.0005,0);
  iv.   Investment in CIS = real GDP * fraction of GDP invested in CIS infrastructure and skills;
   v.   Desired CIS coverage = 1 (N.B it's a constant assigned value 1);
  vi.   Intervention effectiveness = impact of cis coverage on intervention effectiveness table (CIS coverage); etc.

After a model has been successfully simulated, you can be able to view different outputs. You use the tools at the left side of the model to manipulate the output. You can use different types of outputs in the form of graphs, tables, tree diagrams (uses tree and causes tree diagrams), etc.

Tool Bar Glossary

Their respective functions are as follows:

Ordinary Windows Functions

1. The Mouse

Windows computers have left and right mouse buttons, but Macintosh computers have only one mouse button. Vensim makes use of the left and right buttons on PCs as described below. Macintosh users will need to use their mouse button and the Ctrl key or Apple key (for right button clicks) as described below.

Left Button

The left button is used to perform almost all operations in Vensim, such as selecting a menu, clicking a button, dragging graphs or sketch objects. Whenever the Guide requires a mouse click without mention of left or right, perform a click with the left button. Macintosh users should click the only button.

Right Button

The right button is used to set options for Sketch tools, Analysis tools, and Sketch objects and also for positioning and zooming on Sketches. When a right button click is required, click the right button on PCs. Macintosh users need to click the mouse button while holding down the Ctrl key or the Apple key (Ctrl + Click or z + Click). To scroll a sketch drag with the right mouse button or hold down the Ctrl key and drag with the left mouse button. To zoom drag with the right mouse button while holding down the shift key.

Mouse Wheel

On computers equipped with a Mouse Wheel you can use this to scroll windows up and down. For horizontal scrolling hold down the shift key and move the mouse wheel. Holding down the control key will allow you to zoom in and out of a sketch.

2. **Title Bar**

Located at the top of the model shows two important items: the model that is open (e.g., *Sales.mdl*) and the Workbench Variable (e.g., `sales force productivity`). (Go to variable for workbench definition)

3. **Status Bar**

Shows the state of the sketch and objects in the sketch. The Status Bar contains buttons for changing the state of selected objects, and moving to another View.

A number of sketch attributes can be controlled from the Status Bar, including:
- Change characteristics on selected variables; font type, size, bold, italic, underline, strikethrough.
- Set the hide level
- Variable colour, box colour, surround shape. Text position, arrow colour, arrow width, arrow polarity, etc.

When using the Text Editor (Vensim Professional and DSS), the Status Bar changes to reflect text edition operations.

4. **File**

Contains common Functions such as Open Model, Save, Print, etc., where the files are located/saved

5. *Edit*

This menu allows you to copy and paste selected portions of your Model. You can also search for a variable in your model.

6. *View*

This has options for manipulating the sketch of the model and for viewing a model as text-only (available only in Vensim Professional and DSS).

7. *Layout*

This allows you to manipulate the position and size of elements in the sketch.

8. *Model*

This provides access to the Simulation Control and the Time Bounds dialogs, the model checking features, and importing and exporting datasets.

9. *Tools*

This sets Vensim's global options and allows you to manipulate Analysis tools and Sketch tools as well as set global options.

10. *Options*

In Vensim PLE and PLE Plus there is an **Options** menu rather than a **Tool** menu.

11. *Windows*

Enables you to switch among different open windows of a model.

12. *Help*

Provides access to the on-line help system.

Model Running Functions

13. *New Model*

Is used to build a New Model.

14. Open Model

Used to open a model that is in progress or completely built.

15. Save

Used to save a partially built or completely built model for future completion, and/or reference; and/or modification.

16. Print

Used to print the model as in word document.

17. Toolbar

The Toolbar provides buttons for some of the most commonly used menu items and simulation features. The first set of buttons access some File and Edit menu items i.e.
  i.   Cut
  ii.   Copy
  iii. Paste
  iv.   Print
  v.   Save
  vi.   Browse

18. Runname

The Runname editing box used for naming simulations which can be viewed in data sets under the control panel window.

19. Sim Set-up

Used to toggle between Simulation and SyntheSim.

20. Simulation Results File Name (window) (See Runname)
21. Simulate

Used to generate the different outputs of the model.

22. SyntheSim

each model Constant will have a slider attached that you can use to adjust values.   You enter Simulation Setup and SyntheSim mode by clicking on the associated icon in the Toolbar.

23. Reality Checks

Reality check is run by first setting up a simulation and then testing one or more of the reality check equations you have entered. You can start reality check from the toolbar or from the Simulation control dialog. You can make changes and adjust other options just as you would for a normal simulation. After you have done this click on Reality check in the Simulation control dialogue or the button on the toolbar.

Any changes you have made to constant values, data to be used, and so on prior to launching Reality Check will continue to hold throughout the Reality Check session.

24. Level

Levels are also known as stocks, accumulations, or state variables. Levels change their values by accumulating or integrating rates. This means that the values of Levels change continuously over time even when the rates are changing discontinuously. Rates, also known as flows, change the value of levels. The value of a rate is not dependent on previous values of that rate; instead the levels in a system, along with exogenous influences, determine the values of rates. Intermediate concepts or calculations are known as auxiliaries and, like rates, can change immediately in response to changes in levels or exogenous influences.

When constructing a Level and Rate diagram, consider what variables accumulate over a period of time. Another way to think about this: if Time slowed down to zero for your system, what variables would still be nonzero? For example, in the system where you pour water into a glass, the water contained in the glass is the Level. If you froze time, the pouring (a Rate) would stop, but you would still see a quantity of water in the glass (a Level). Once you know what levels you need, enter them first and then connect the rates and auxiliaries. Model building tends to be iterative.

25. Arrow

Arrow tools allow you to create a link between one variable and another. The regular arrow tool creates either a straight curved (arc) link, the Polyline Arrow tool creates a series of line segments for the link, and the Perpendicular Arrow tool creates a series of perpendicular line segments for the link.

26. Rate

The rate tool class contains the Rate tool and the Valve tool. The Rate tools adds a complete rate (a Valve, two arrows and Clouds if necessary), while the Valve tool adds just the Valve. Rates and valves are used to represent flows of materials into and out of levels.

To use the Rate tool, click on the variable you want to represent a flow out of, then move the mouse to the Level variable you want to represent a flow into and click again.

27. Sketch Tools

Sketch tools are grouped into a Sketch toolset. Vensim PLE and, PLE Plus have only a built in Sketch toolset, but the other configurations allow you to choose and modify your Sketch toolsets by adding, moving and changing the actions of the different tools. Customized toolsets can be saved to files and reopened for later use. The built in Sketch toolset (*default.sts*) contains most of the Sketch tools needed for building models.

Vensim PLE and PLE Plus do not contain the Model Variable, Merge, Unhide Wand or Hide Wand tools.

For the other configurations the Sketch tools can be configured by clicking with the right mouse button on the tool and changing its options. If you change a tool's configuration, you will be asked whether you want to save the Sketch toolset when exiting Vensim.

 Clicking **Yes** overwrites the old toolset. Clicking **No** keeps, the old toolset (you will lose your changes). Clicking **Cancel** allows you to use the **Tools** menu to save the toolset with a new name before exiting. There is no limit to the number of toolsets you save, but most users find it simplest to use one sketch toolset configured to their needs.

The Sketch tools in the built in Sketch toolset are:

- Lock – sketch is locked. Pointer can select sketch objects and the Workbench Variable but cannot move sketch objects.
- Move/Size- move, sizes and selects sketch objects: variables, arrows, etc.
- Variable-creates variables (Constants, Auxiliaries and Data).
- Level-create variables with a box shape (used for Levels)
- Arrow-creates straight or curved arrows.
- Rate-creartes Rates consisting of a variable, perpendicular arrows, a valve and, if necessary, sources and sinks
- Model Variable-adds an existing model variable and the causes of that variable to the sketch view
- Shadow Variable-adds an existing model variable to the sketch view as a shadow variable (without adding its causes).
- Merge-merges two variable into a single variable, merges Levels onto existing clouds, merges Arrows onto a variable to split an Arrow, and performs other operations.
- Input Output Object-adds input Sliders and output graphs and tables to the sketch.
- Sketch Comment- adds comments and pictures to the sketch.
- Unhide Wand- unhides (makes visible) variables in a sketch view.
- Hide Wand- hides variables in a sketch view.
- Delete- deletes structure, variables in the model, and comments in a sketch.
- Equations- creates and edits model equations using the Equation Editor
- Reference Modes- use to draw and edit reference modes

28. Build windows

Build Windows are used to create models in Vensim. By default, they open with the Sketch tools for sketching the structure of the model and for writing equations. The Status Bar provides buttons for modifying the sketch. Except in PLE models can be built from several different sketches or sketch views. Each sketch view shows a part of the model, much like each page in a book tells part of a story. In Vensim Professional and DSS, the Build Window can be switched to a Text Editor for building and editing text-based models. The Status Bar then switches to a text-editing version.

29. Output windows

Output Windows are generated by clicking on an Analysis tool. The Analysis tools gather information from the model and display the information in a window as a diagram, graph, or text, depending on the particular tool. Dozens of these windows can be open simultaneously, and a particular window can be closed individually by clicking the **Close** button in the top left or top right corner, or all windows can be closed at once using the menu item **Windows>Close All Output**.

30. Control Panel

The Control Panel allows you to change internal settings that govern the operation of Vensim, such as which Workbench Variable is selected or what Datasets are loaded. The control panel groups controls in six tabbed folders (five in Vensim PLE and PLE Plus). Select a particular control by clicking on the appropriate tab at the top of the window.

- Variable- allows you to choose a variable in your model and select it as the Workbench Variable.
- Time Axis-allows you to change or focus the period of time over which Analysis tools operate.
- Scaling- enables you to change the scales of output graphs.
- Datasets- allows you to manipulate the stored datasets (runs).
- Graphs –brings up the Custom Graph Control.
- Placeholders-is a control that sets Placeholder Values (Not PLE or PLE Plus)

31. Lock Sketch

Locks the mouse to sketching only.

32. Variable

Allows you to choose a variable in your model and select it as the Workbench Variable.

Graphical Output Function Icons

33. Causes Tree

Creates a tree-type graphical representation showing the causes of the Workbench Variable.

34. Uses Tree

Create a tree-type graphical representation showing the uses of the Workbench Variable.

35. Loops

Displays all the relationships that a Workbench variable has to other variables. Displays a list of all feedback loops passing through the Workbench Variable.

36. Document

Reviews equations, definitions, units of measure, and selected values for the Workbench Variable.

Document All

Reviews equations, definitions, units of measure, and selected values for all the variables of that particular model.

37. Causes Strip

Displays simple graphs in a strip, allowing you to trace causality by showing the direct causes (as shown) of the Workbench Variable.

38. Graph

Displays behaviour in a larger graph than the **Strip Graph**, and contains different options for output than the **Strip Graph**.

39. Table

Generates a table of values for the Workbench Variable.

40. Table Running Down

Table with time running down.

41. Run Comparisons

Compares all Lookups and Constants in the first loaded dataset to those in the second loaded dataset

Display of Variables in the Model

42. View Window

Large models can be presented more clearly in multiple views than in a single view. Views can be thought of as similar to pages of a book, each page telling a portion of the story. Each view displays a sketch and is connected to one (or more) of the other views through variables or shadow variables. Multiple views allow models to be broken into sectors, such as production, financial, customer and so on

Text Types

43. Font types; bold; italics; underline; strike through; shape; colour on text; colour on box; set surround shape on variable; shape on box; colour on selected arrow; arrow width; polarity on selected arrow; push highlighted word to background

3. BASIS FOR DEVELOPMENT OF SEB CIS –DRR MODEL

Setting the scene

Studies have shown that nearly 100% of natural disasters in Africa are triggered by extremes in the climate system: droughts, floods, tropical cyclones, storms, etc. Disasters themselves occur when there is no adequate advance warning on impending climate risks which often intersects with vulnerability of communities as they make them less vulnerable. There is need to invest in capacitating nations to develop Climate Early Warning Systems. In order to assess the value of CIS in DRR, it is, therefore, logical and instructive to apply causal relationships between CIS and DRR. This will form the basis of generating models that can be used in benefit-cost-analysis which will inform policy makers on the viability of investment in CIS for the purposes of DRR, among other sectors. In this regard, it is important to note that the latter of which has several generally interrelated indicators: decimation, disruption of transport networks and power generation, health challenges, etc. With requisite data or proxies of data there are possibilities to develop CDLs from the CIS and the various indicators in DRR.

Data sources and formats

Data on DRR indicators and climate parameters are obtained from primary and secondary sources. These are conveniently formatted for processing.

Theoretical formulations (CDL)

As stated above, CIS has nearly one-to-one relationships in disasters. So it is instructive to develop the SEB model as it relates to CIS and DRR. This requires the appropriate construction of CDL from which when the SEB model is run the outputs mimic real life conditions. This is necessarily quite an elaborate process: scenarios of different simulations should enable a realistic assessment of impacts of different policy interventions. So the design of the CDLs has to be as comprehensive as possible. In the particular model, climate impacts on disaster indicators are enumerated.

4. DESIGN OF SEB MODEL FOR CIS-DRR

The SEB model for CIS-DRR is set up to assess climate impacts of adverse weather events within and across various economic sectors (and actors). The model consists of multiple sketches, each capturing a specific element of the total model (e.g. agriculture production, livestock, health care, etc.). The list of sectors included in the model can be accessed in the bottom left of the Vensim software, as illustrated in Figure 4.2. To visit the different sectoral sketches, simply click on the name of the respective sector. At the point of the screenshot, we are in the "DRR Interface" sketch.
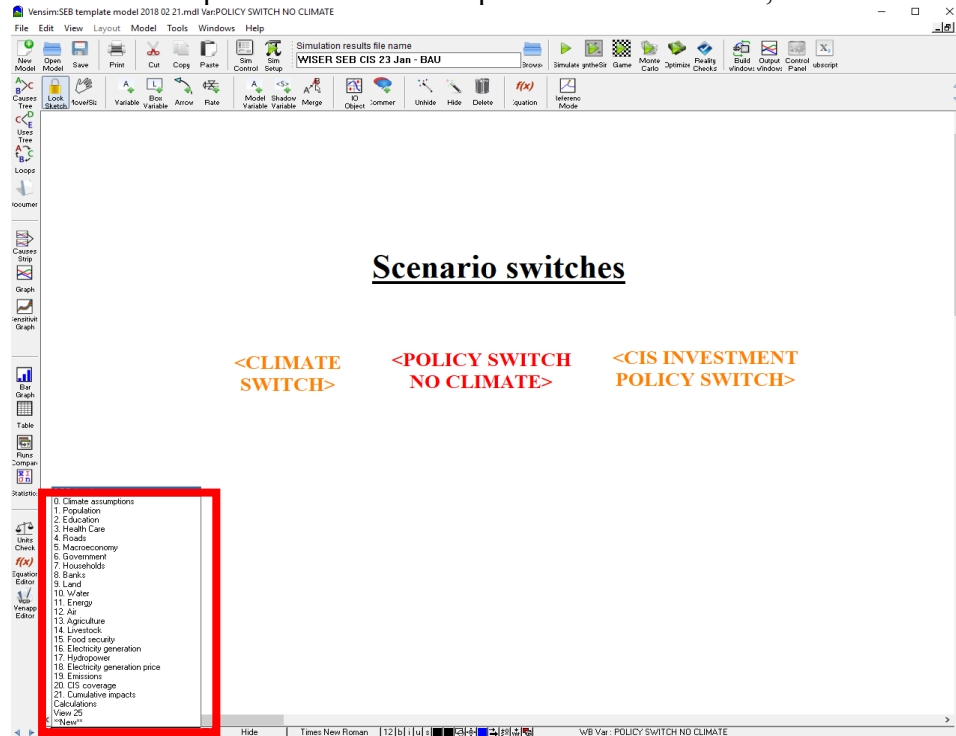
Figure 4.2: Overview of sectors in the CIS DRR model

Climate impacts, and the impacts of DRR interventions, are captured in the respective sketches where the impacts occur. All climate impacts and climate related variables are highlighted in pink in the model structure throughout the model. Figure 4.3 provides an overview of how the variables used to simulated climate impacts (in this case on productive agriculture land) are represented.
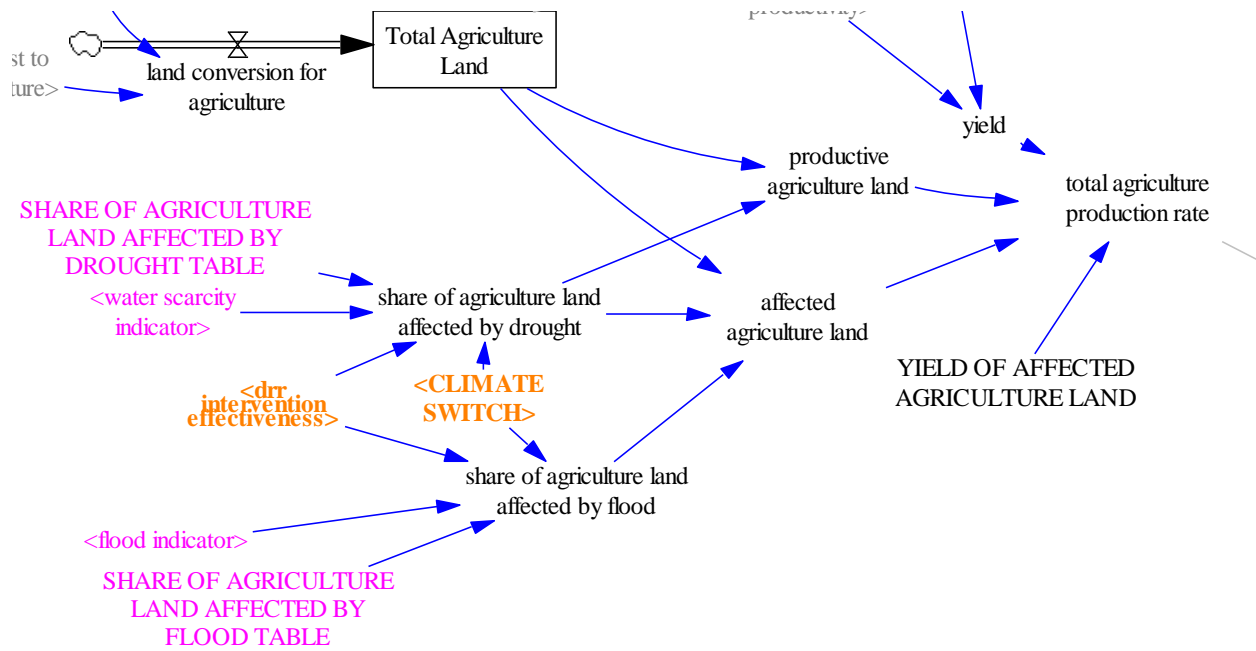
Figure 4.3: Illustration of climate impacts in the model structure

Climate impacts depend on precipitation values and the respective tables that have been derived from the available data set (Bradwell reference). The approach for calculating the parameters to capture climate impacts in the CIS DRR model is outlined in the main report. Figure 4.4 shows the lookup function of the variable "Share of agriculture land affected by flood table" for illustration purposes.
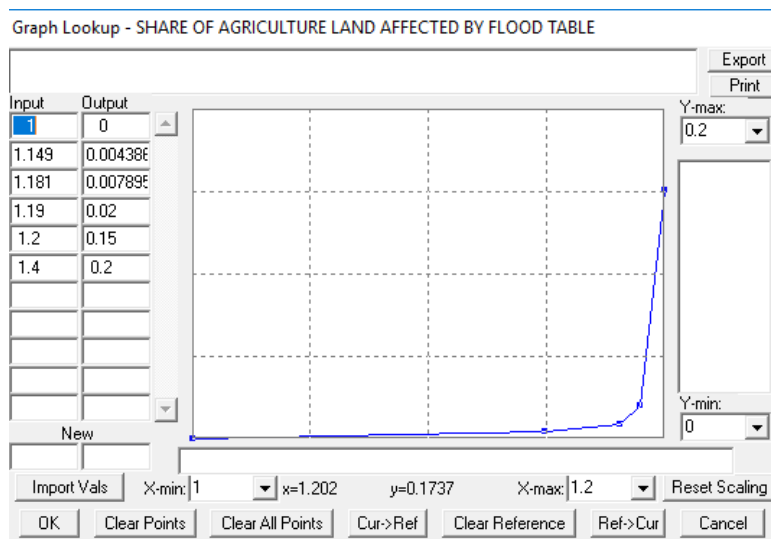

Figure 4.4: Illustration of the graphical function used to simulate climate impacts on agriculture land

The lookup functions (or table functions) can be accessed by following the following three steps, as illustrated visually in Figure 4.5.

1) Click on the equation editor tool above the sketch viewer and click on the variable of interest to you. A window will open that contains the values of the table as defined by the user.

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2) Click on "As Graph" in the equation editor to access the lookup function and obtain a graphical representation of the table function

3) This window illustrates the lookup function for the variable of interest, in this case "Share of agriculture land affected by flood table". In this window, parameter values can be edited, which should be done with care. The current values are based in empirical data, and changing these values can have a significant impact on the simulations results.
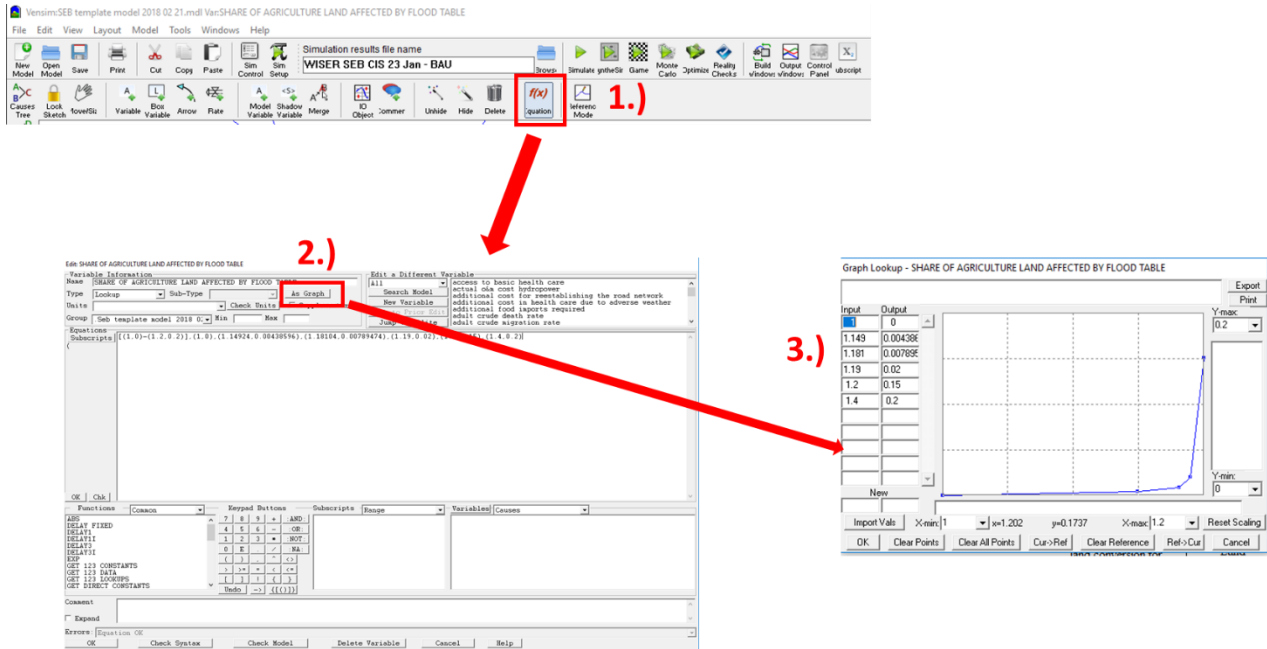
Figure 4.5: Steps to access lookup functions in the CIS DRR model

5. SETTING SCENARIOS

The current version of the model can be used to run the following four scenarios:

BAU

CLIMATE

NO CLIMATE

CIS

Policy switches in the "DRR Interface" sketch are used define the scenario to be simulated. A policy switch is a variable used in several places in the model to "switch" effects or impacts on and off. A policy switch variable is active if it has the value "1", and inactive if it has the value "0".

The following three steps are necessary to define the scenario to be simulated, as illustrated in Figure 6.1:

1) Click on the equation editor tool in the task bar of Vensim.
2) Open the equation editor of the policy switch that you want to edit.

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3) Change the value from "0" to "1" to activate a switch, and from "1" to "0" to deactivate a switch. After changing the value click on "Ok" in the bottom left of the window to save the changes.
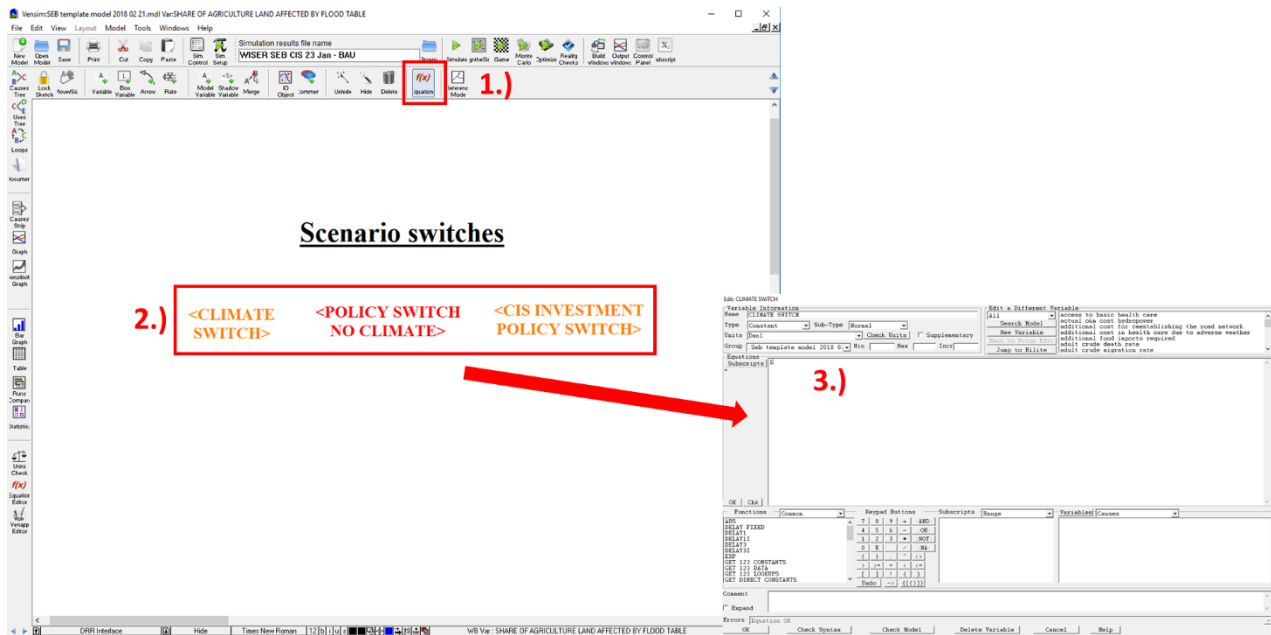
Figure 6.1: Steps to define scenarios

Table 5.1 provides an overview on the required parameterization of the policy switch variables, in order to simulate each of

Scenario	Climate switch	Policy switch no climate	CIS investment policy switch	Comments
BAU	0	0	0	Business as usual scenario, without climate impacts.
Climate	1	0	0	Business as usual scenario, with climate impacts and 30% CIS coverage assumed.
No Climate	1	1	0	Reference scenario with the same parameterization as the CIS scenario, but without CIS coverage (0%).
CIS Investment	1	0	1	Policy scenario in which investments in CIS increase CIS coverage to a desired level (here 100%), starting from 2020. Full coverage is reached around 2040.

Table 5.1: Parameterization of policy switches for defining scenarios in the CIS DRR model

6. SIMULATIONS OF MODEL

The two steps required to run a scenario are illustrated in Figure 6

1) Enter a name for the scenario that you want to run in the field under "Simulation results file name". This is the name under which the scenario will be saved on the same folder as the model.

2) Click on "Simulate" to simulate a scenario. If you accidentally forgot to change the file name before running a new scenario, Vensim will ask whether you want to overwrite the old simulation. If you want to overwrite it, click on "Yes", otherwise you can change the file name first and then click on "Simulate" to run the scenario.
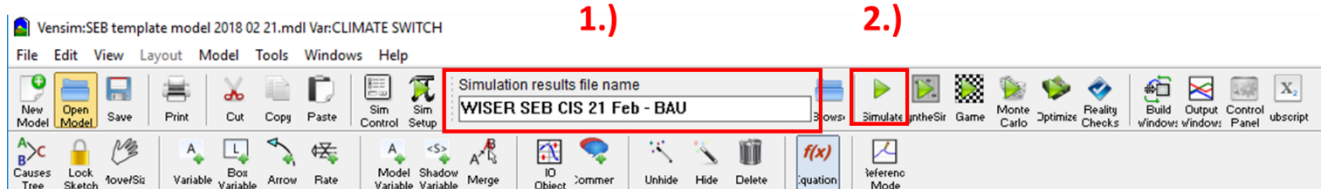
Figure 7: Steps to name and run a scenario in Vensim

7. STEPS TO SUCCESSFULLY RUN THE SEB MODEL IN CIS FOR DRR WITH EXAMPLES OF OUTPUTS

Taking into account the theoretical steps above; there is need to follow the steps below in order to build and run the model in practice. For Advanced Modelling, you need Vensim PLE Plus, Vensim DSS and Vensim Pro because you can use arrays in the equation editor. Vensim Model Reader is just for running models, it does not have the capabilities to designing models. The Model Reader can however read arrays.

To start building the model, you **double click** on the Vensim Icon and there will be a blank model that appears. It prompts you to enter the time axis, depending on what model you want to build. After you set the time step, the model will appear as in Figure 7.1, below:
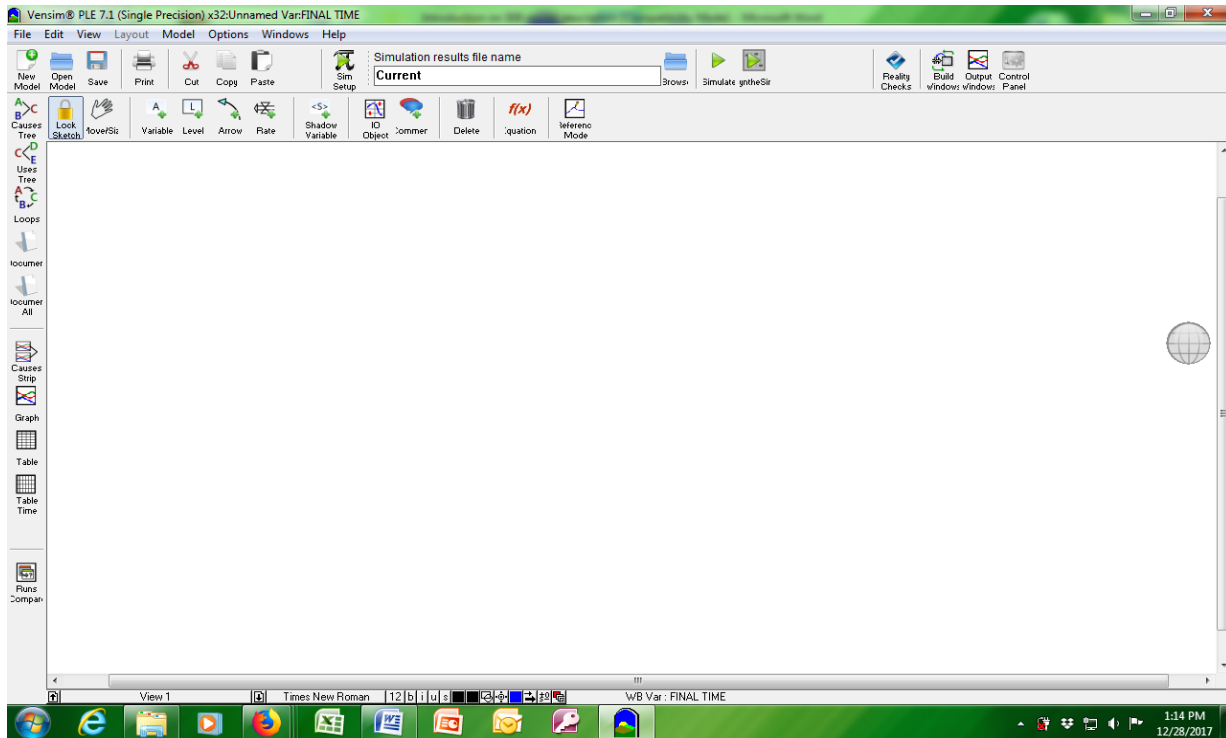
Figure 7.8: Vensim Page after double clicking on icon.

After Vensim is open, you use the toolbar to construct your **stock and flow diagram** or Causal loop diagram. It should look like in in Figure 7.2 below when fully constructed.
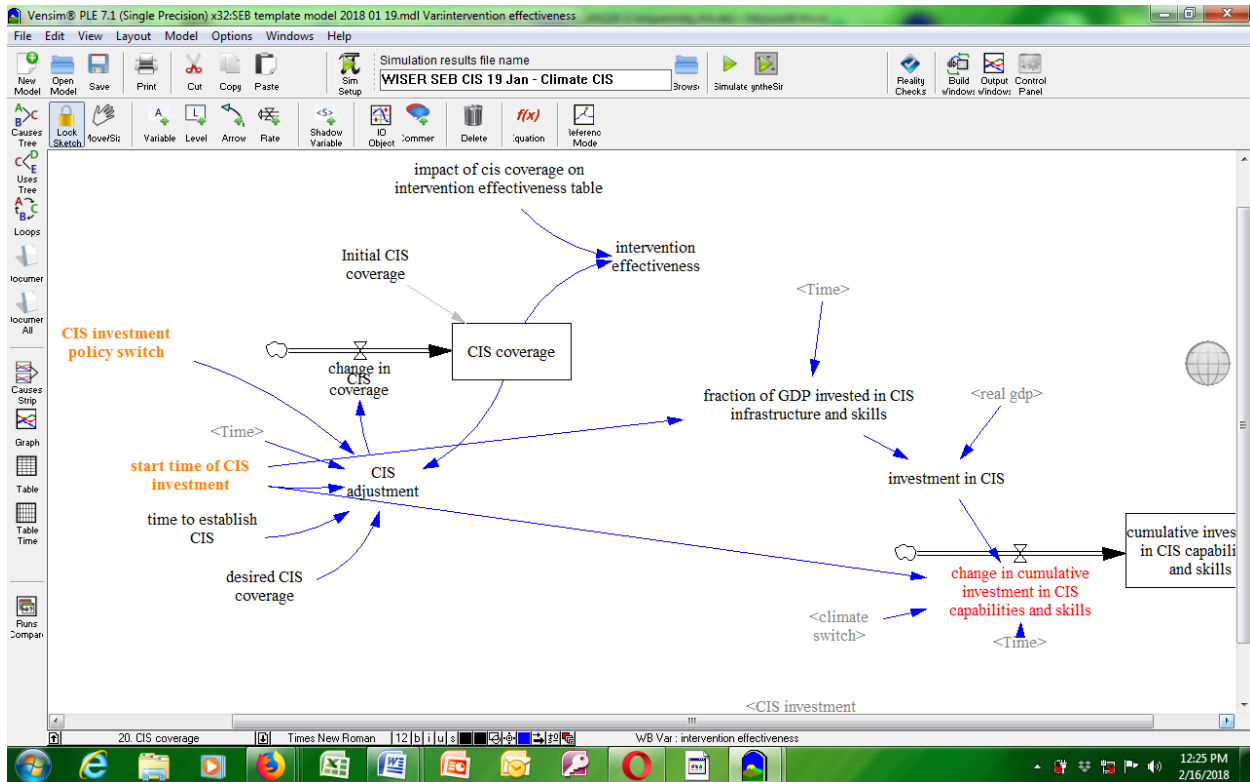
Figure 7.2: Complete Causal Loop/Stock and Flow Diagram.

After constructing your diagram, you have to **click on each variable to enter equations** which match the variables surrounding it. You do this by clicking **the f(x) tool** first then the variable for which you want to write the equation. Once you click on both the equation editor pops up as shown in Figure 7.3 below:

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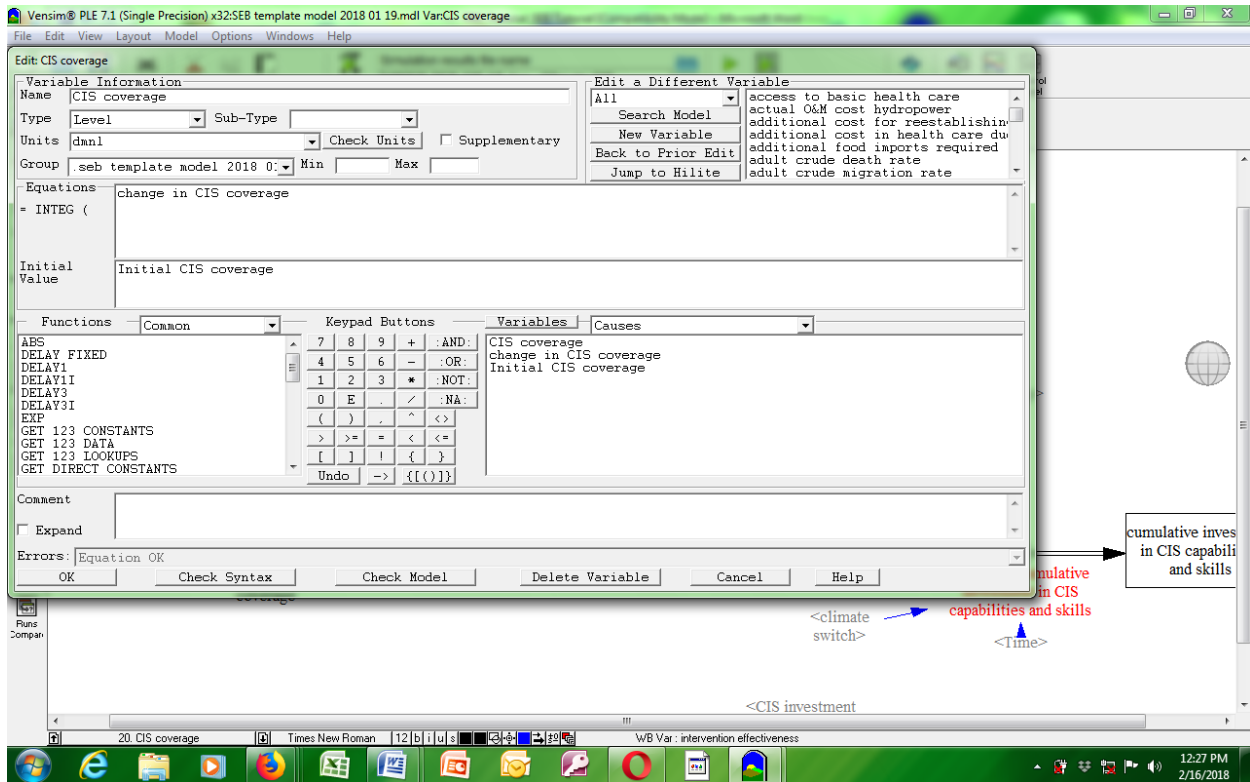
Figure 7.3: Equation editing dialog box.

This is where you write the equations for your variables, one at a time. Once you finish entering equations for all the variables, click on **Check Model**. If there are errors, it shows you at the bottom of the **equation editor** where it says **errors.** The variables that have errors are also highlighted in black as shown in Figure. 7.4, below:

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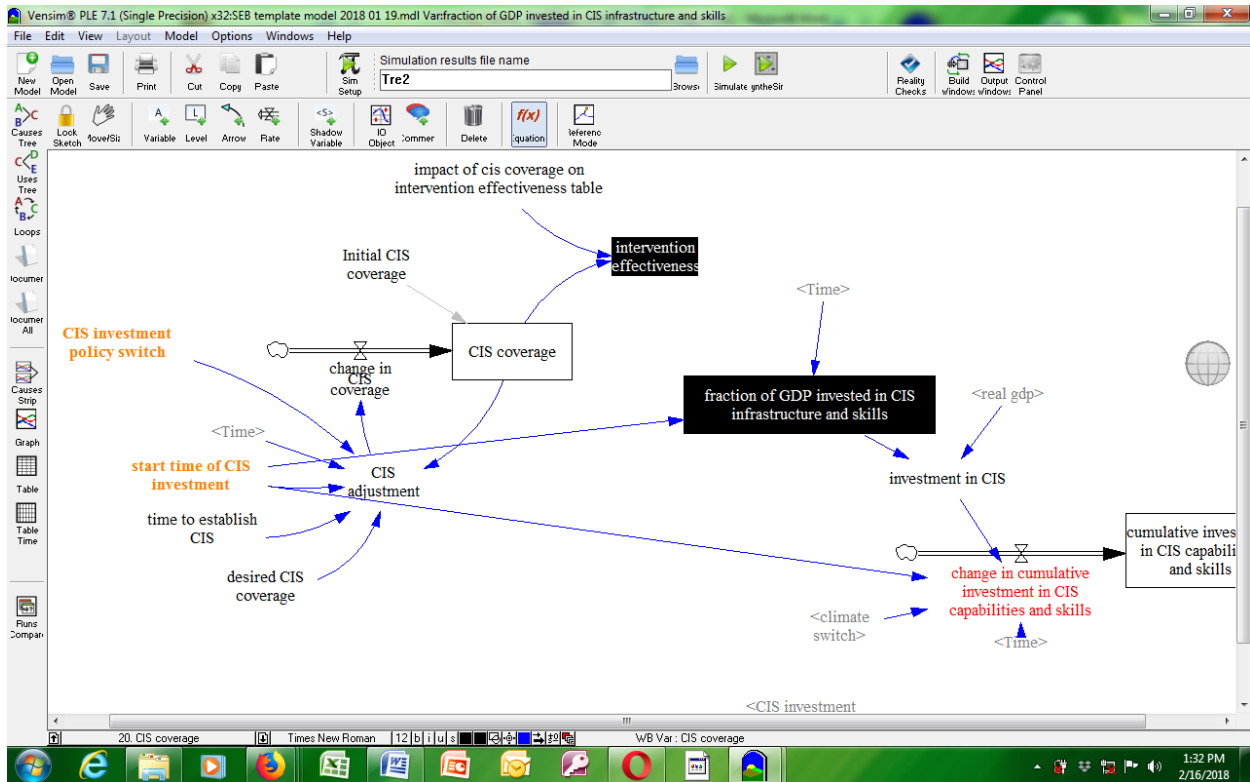
Figure 7.4: Screen showing variables with incomplete/or wrong equation.

If there are **no errors**, it says Model/Equation OK and also no variables will be highlighted on the screen. The Model is ready for simulation at this point.

Name your Model in the simulation results file name field and **click on simulate**. After simulating click on the output window and select the datasets that you want simulation results for as in Figure 7.5, below:
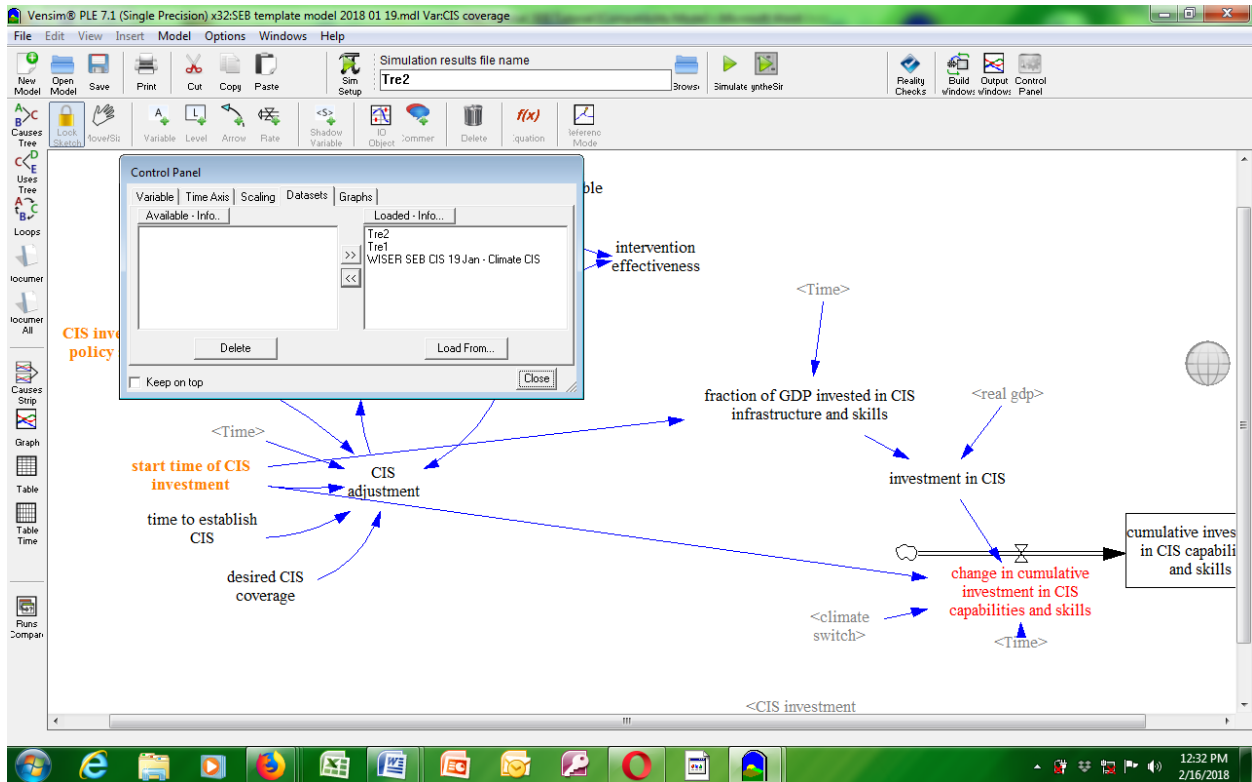
Figure 7.5: Datasets dialog box.

After selecting the data set(s) click on load form and you can start seeing simulation results by using the output windows located at the left side of the Model. For this tutorial we will use the rate change in cis coverage. Let's click on it and it should be highlighted and your screen should look as in Figure 7.6, below:
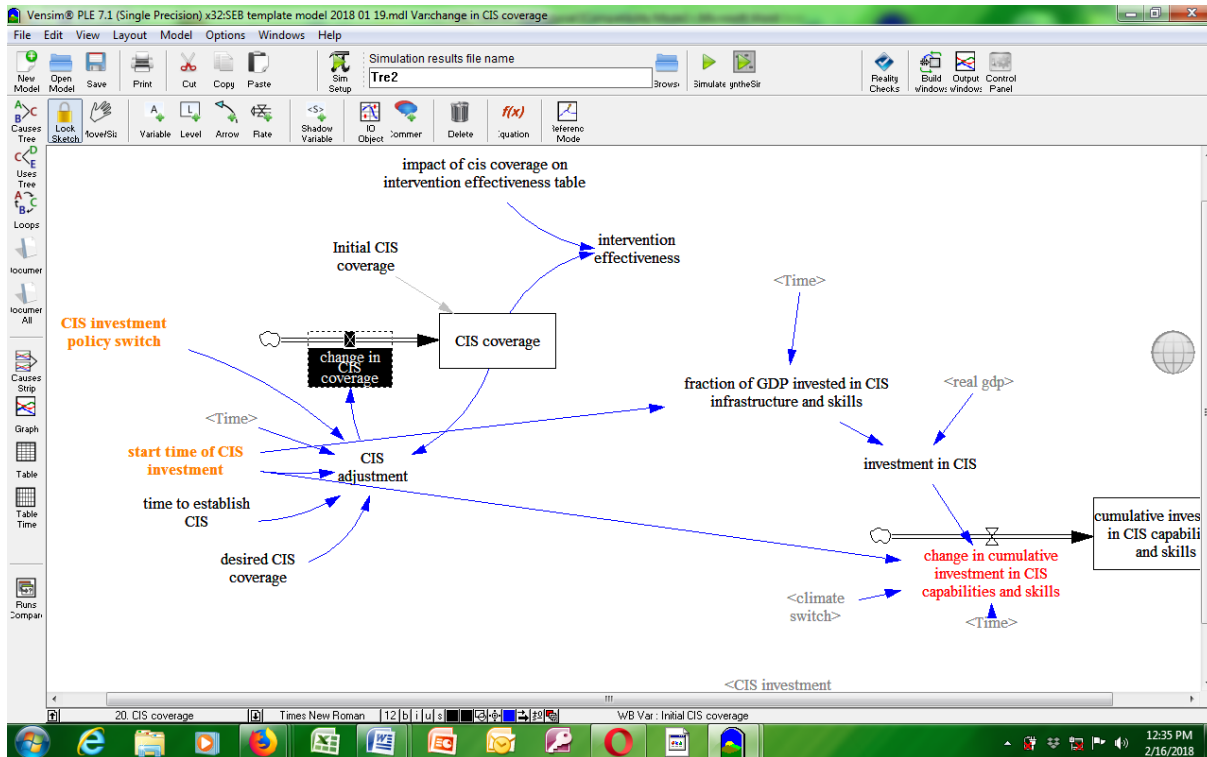
Figure 7.6: Highlighting a workbench variable.

We can now click on any of the **outputs toolbars** to view **simulation results**. Let us use graph as a first example. Click on graph and it should reflect the result as in Figure 7.7, below:
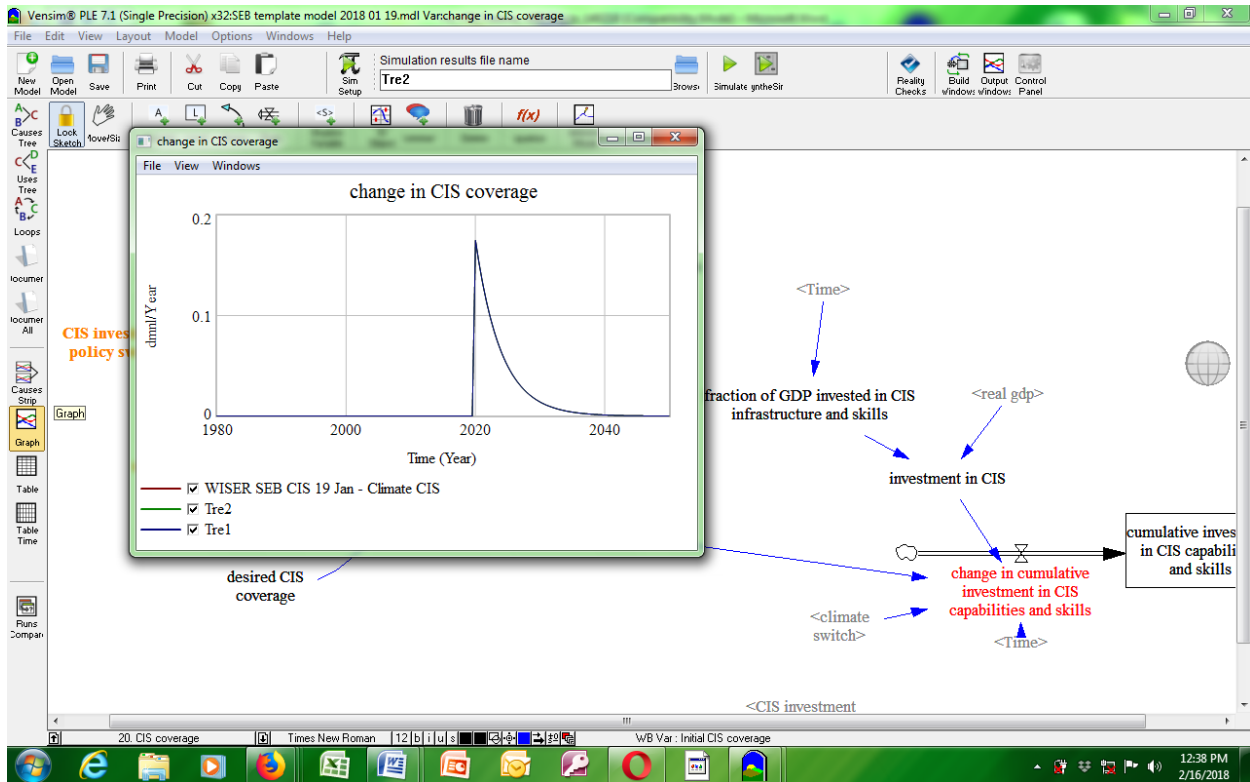
Figure 7.7: Graph output window.

It predicts the behaviour of that variable for the next 22 years based upon the historical data entered into the **Model** by the **Builder**.

The next examples we will use are: Table, Causes Tree, Uses Tree, Loops, Causes Loops, Document, Document All, Causes Strip, Table Time, Runs Comparison; and they will be accompanied by diagrams:

1) **Table**
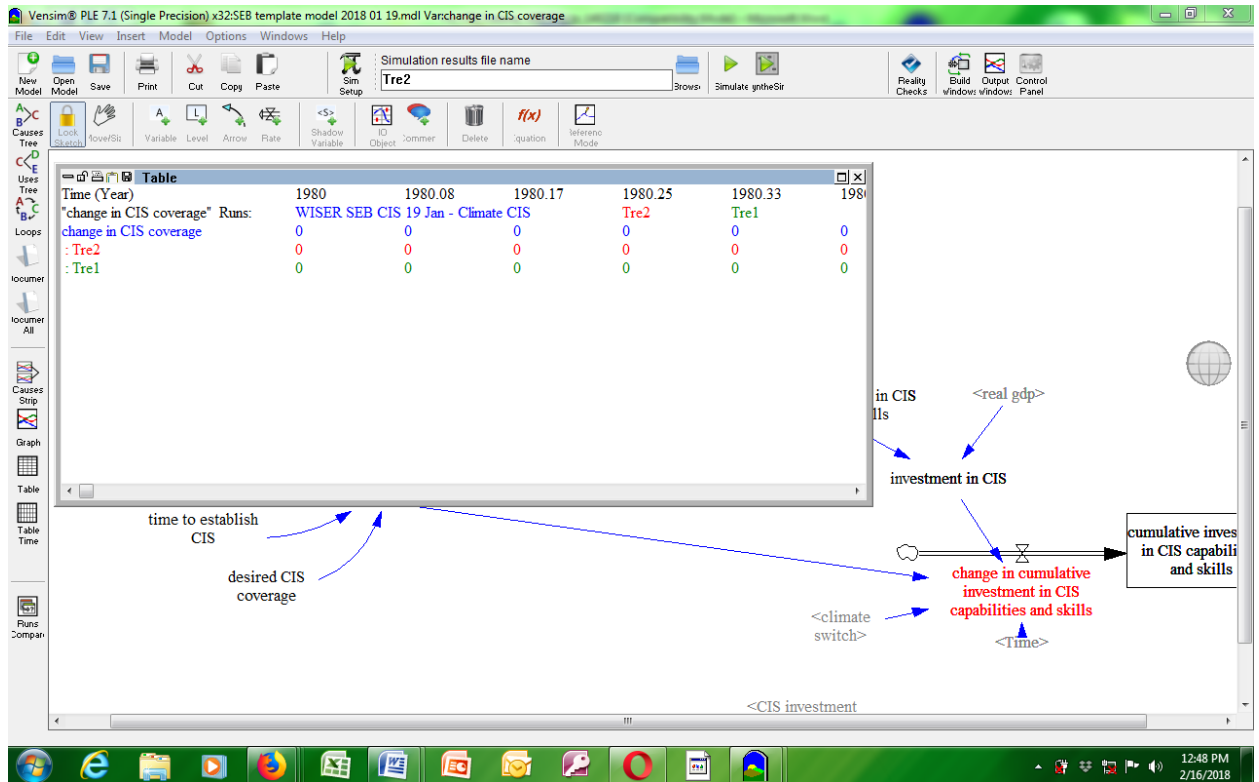
Figure 7.8: Table output window.

2) Causes Tree
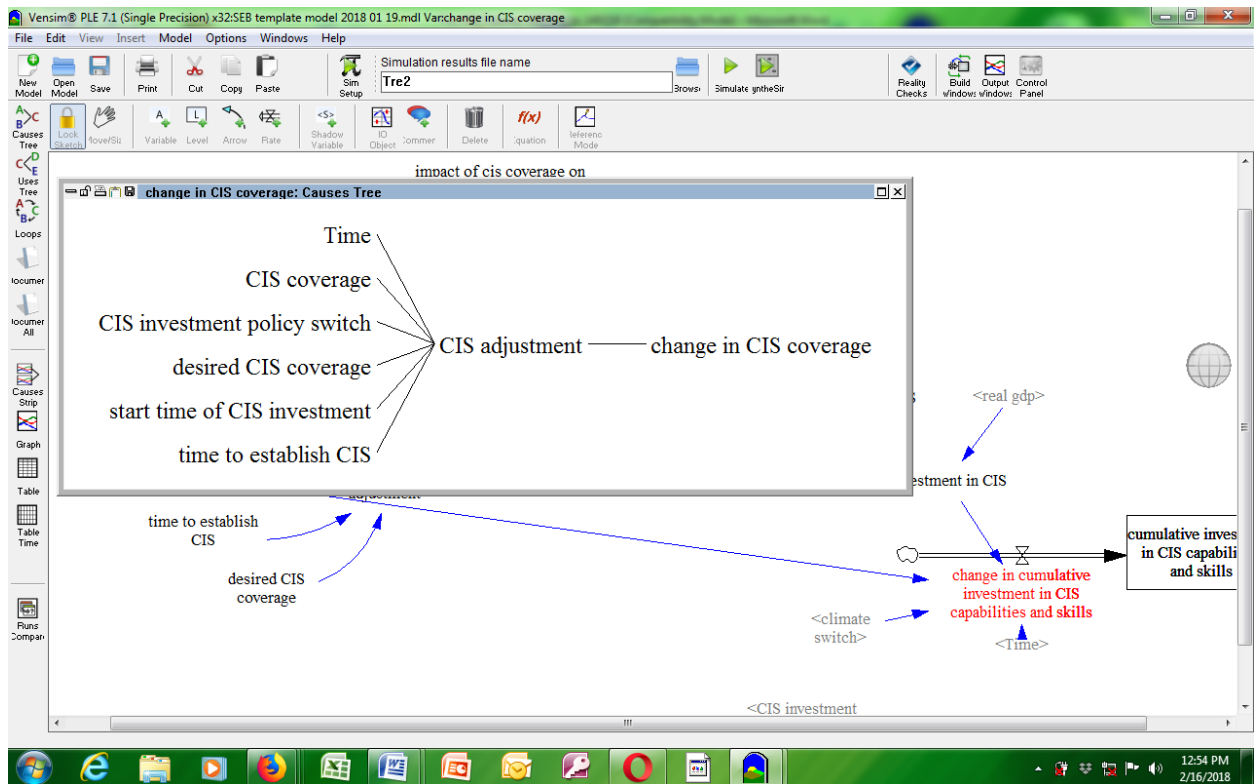
Figure 7.9: Causes Tree output window.

3) Uses Tree
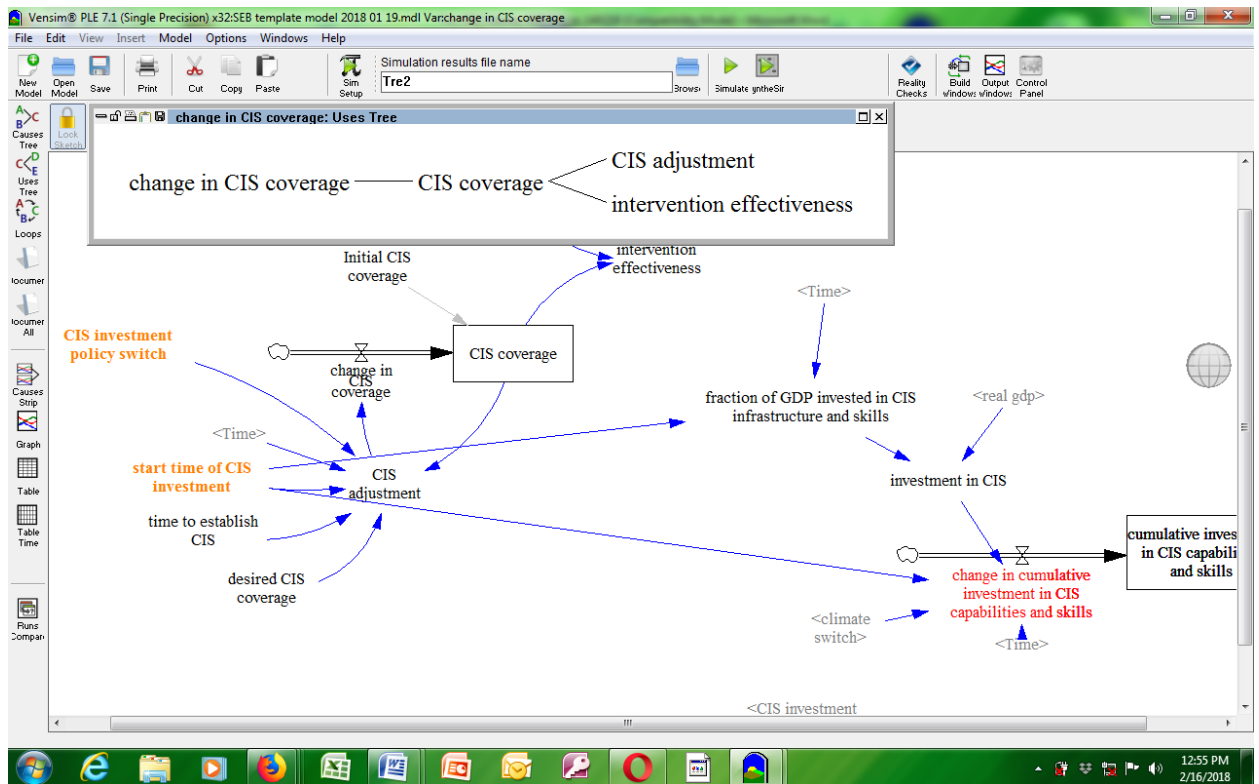
Figure 7.10: Uses Tree output window.

4) Loops
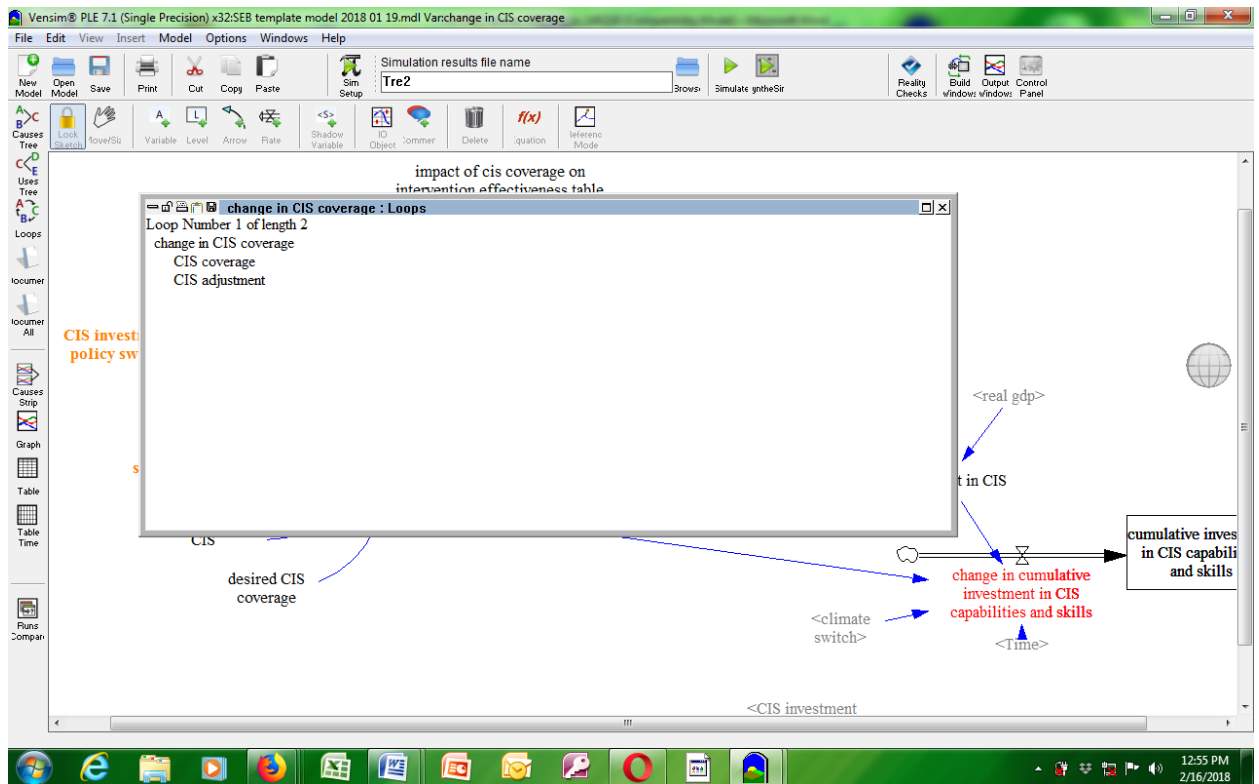
Figure 7.11: Loops output window.

5) **Document**
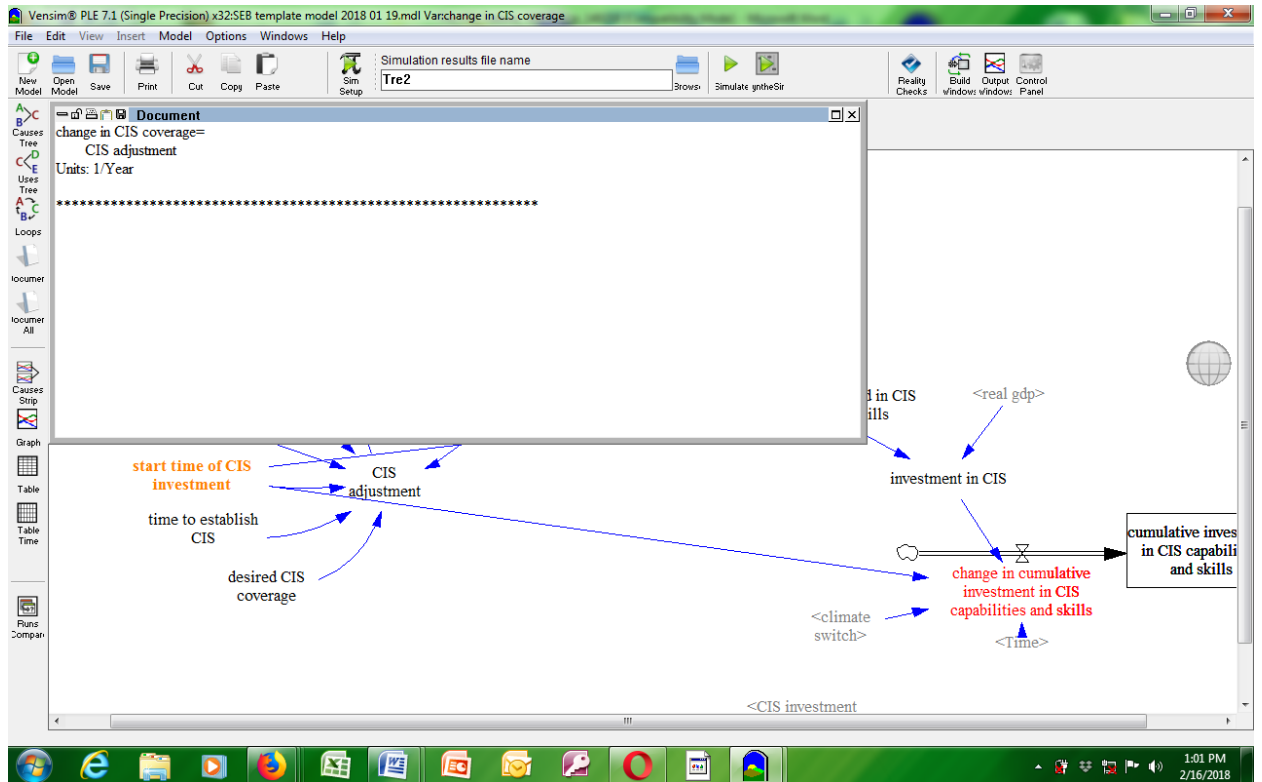
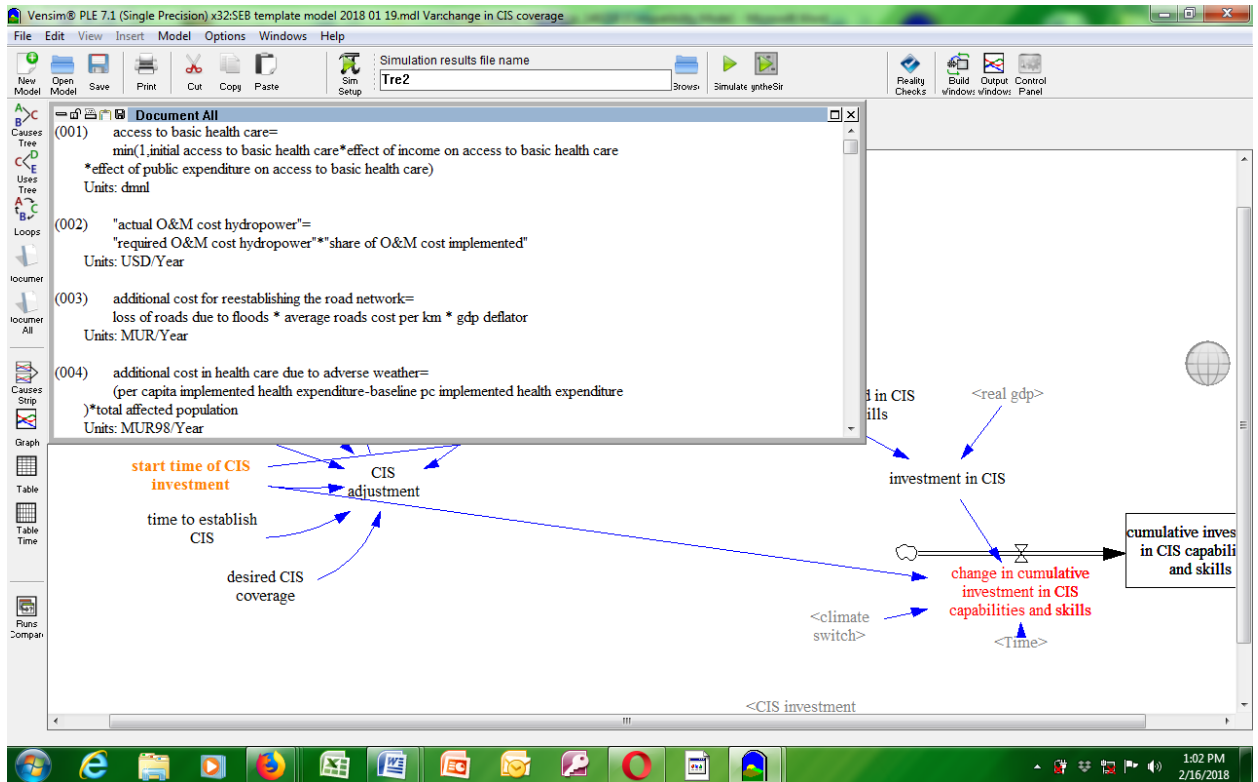Figure. 7.12: Document output window.

6) Document All

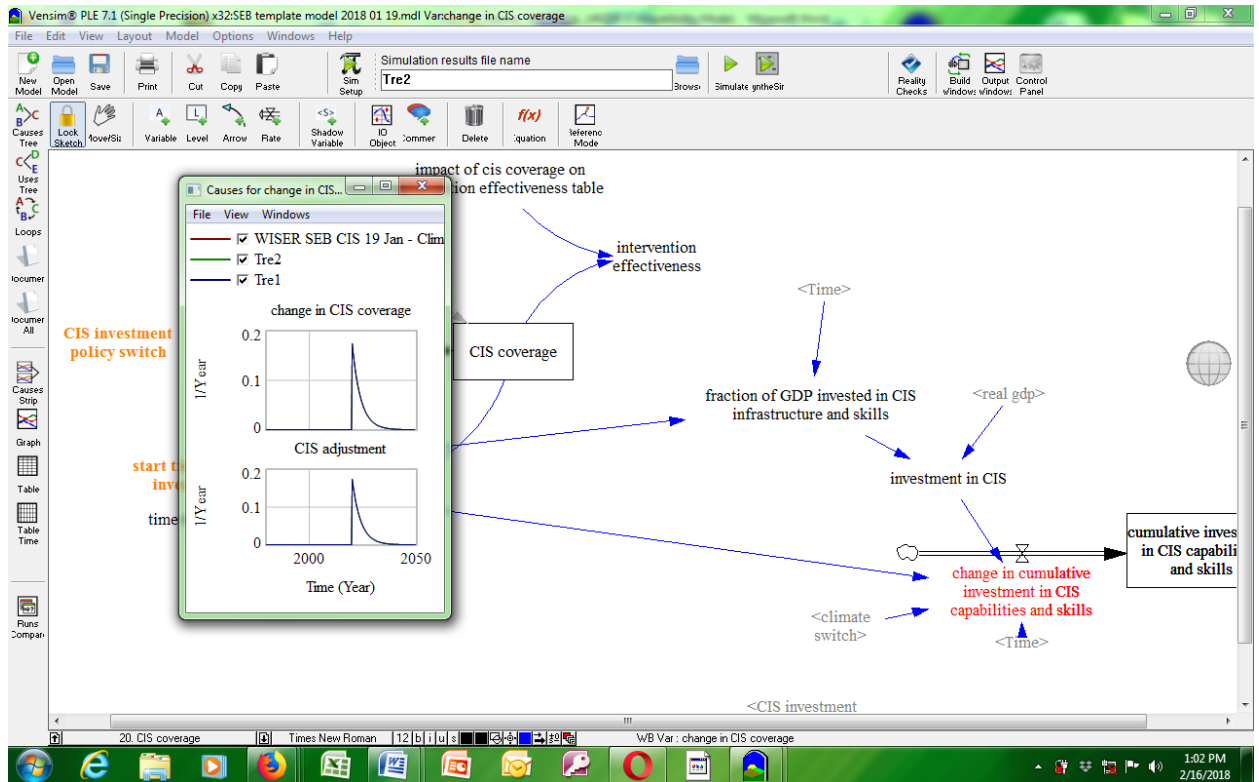Figure. 7.13: Documents All output window.

7) Causes Strip

Figure. 7.14: Causes for Change output window.
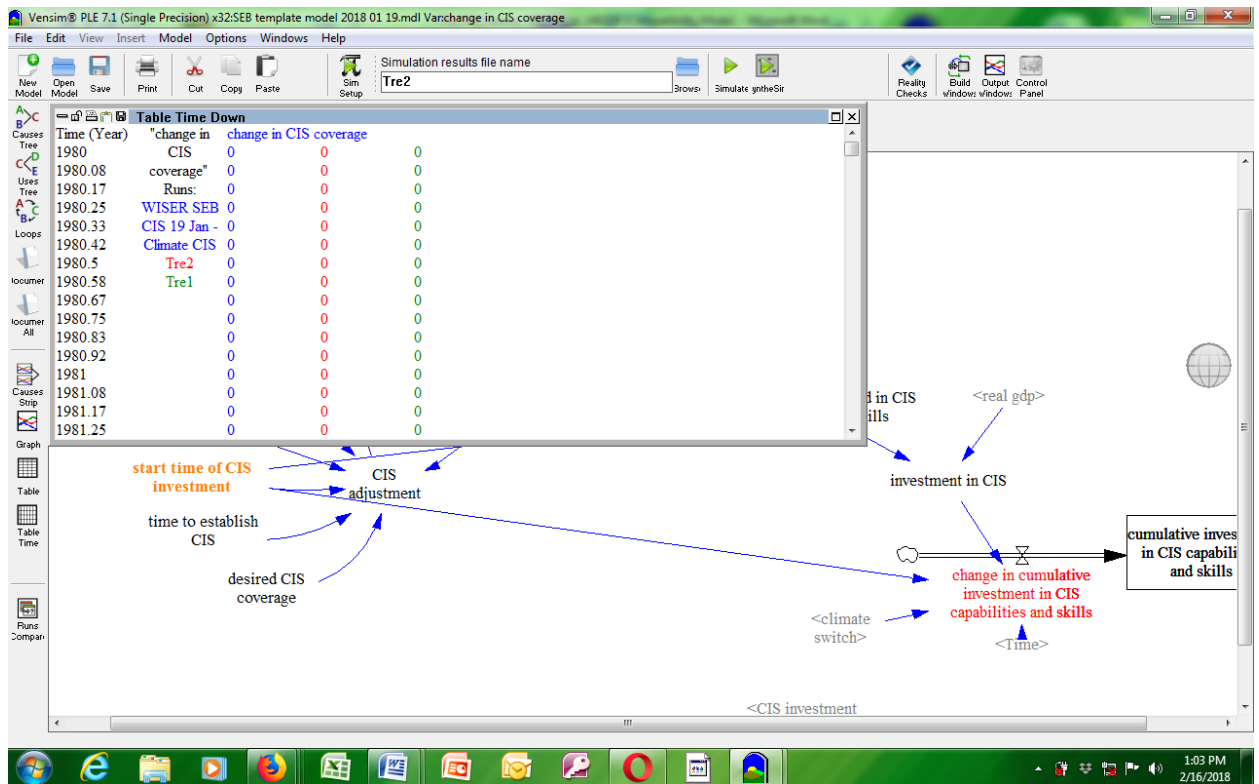
8) Table Time

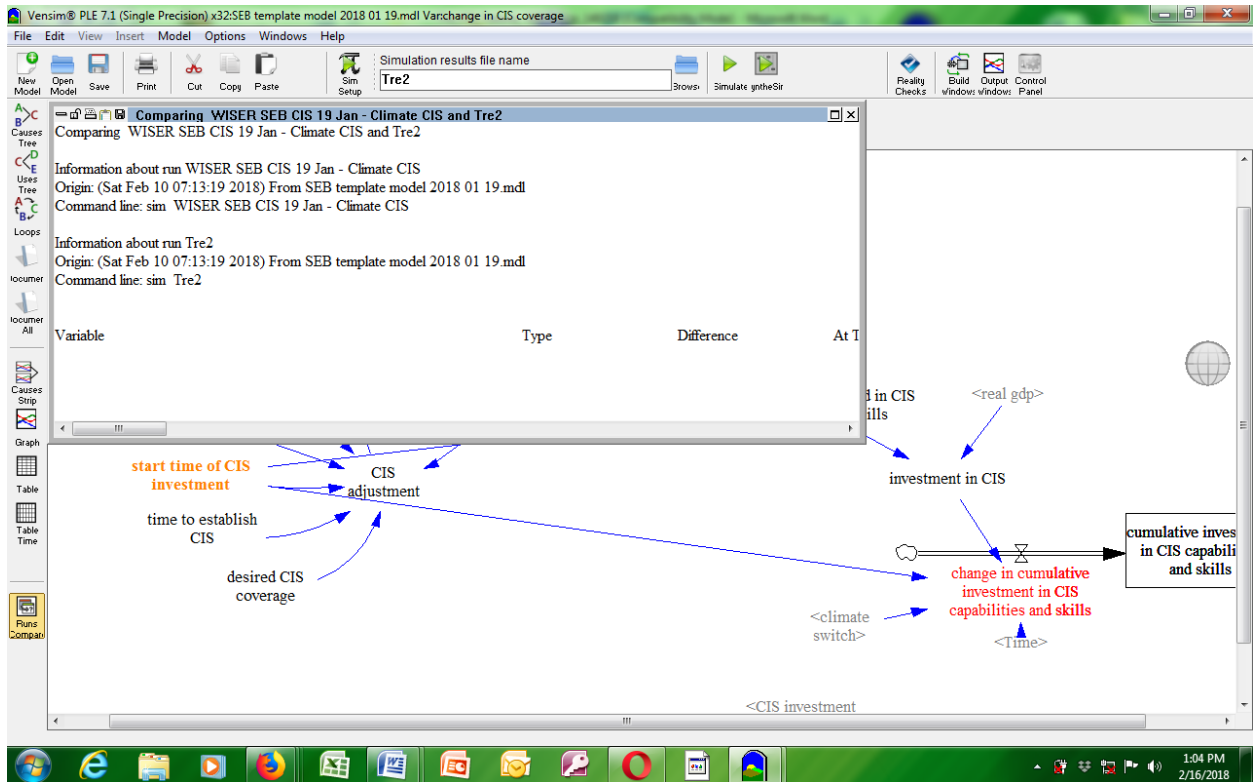**Figure 7.15: Table Time output window.**

9) Runs Comparison

Figure 7.16: Runs Comparison output window.

It is also possible to view **two or more outputs at the same time**. If you click on an output and not close it and you click on another output. The second one will super impose the first output. Therefore, it is possible to view two outputs or more on the same screen by resizing the windows using the mouse. An example is as in Figure 7.17, below:
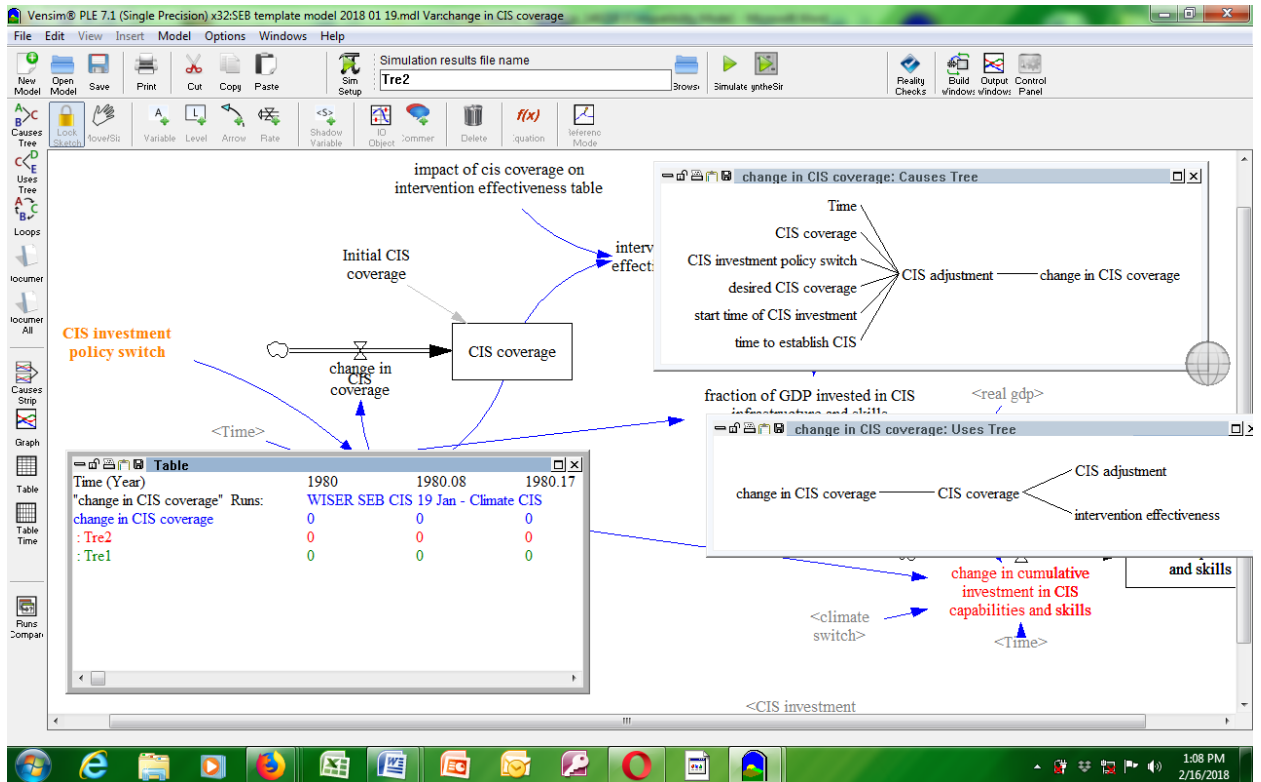
Figure 7.17: Multiple outputs view window.

You can use the SyntheSim Function to view your results in real time i.e. sliding the variables from left to right i.e. **increasing or decreasing** them. The SyntheSim results will appear in red and your default simulation in black, see, Figure 7.18 below:
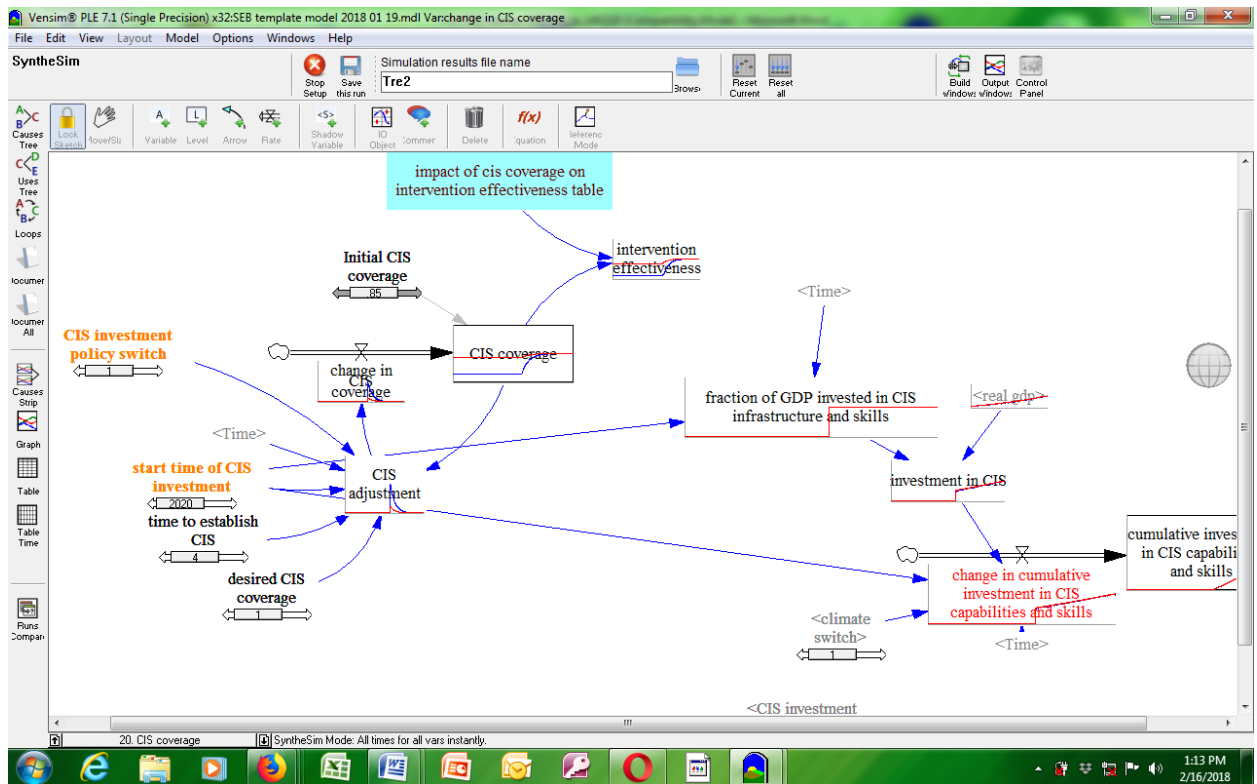
Figure 7.18: SyntheSim view output window.

EXAMPLES OF OUTPUTS FROM SCENARIOS
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Model output validation

Comparison of simulation wit/h data on events and impacts were done up to 2018. Many simulation outputs from Model show good correspondences with real data where these are available. For instance, Figure represents the number of extreme adverse weather events that occurred between 1980 and 2015. Between 2000 and 2015, the model indicates a flood event almost every other year, and 3-4 severe drought events (including some minor drought events) in both scenarios, which is consistent with the frequency and impacts indicated in the dataset (UNISDR: 2017: web page link- http://www.desinventar.net/data_sources.html). According to the data UNISDR: 2017: web page link- http://www.desinventar.net/data_sources.html), Ethiopia, Mozambique and the Niger experienced between 3 and 5 drought events between 1980 and 2015 with a significant number of people affected.
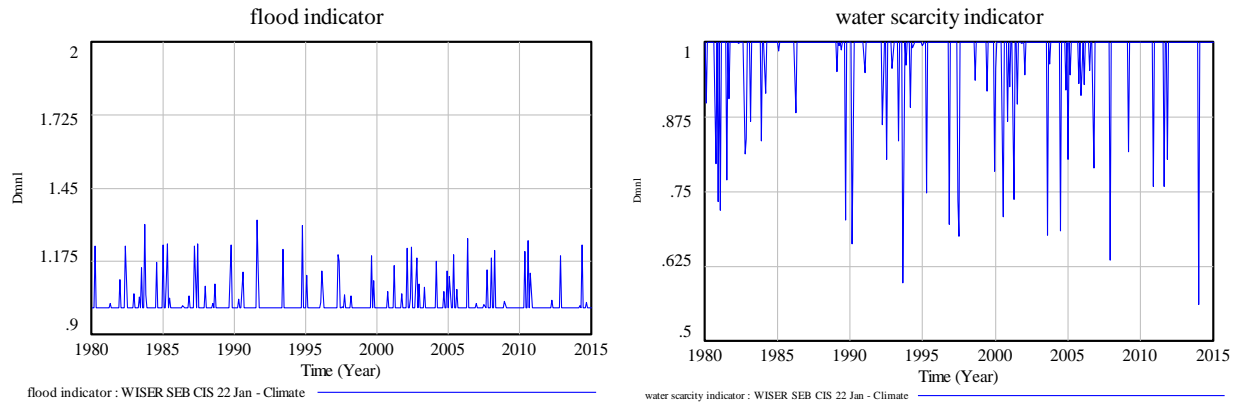
Figure 7.19: Flood indicator and water scarcity indicator 1980 to 2015

8. CONCLUDING REMARKS

The manual presented above is a sum total of efforts seeking to provide the steps that need to be taken in order to run SEB Model as applied to CIS –DRR successfully. It provides an overview of the version of Vensim software used; the theoretical basis of the modelling efforts. There are graphical examples of the steps to be followed and the outputs. It is, however, important to note that any manual is not always cast in stone. As users carry out their work, following the manual, there may find other ways to improve the manual. So this should be an interactive process between developers and users of the manual.

9. ANNEXES

[[[IN T THE   PRESENT VERSION, THE ANNEX HAS DELIBERATELY LEFT WITHOUT ANNEXURES]]]