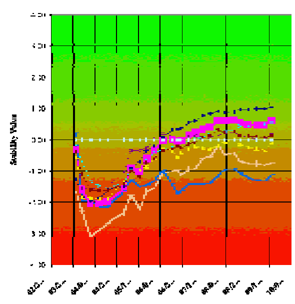
Operations Other Than War (OOTW)
Flexible Asymmetric Simulation Technologies (FAST)
Prototype Toolbox:
ISSM v4.00 Analysts' Guide

What is Victory in OOTW?

ISSM measures it.



OOTW FAST Prototype Toolbox Refinement

Contract Number:
N61339-06-C-0040

Prepared for:
NAVAIR Orlando TSD PJM
12350 Research Pkwy.
Orlando, FL 32826-3275

Prepared by:
Dynamics Research Corporation
3505 Lake Lynda Drive
Suite 100
Orlando, FL 32817

15 December 2006

OOTW FAST Prototype Toolbox:
ISSM v4.00 Analysts' Guide

Authored by:
Dean S. Hartley III

Prepared by:
Dynamics Research Corporation
3505 Lake Lynda Drive
Suite 100
Orlando, Florida 32817
POC: Wayne Randolph

Sponsored by:
Defense Modeling and Simulation Office
1901 N. Beauregard St.
Suite 504
Alexandria, VA 22311

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. BACKGROUND

This document describes the underlying logic of the ISSM model and how to customize the logic in the Preprocessor and Postprocessor. The Analysts' Guide is meant to support a deeper understanding of how the ISSM works. The Users' Guide (OOTW[1] FAST Prototype Toolbox: ISSM v4.00 Users' Guide) provides the instructions for operating the ISSM. The Programmers' Guide (ISSM v4.00 Programmers' Guide, not available to general users) provides code details and notes on modification procedures.

Because the ISSM is implemented as a spreadsheet model in Excel, the user must have a valid copy of Microsoft Excel™ (version 97 or later) installed on his computer.

1.1 GENERAL DESCRIPTION

The acronym ISSM stands for Interim Semi-static Stability Model. The ISSM computes the inferred value of "**civil stability and durable peace,**" given the values of a set of factors within a single geopolitical area. If this inference is viewed in terms of the impact of factors, then it is an instantaneous impact. This is a **static** model, as opposed to a dynamic one, and it is a view of the situation looking from outside of it. Version 1 gave an instantaneous snapshot based on about 30 input variables. By retaining the snapshots over time, it supported a view of trends over time.

Version 2 added a few new nodes and added external intervention variables. These external interventions have the property of producing results at times after their initiations, requiring new logic to introduce the time delays and show the results at the appropriate times. When a change is introduced into a situation, as in an intervention, there is a characteristic lag before any effect is seen and a time interval during which the effect grows to its maximum. These are dynamic attributes hence the "**semi-static**" in the model name. Version 2 also added new graphs to support additional views of the data.

Version 3 added a Preprocessor, a Postprocessor, and a Controller. The Preprocessor allows the ISSM to be tailored to accept locally available data. The Postprocessor allows the ISSM to be tailored to meet a particular commander's Measures of Merit (MoMs). The Controller supports configuration management of numerous versions of the set of ISSM workbooks being used to model excursions or scenario variants.

Version 4.0 added functionality to support automated upgrades. That is, a scenario built in Version 4.0 will support automatic transfer of its data and custom logic to a later version with minimal manual intervention. This functionality provides improved error-checking for the custom logic. Version 4.0 also integrates the DIAMOND custom logic and general custom logic, which had previously required two sets of versions under the umbrella of Version 3.0.

Version 4.0 is as a system of four Excel workbooks, as shown in Figure 1-1. Intervention data is entered directly into the ISSM Main; observation data may be entered directly into the ISSM Main or through the Preprocessor; and the output may be taken from the ISSM Main or the Postprocessor. The Controller is used to ensure coordination among the workbooks containing data for each scenario.

[1] Operations Other Than War (OOTW)

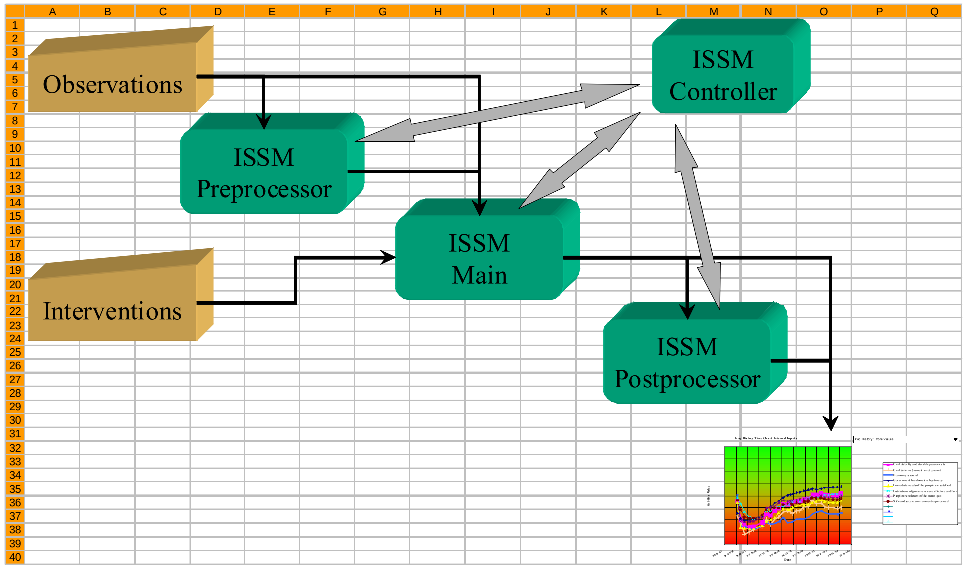


Figure 1-1. ISSM System

The current version of the ISSM system is 4.00; however, each of the workbooks that make up the system has its each version number, as shown in Table 1-1, below.

Table 1-1. Current Version Numbers

Workbook	Version	Date	File Name
Controller	4.00	7/20/06	ISSMControl4_00.xls
Preprocessor	4.01	6/30/06	Preprocessor4_01Blank.xls
ISSM Main	4.03	11/21/06	ISSM4_03Blank.xls
Postprocessor	4.01	6/30/06	Postprocessor4_01Blank.xls

1.1.1 Validity

The underlying model of the ISSM, like any other model, is an approximation. For example, it does not allow for any feedback loops. The assumption is that the results of feedback will be visible to the user and will affect subsequent sets of input data. Further, the connecting logic and mathematics, while plausible and derived from reasonable sources, have not been validated. Hence the "**interim**" in the model name. The structure is sufficiently flexible to permit ease of modification of the mathematical model as the situation warrants.

This model was inspired by the model described in *Doing Windows: Non-Traditional Military Responses to Complex Emergencies*, Bradd C. Hayes and Jeffrey I. Sands, CCRP, 1998. However, nodes have been added; some definitions have been changed; and some connections have been changed. In addition, the connecting logic, while similar, is not identical. Since 2002 the FAST verification and validation (V&V) processes have been under way. These processes included V&V of the ISSM and have been documented.[2, 3] Much of what can be said about the validity of the ISSM (to date) is repeated in Section 17.

1.1.2 Central ISSM Model

The connections for model are shown in the diagram to below. Each sector (Conflict, Economy, Justice, Misc, Movement, Needs, and Core) has its own color, shown in the node outlines and in the connecting lines. Independent nodes (those with values defined by user inputs) have a blue fill. Nodes whose values are dependent on the values of other nodes are filled with the color for the sector.

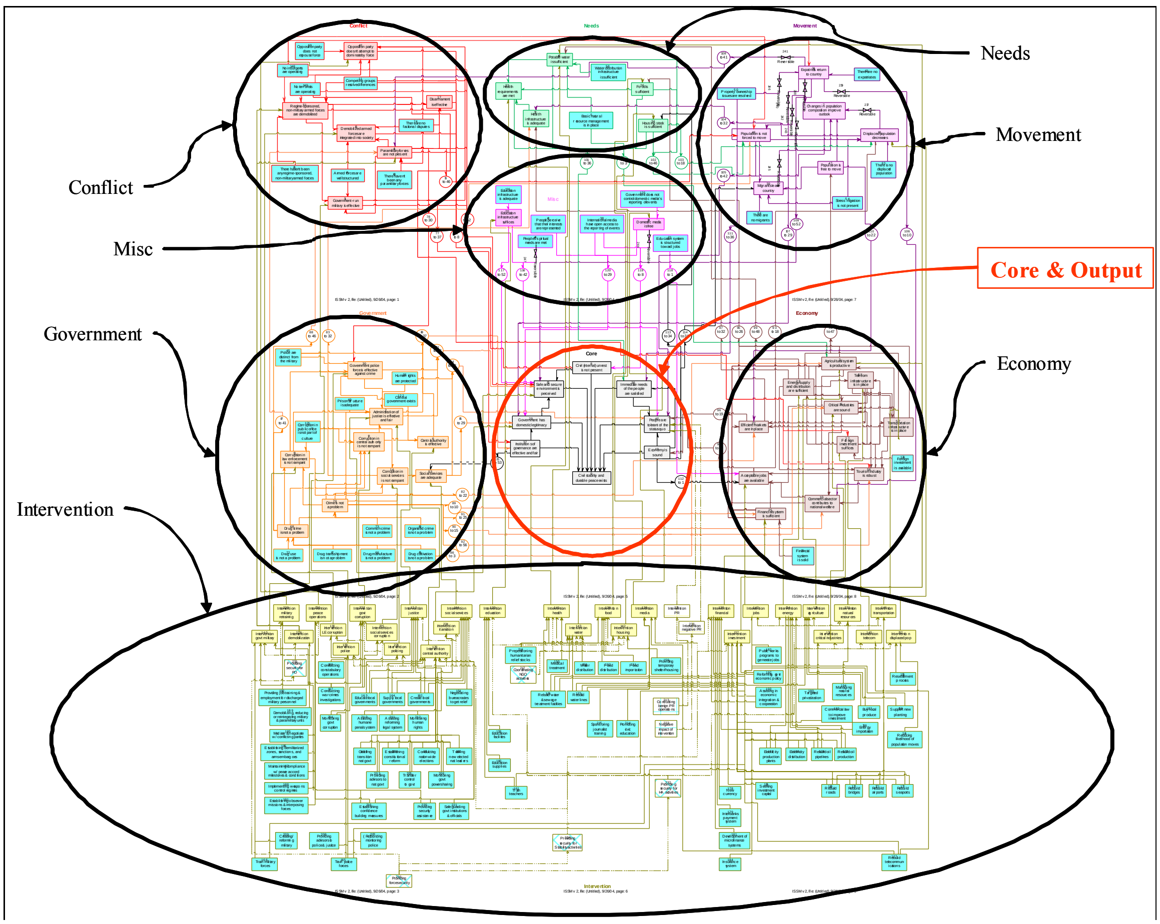


Figure 1-2. ISSM Variable Connections

[2] Senko, Robert M, *Military Operations Other Than War (MOOTW): Flexible Asymmetric Simulation Technologies (FAST) Prototype Toolbox: Verification Strategy and Plan*, Dynamics Research Corporation, Vienna, VA, August 2005.

[3] Hartley, Dean S., III, *Military Operations Other Than War (MOOTW): Flexible Asymmetric Simulation Technologies (FAST) Prototype Toolbox: FY05 Validation Strategy and Plan*, Dynamics Research Corporation, Vienna, VA, December 2005.

1.1.3 ISSM Preprocessor

The ISSM Preprocessor supports custom user logic to tie new input variables and their observed values to the Main ISSM input variables. The user must define new input variables and new intermediate variables and the logic that connects them to each other and to the ISSM input variables. The user then enters the data on a periodic basis and uses the Preprocessor to copy the results to the ISSM Main. The user continues to enter external intervention data into ISSM Main; but does not enter data into the ISSM internal inputs, as they come from the Preprocessor.

When the ISSM is used with DIAMOND, DIAMOND acts as a surrogate for reality. DIAMOND is a simulation and, as such, has a mechanism for advancing simulated time, producing interactions, and reporting on the results. DIAMOND was not built with the ISSM in mind and does not directly produce the inputs that the ISSM needs. However, the ISSM Preprocessor, which was built to handle data conversions from real data, can just as easily handle data conversions from simulated data. Because the data output from DIAMOND for one scenario will be largely the same (in format) as the data output for another scenario, the problem is easier for the ISSM. Once the logic is built for the Preprocessor to handle DIAMOND output, it does not have to be rebuilt for the next use.

Using the Preprocessor entails a considerable extra input burden on the user, which must be justified by the nature of the available data and the additional traceability of the results.

1.1.4 ISSM Postprocessor

The ISSM Postprocessor supports custom user logic to create additional output variables from the ISSM Main set of variables. The user must define all the new variables and the logic connecting them to each other and to the ISSM Main variables. No data entry is required.

Using the Preprocessor allows the user to produce additional Measures of Merit (MoMs) that match the needs of the Commander in the field or other enduser of the ISSM

1.1.5 ISSM Controller

The ISSM Control supports configuration management of the data produced by the ISSM system. Because the ISSM is implemented as a set of Excel workbooks, which contain both the program and the data, each scenario or variant requires a complete set of copies of the workbooks (except for the Controller). The user needs to organize the locations in which these sets are saved and the naming of the workbooks to support retention and retrieval. The Controller manages this process. It also contains the graphical progress meter that is used during the longer calculations of the workbooks to assure the user that something is happening.

1.2 ORGANIZATION OF THE ANALYSTS' GUIDE

The Analysts' Guide contains two overview sections, a section on the Controller, four sections on the ISSM Main, three sections on the Preprocessor, four sections on the Postprocessor, and one section on the Upgrade process.

1.2.1 Overview Sections

Section 1, this section, gives a brief description of the ISSM system and its components.

Section 2 describes the logic model of the ISSM, that is the application of nodes and arcs in describing inference logic and the implementation of this model in Excel.

1.2.2 Section Dealing with the Controller

Section 3 describes the implementation of the ISSM Controller as an Excel workbook, with a description of each worksheet.

1.2.3 Sections Dealing with the ISSM Main

Section 4 describes the logic of the Main ISSM model, how it works, how the variables are connected, what logic is customizable, and how the logic connects to the Excel implementation. Section 5 describes the ISSM Main's implementation as an Excel workbook, with a description of each worksheet. Section 6 describes each of the ISSM inputs and sources and methodologies for defining their values. Section 7 describes how to create custom logic for the ISSM Main. Section 8 describes other parts of the ISSM Main logic that the user can modify.

1.2.4 Sections Dealing with the Preprocessor

Section 9 describes the logic of the ISSM Preprocessor, how it works, what logic is customizable, and how the logic connects to the Excel implementation. Section 10 describes the Preprocessor's implementation as an Excel workbook, with a description of each worksheet. Section 11 describes how to create custom logic for the Preprocessor.

1.2.5 Sections Dealing with the Postprocessor

Section 12 describes the logic of the ISSM Postprocessor, how it works and how it connects to the Excel implementation. Section 13 describes the Postprocessor's implementation as an Excel workbook, with a description of each worksheet. Section 14 describes the available inputs to the Postprocessor (the ISSM Main inputs, intermediate variables, and output). Section 15 describes how to create custom logic for the Postprocessor.

1.2.6 General Sections

Section 16 describes the process for upgrading an ISSM model from one version to another, including a detailed description of the "Output" workbook that mediates the process.

Section 17 concludes with what is currently known concerning the validity of the ISSM.

2. GENERAL ISSM LOGIC STRUCTURES

The ISSM implements logical inference. This section describes the method that is used in all of the ISSM parts.

2.1 THE NODE MODEL

The variables in ISSM are of two types, precursors and nodes. Precursors are input variables that require processing before they become nodes. For example, an inputs that define the number of some item that are available and the number that are desired are each precursors. The variable that is the result of dividing one into the other is also a precursor. The variable that results after the dividend is scaled to a number between -3 and +3 is a node. Variables are called nodes because they can be represented as nodes in a directed graph, in which the arcs represent the input/output connections between the variables.

Figure 2-1 shows the form of the ISSM node model, as implemented in an Excel spreadsheet. Subsequent figures will highlight each portion. The center block identifies the node under consideration, called the Node. The left hand side identifies the inputs to the Node, called the From Nodes. The right hand side identifies the outputs of the Node, called the To Nodes.

From Node	FROM Node Name	From Val	Weight	Mod Val	Mod Weight	Prior	Nd#	Raw Val	VALUE	NODE Name	Inflate	Center	Val	TO Node Name:	To Node
4	Armed forces are well structured	-1.25	1.00	-1.25	1.00	0	**31**	-0.37	**-0.37**	**Government-run military is effective**	1.00	0.00	-0.37	Institutions of governance are effective and fair	37
41	Paramilitary forces are not present	-0.55	1.00	-0.55	1.00				**-0.37**		1.50	0.00	-0.55	Opposition party doesn't attempt to dominate by force	40
51	Regime-sponsored, non-military armed forces are demobilized	0.19	1.00	0.19	1.00				**-0.37**		1.00	0.00	-0.37	Safe and secure environment is perceived	52
140	Intervention govt military	0.14	1.00	0.14	1.00										

Figure 2-1. Node model in Excel

Table 2-1. Color Codes

The variables change color to reflect their values:	
Green:	**1.00 <= Value <= 4.00**
Yellow:	**0.00 <= Value < 1.00**
Orange:	**-1.00 <= Value < 0.00**
Red:	**-4.00 <= Value < -1.00**

Figure 2-2 shows the data associated with each of the inputs to the Node. The first two columns show the From Nodes' identifying node number and their names. Each name cell has a conditional format that turns its background to the color associated with its value (see Table 2-1). The third column displays the value that is carried into the computation of the Node's value for each From Node. This value is not the value **of** the From Node, as will be seen in the discussion of the To Nodes, below. The Weight column contains the weights that will be multiplied times the From Val contents. These weights may be modified by the user; however, this is not recommended, except in the user logic of the Preprocessor and Postprocessor.

From Node	FROM Node Name	From Val	Weight	Mod Val	Mod Weight
4	Armed forces are well structured	-1.25	1.00	-1.25	1.00
41	Paramilitary forces are not present	-0.55	1.00	-0.55	1.00
51	Regime-sponsored, non-military armed forces are demobilized	0.19	1.00	0.19	1.00
140	Intervention govt military	0.14	1.00	0.14	1.00

Figure 2-2. From Node side of the node model

The last two columns generally repeat the previous two columns; however, the formulas within their cells also check the contents of the corresponding cell for an error message or the absence of contents. If the From Val cell contains the #NA error message, the Mod Val cell will be empty. If the Mod Val cell is empty, then the Mod Weight cell will be empty.

The reason for this extra processing lies in the way in which Excel calculates weighted values. In this example one of the From Nodes is an Intervention node, that is, one that comes from an External Input. When you decide not to use External Inputs, that node does not disappear. Instead all Intervention nodes have #NA for their values. In the example above, the calculation of the value of the Node occurs in the Raw Val column in the row with the Node name, shown in Figure 2-3. This calculation uses the Excel SUMPRODUCT function (add the products of each Mod Val * Mod Weight), divided by the Excel SUM function (add each Mod Weight). In order to cover all possibilities, these functions must include all four From Nodes; however, if there are only three valid From Nodes in a particular situation, dividing by four weights would yield the wrong answer. Using the Mod columns, with their extra computation, ensures the proper value will be calculated in all situations.

Prior	Nd#	Raw Val	VALUE	NODE Name
0	**31**	-0.37	**-0.37**	**Government-run military is effective**
			-0.37	
			-0.37	

Figure 2-3. The Node part of the node model

The Prior column is not used. The Nd# column gives the identifying number for the Node and the final column gives the Node's name. The Value column contains the final value for the Node. It is calculated by clipping the Raw Val at -4 and +4 to prevent excessive influence by a single variable. The Node's value is repeated in its column for computational convenience for each output.

Figure 2-4 shows the final part of the node model, the To Node side. The two right-hand columns give the To Node name and identifying number. The two left-hand columns give the parameters for the computation of the value being sent to the To Node. These parameter values can be changed by the user; however, this is not recommended, except for the user logic in the Preprocessor and Postprocessor. The contents of the Val column are defined by the following formula:

Val = (Node Value) * Inflate + Center.

The Inflate parameter inflates or deflates the spread of the Nodes value, increasing or decreasing its impact. The Center parameter moves the zero point of the To Node with respect to the zero point of the Node.

Inflate	Center	Val	TO Node Name:	To Node
1.00	0.00	-0.37	Institutions of governance are effective and fair	37
1.50	0.00	-0.55	Opposition party doesn't attempt to dominate by force	40
1.00	0.00	-0.37	Safe and secure environment is perceived	52

Figure 2-4. To Node side of the node model

Figure 2-5 shows the effects of the Inflate and Center parameters. The black diagonal line represents Inflate = 1 and Center = 0. The To Node value equals the Node value, for all possible Node values. The blue diagonal line represents the effects of Inflate = 1.25 and Center = 0. If the Node were the only input to the To Node, the eventual To Node value would be clipped, as indicated by the horizontal blue lines.

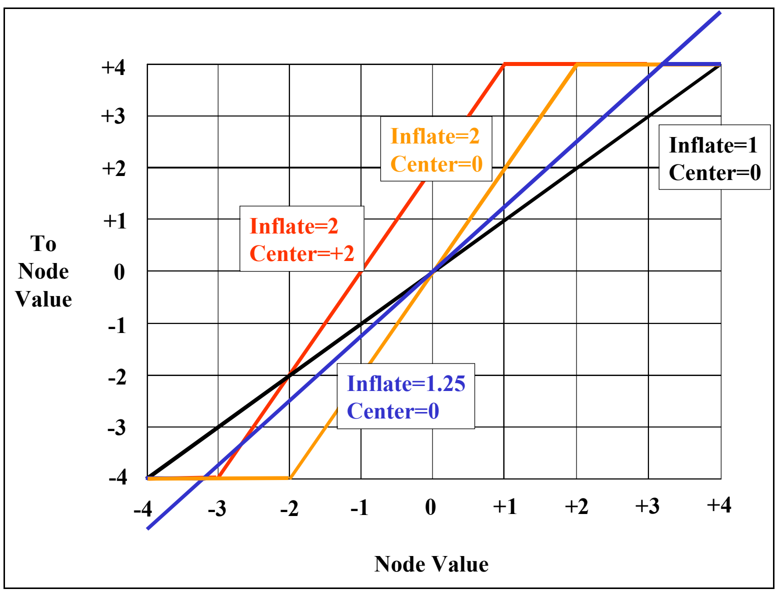


Figure 2-5. Effects of Inflate & Center on To Node value

The orange line represents a larger inflation value of 2. The red line represents the effects of Inflate = 2 and Center = -1. The combination of Inflate and Center allow you to approximate a non-linear connection between the Node and the To Node.

Figure 2-6 shows how to calculate the desired Inflate and Center values, given one or two desired inflection points. In the figure, L is the desired low point and H is the desired high point. That means that L is the largest input value that you want to generate the worst possible output result. Setting L to be some number lower than -4 implies that even the worst input result isn't all that bad as far as this particular output is concerned. Setting L > -4 means that even a moderately bad input value (or even a good input value if L > 0) should be associated with a very bad output. Similarly, H is the smallest input value that you want to generate the best possible output result. Set H > 4 if the best possible input doesn't generate a perfect output.

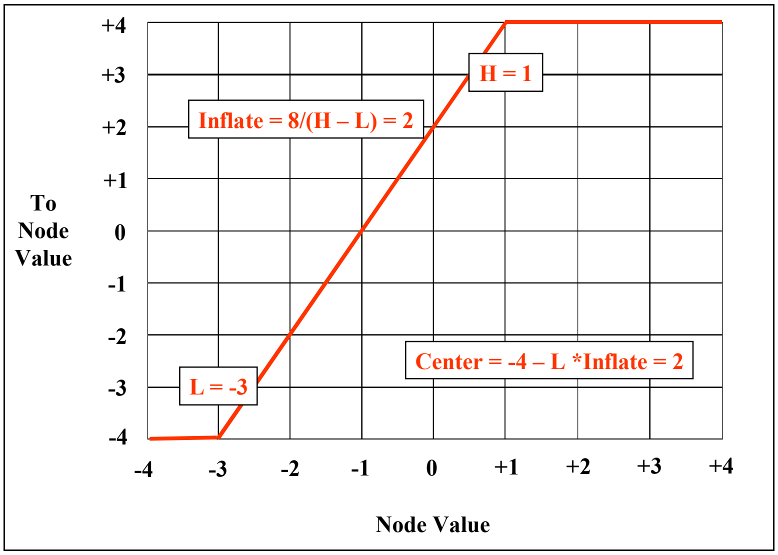


Figure 2-6. Calculating the desired Inflate and Center values

In Figure 2-6, the hypothetical situation is one in which the To Node's value is very sensitive to the value of the Node. You determine that if the Node drops to a level of -3, the situation for the To Node can't get any worse, and if the Node climbs to a level of +1, the situation for the To Node won't get any better with further increases of the Node's value. So you set L = -3 and H = 1. You then calculate that

Inflate = 8 / (H - L) = 8 / (1 - (-3)) = 8 / (4) = 2, and

Center = -4 - L * Inflate = -4 - (-3) * 2 = -4 - (-6) = -4 + 6 = 2.

Using these values for Inflate and Center will generate the relationship between the Node and this To Node that you desire.

2.2 NODE LOGIC

Figure 2-7 shows an example node model from the ISSM, overlaid by the corresponding graphical notation of ellipses and arrows.

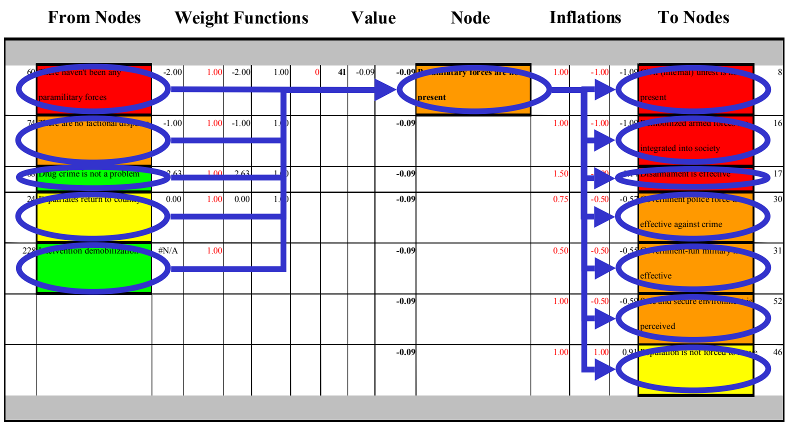


Figure 2-7. Connecting the Excel implementation to the node and arc representation

The node logic in the ISSM workbooks focuses on each node in turn, placing it as the Node in exactly one diagram. It will appear as a From Node in the diagrams for each of its To Nodes. It will also appear as a To Node for each of its From Nodes. This concept is illustrated in Figure 2-8.

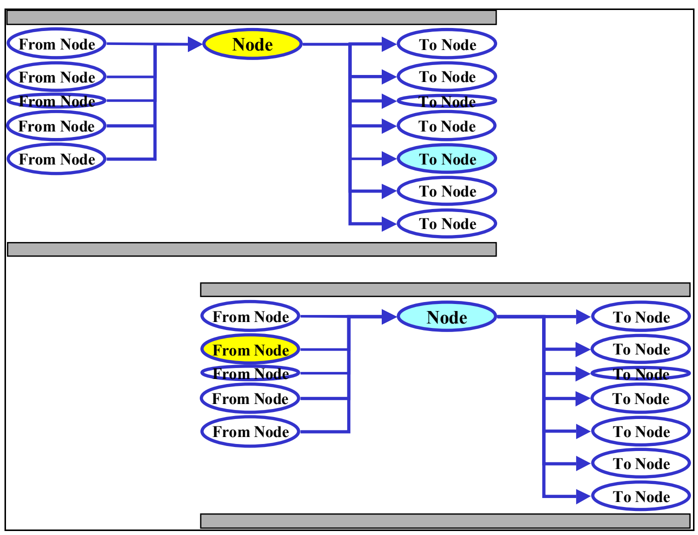


Figure 2-8. Somewhere else, the Node appears as a From Node for one of its To Nodes

3. ISSM CONTROLLER V4.0 IMPLEMENTATION

The Controller assists you in maintaining control of your various sets of ISSM files, each set pertaining to a scenario or scenario variant. The original, blank ISSM Main, Preprocessor, and Postprocessor workbooks are maintained as read-only files in the same folder as is the Controller. The Controller supports you in opening either blank files or a previously defined scenario set, saving the files in a new folder, and closing the files.

One of the changes introduced with the 3.0 version of the Controller was the inclusion of version numbers in the file names. When the user saves his work, the Controller automatically begins the name of each workbook with its identifier: Preprocessor, ISSM, or Postprocessor. The Controller also automatically adds the current version number of the workbook. Finally, the Controller adds the user supplied identifier. This naming discipline makes it possible for the user to distinguish between the three types of workbooks and between various user projects by the user supplied identifier. Version 4.0 extended the amount of information that the user can supply to identify a scenario, as illustrated in Table 3-1.

Table 3-1. Scenario Identification Information

Identification Element	Explanation	Example
Region/Country Name	Geographical region that is larger than that covered by this scenario	Iraq
Sub-Region Name	Geographical region of this scenario	Baghdad
Excursion Name	Excursion within this scenario represented by this set of workbooks	Baseline
Replication Number	When based on a stochastic simulation, the replication number represented by this set of workbooks	1
Scenario Name	General name for the scenario, including excursions and replications	Iraq06
Common Part of File Name	Code to identify all the workbooks belonging to this set	Baghdad18
Recalculation Date	Last date/time of full recalculation of all workbooks in this set: set by the program	7/11/06 15:32

It is recommended that the user create and maintain additional naming discipline by numbering the versions of a particular project. For example, Test_Iraq_01 was the name for the first version of a project of entering historical data concerning Iraq into the ISSM. By incrementing the number each time a significant amount of new data were added, one can identify the workbooks that make up each set by the commonality of name and identify the latest version by largest number. If for some reason, the computer has made the latest version unreadable, the user has available the previous version, which while requiring work to bring back to what should be available in the latest version, at least requires less work than recreating the entire project from nothing.

The Controller maintains a registry of the last used set of files and their locations. It also places the file name of the current Main ISSM in the Preprocessor and Postprocessor workbooks so that they can connect to the proper Main ISSM file. Each of these files has an Excel maintained link to the Controller to support their use of the Controller's progress meter.

The ISSM Controller may be started from the FAST Controller through the ISSM icon (recommended) or started as a separate Excel workbook. The Controller uses macros, so you must click the Enable Macros button in the dialog box that is displayed as Excel opens the Controller.

The Controller workbook has three worksheets. These are briefly described in the subsections below.

3.1 CONTROLS WORKSHEET

Figure 3-1 shows the contents of the Controller's first worksheet. This worksheet contains the name and version information, the Controller banner, seven pieces of information regarding the scenario set and six controls.

The scenario set information initially contains the data on the last scenario that was used. When ISSM files are opened and saved, the new information on the file set is displayed.

The first three controls permit you to open, save and close the ISSM programs. The Connect/Disconnect control permits you to connect and disconnect the User- and Diamond- Worksheets with the Preprocessor and ISSM Main. The last two controls allow you to save the data and logic from a scenario using a current version of the ISSM system and import the data and logic into a newer version of the ISSM.

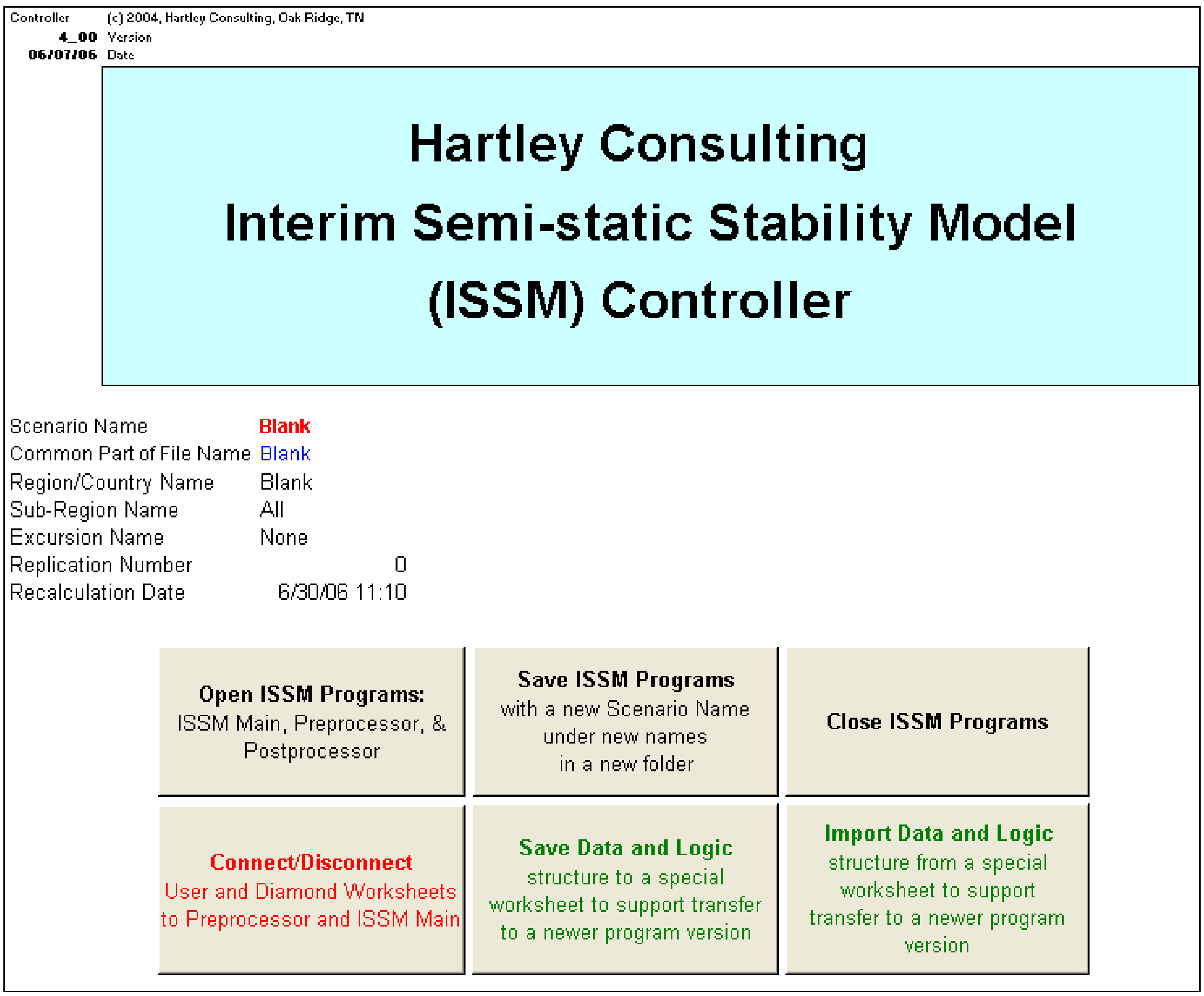


Figure 3-1. Controller main screen

3.1.1 Errors Associated with the Open Control

As the directions on the Registration Worksheet say, before opening any of the other ISSM workbooks with the Controller on a new computer you must erase the contents of the Name and Path cells for each file type. The reason for this is that the controller uses the Path data to begin open its first dialog asking you to select a file or files to open. If that path does not exist on your computer (e.g., the path is as in the figure and your computer doesn't have an "E:" drive), Excel generates an error message (see Figure 3-2). If this occurs, select the "End" control, erase the contents, and try again.

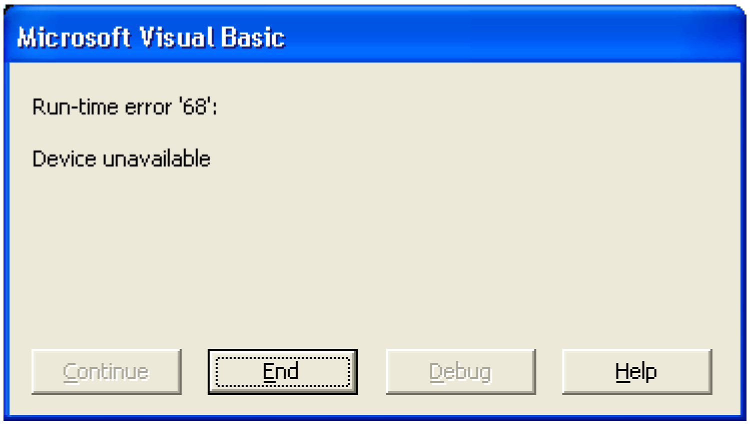


Figure 3-2. Bad path name error message

If you try to open the Controller again, you may receive the message in Figure 3-3. (If you selected the Controller and a valid ISSM workbook, this message will not appear, as the "open" logic will skip re-opening the Controller.) Answer "No". Since you didn't select an ISSM Main workbook to open, the message in Figure 3-4 will appear. Answer "OK" and re-select the "Open" control.

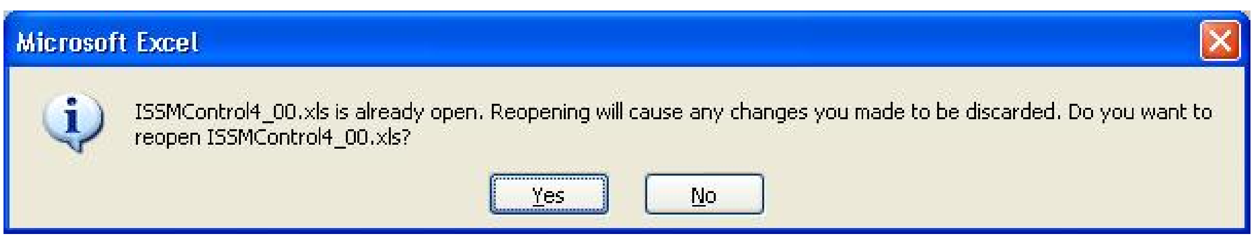


Figure 3-3. Duplicate Controller selected for opening

Figure 3-4. No ISSM Main selected for opening

If you made a selection that didn't include a copy of the ISSM Main, you will see the message in Figure 3-4. Answer "OK" and reselect the proper copy of the ISSM Main (the one that goes with the previously selected workbook).

After each of these errors, the cursor will retain its hourglass shape, despite having completed the computations. Once you reselect the "Open" control, it will revert to its proper shape.

3.1.2 Errors Associated with the Save Control

Figure 3-5 shows the dialog boxes for the scenario definition information (Table 3-1) [after the "did you really mean it" message]. You may change each entry or leave it as is. Using the "Cancel" response leaves it as it was.

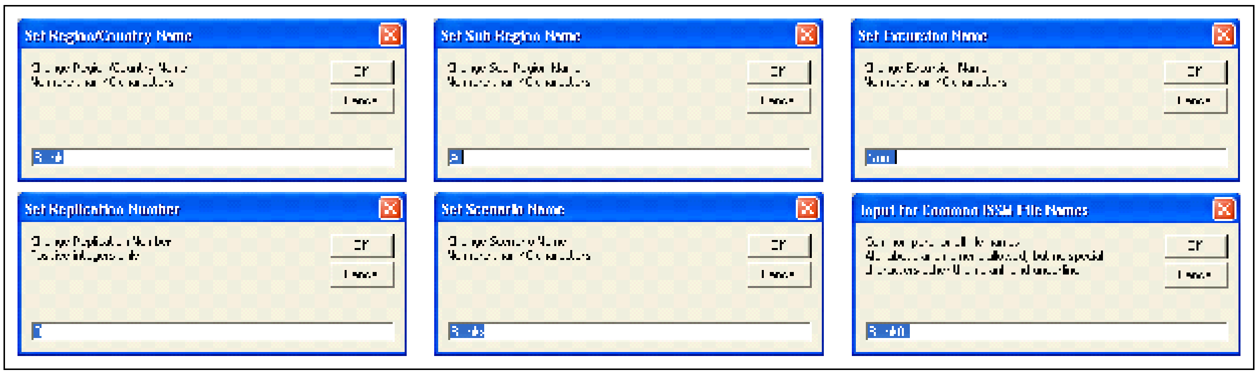


Figure 3-5. Scenario definition dialog boxes

Once you have completed the scenario definition, you are asked where to save the workbooks. The Save dialog box is the standard Windows Save dialog, in which you may navigate to a different folder or create a new folder and save the results. If for some reason you select the "Cancel" control, rather than the "Save" control, the particular workbook named in the "File Name" box is not saved. **You will not be told.** The dialog box for the next workbook will appear for its disposition, whether you saved the previous workbook or not.

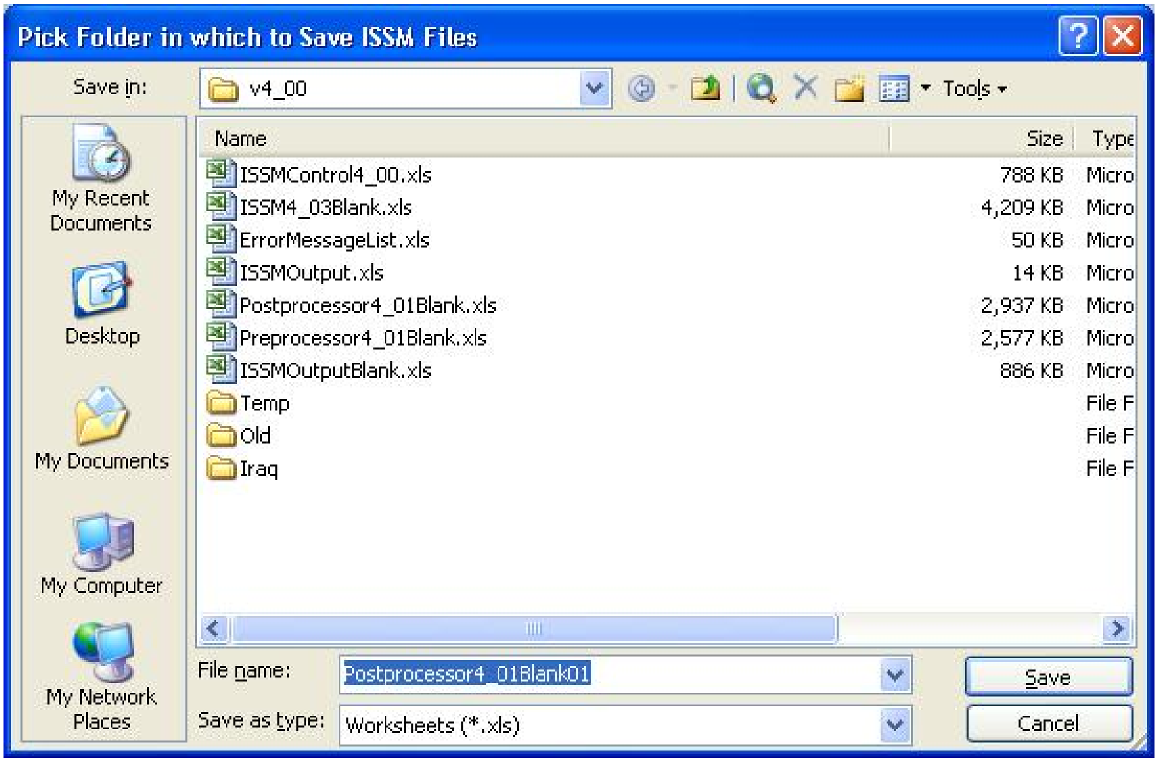


Figure 3-6. Pick folder to save files dialog box

3.1.3 Errors Associated with the Close Control

Occasionally, Excel will abort during the Close process. The reason is unknown at this time. You are advised to use the Save control first. Then Close using a new number for the name. **Disregard any attempts by Excel to recover the last name if the abort happens and use the versions created in the last Save.** Excel's recover process is unable to completely recover the ISSM files.

3.1.4 Errors Associated with the Connect/Disconnect Control

Table 3-2 contains the error messages that may be generated by the Connect/Disconnect button, both messages that show on the screen and messages in the Errata worksheet of the "Output" workbook.

Table 3-2. Controller Connect/Disconnect Error Messages

Message	What it means	What to do
Date # nn in (worksheet) = (date); however, the corresponding date in (worksheet) = (date).	The dates in the two worksheets must agree in sequence.	You may have skipped a date in one worksheet or the dates may not be exactly the same. You will have to correct the dates or add a column of information for the missing date.
Errors were found in the connections between the User/Diamond worksheets and the Preprocessor or Main ISSM inputs. They are shown in the Output Workbook. You must correct these and re-run the 'Connect/Disconnect' procedure.	General message that errors have been found.	Find the particulars in the Errata sheet.
Node nnn in (worksheet) is not listed in (worksheet).	A node is missing in one worksheet.	You will have to add (or delete) the node, with accompanying logic.

Correct any errors using the "What to do" instructions and re-select the Connect/Disconnect control.

3.1.5 Errors Associated with the Save Data and Logic and Import Data and Logic Controls

The error messages and explanations are included in Section 16, along with a complete discussion of the Upgrade process.

3.2 REGISTRATIONS WORKSHEET

Figure 3-7 shows sample contents of the second worksheet in the Controller, the Registrations page. The controller records the file names of the ISSM programs that have been opened or saved, their paths, and their version/date information.

The first time the controller is installed in a new computer, or if it is moved to a new directory, erase the contents of the name & path cells for each of the four program types.

Program IDs					
	Type	Name	Path	Version	Date
	Controller	ISSMControl4_00.xls	E:\Projects\ISSM\v4_00	4_00	06/07/06
	ISSM	ISSM4_03Blank.xls	E:\Projects\ISSM\v4_00	4_03	11/21/06
	Preprocessor	Preprocessor4_01Blank.xls	E:\Projects\ISSM\v4_00	4_01	06/30/06
	Postprocessor	Postprocessor4_01Blank.xls	E:\Projects\ISSM\v4_00	4_01	06/30/06

Figure 3-7. Registration information

As the directions on the page say, before opening any of the other ISSM workbooks with the Controller on a new computer you must erase the contents of the Name and Path cells for each file type. The reason for this is that the controller uses the Path data to begin open its first dialog asking you to select a file or files to open. If that path does not exist on your computer (e.g., the path is as in the figure and your computer doesn't have an "E:" drive), Excel generates an error message (see Figure 3-2). If this occurs, select the "End" control, erase the contents, and try again.

3.3 PROGMETER WORKSHEET

The final worksheet in the Controller is the progress meter sheet, which is used by all programs to show the status of slow-running processes. The bar is advanced across its holding area as the steps of the process are accomplished (Figure 3-8). The label below the bar will also change to describe the sub-section of the process that is under way.

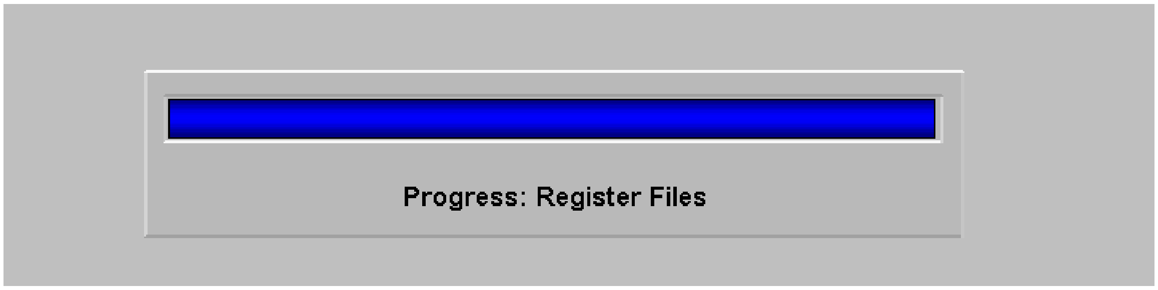


Figure 3-8. Progress meter (finished)

4. ISSM V4.0 LOGIC DESCRIPTION

This model describes the impact on the "civil stability and durable peace" of the values of a set of factors within a single country. This is an instantaneous impact and does not allow for any feedback loops or actions over time.

Section 4.1 gives an abstract description of how the logic works, defining the notation of the node model. Section 4.2 uses this node model to describe the internal inputs of the ISSM Main and their relationships to the intermediate and output nodes in the model. Section 4.3 uses the node model to describe the external inputs of the ISSM Main and their relationships to other nodes. Section 4.4 describes the available free-form custom logic that can be used to connect data that do not directly fit the ISSM Main external inputs to the external inputs. The descriptions includes valuation and sector information.

Section 4.5 describes the connection between the node model and the Excel implementation in the ISSM Main. This implementation is more fully described in Section 5. Section 6 provides an extensive description of the internal and external inputs, giving sources for and interpretations of the data. Section 14 provides technical descriptions of the calculations that generate the ISSM Main intermediate nodes, implicitly defining the nodes. This section is placed in the Postprocessor portion of this document because the need for these definitions is most needed for determining inputs to the Postprocessor. Section 7 contains the process description for creating the free-form custom logic, initially described in Section 4.4. Section 8 describes other parts of the ISSM Main logic that the user can modify.

4.1 GENERAL LOGIC MODEL

The base logic for the ISSM consists of three types of variables: input variables or independent variables, intermediate variables, and the output variable, with the last two categories being dependent variables. The inclusion of the external input variables adds more input/independent variables and more intermediate/dependent variables.

Figure 4-1 shows the standard internal input node model. The user input flows to an input node, which is used with other input nodes to create an intermediate variable node. If the Preprocessor is used, its logic effectively replaces the raw data input in this figure.

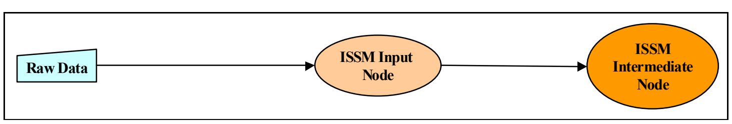


Figure 4-1. General internal input node model

Figure 4-2 illustrates the general node model for external inputs, which are converted into Intervention nodes. The data in the ExternalInputs sheet may be in the form of two inputs, an "available" number and a "desired" number, which are divided to produce a fraction, or a fractional number, which flows directly to the fractional data block. In any case, the fractional data flow to the scaled data, where they are converted into scaled numbers (-3 to +3). The scaled numbers create the Intervention From Nodes, which are combined according to the appropriate logic into Intervention Nodes. If the use of external inputs / intervention data is turned on, the Intervention Nodes are combined with the other nodes into the Intermediate nodes.

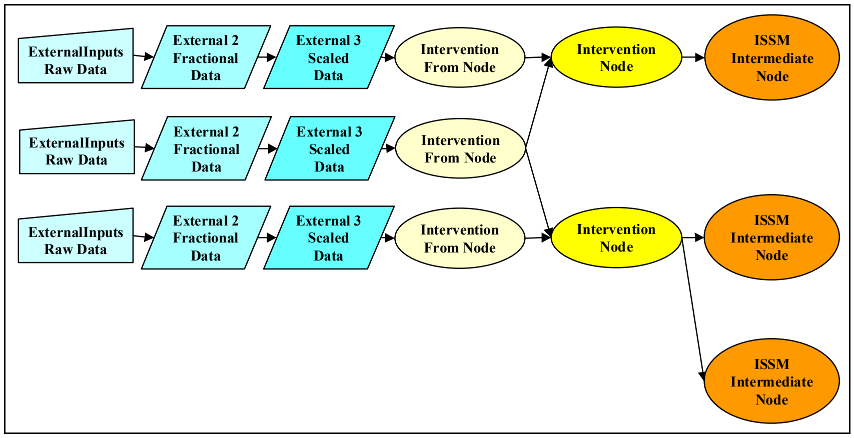


Figure 4-2. General external input / intervention node model

Figure 4-3 illustrates how the internal inputs and the external inputs are combined to create ISSM Core variables and the final output.

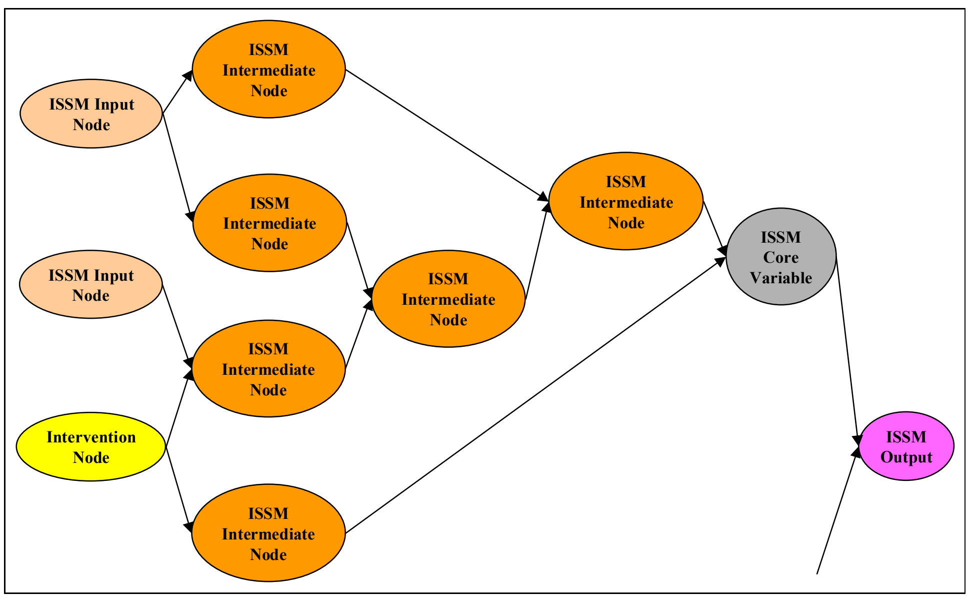


Figure 4-3. Notional ISSM logic

4.2 INTERNAL MODEL

The internal model is divided into seven sectors: Conflict, Government, Needs, Miscellaneous, Movement, Economy, and Core (including the final output).

4.2.1 Conflict Sector Model

Figure 4-4 shows the diagram of the node connections within the conflict sector.

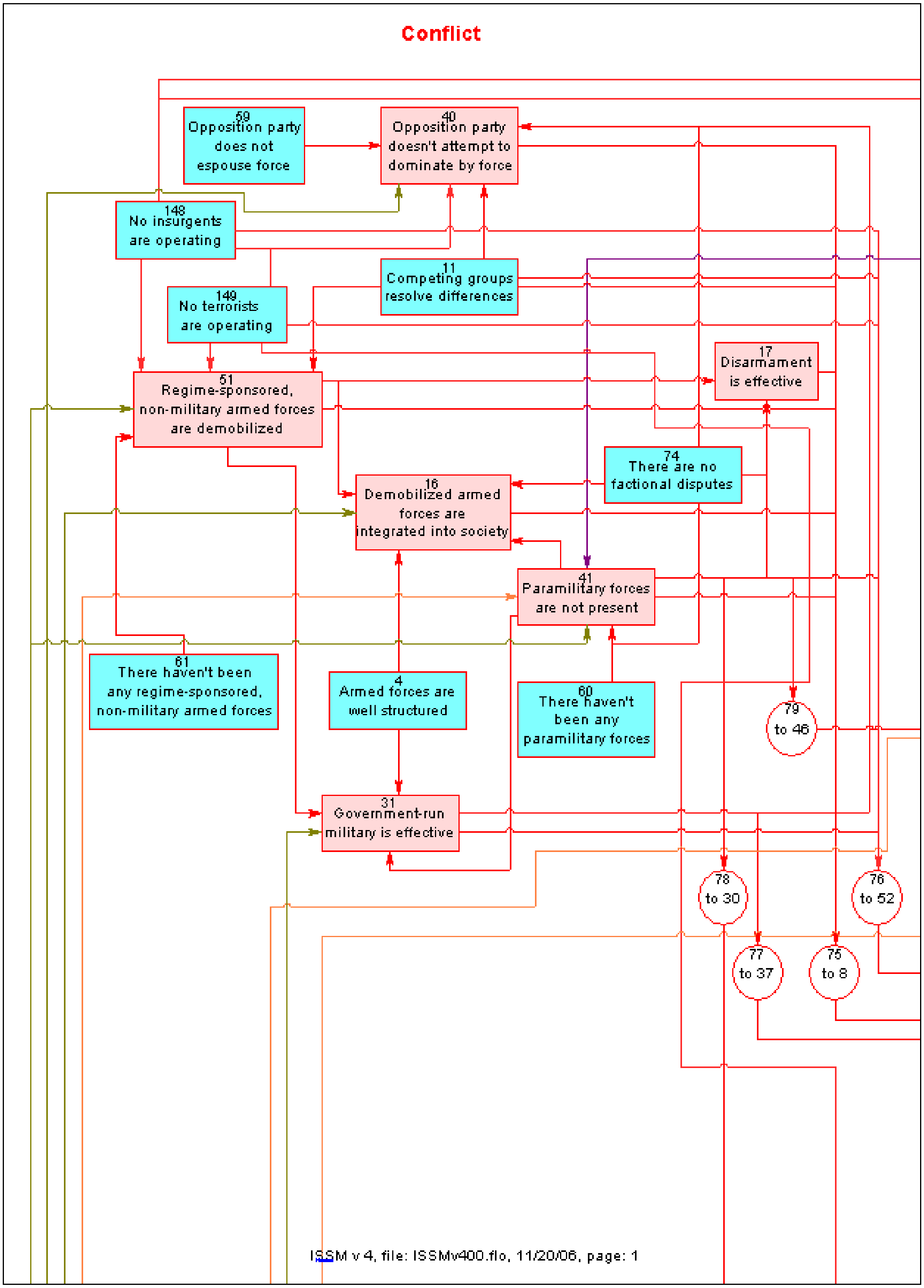


Figure 4-4. Conflict sector

Table 4-1 lists the input and intermediate nodes/variables of the conflict sector, with their node numbers.

Table 4-1. Conflict sector input and intermediate variables

Nd#	NODE Name	Group	Sector
4	Armed forces are well structured	Input	Conflict
11	Competing groups resolve differences	Input	Conflict
148	No insurgents are operating	Input	Conflict
149	No terrorists are operating	Input	Conflict
59	Opposition party does not espouse force	Input	Conflict
74	There are no factional disputes	Input	Conflict
60	There haven't been any paramilitary forces	Input	Conflict
61	There haven't been any regime-sponsored, non-military armed forces	Input	Conflict
16	Demobilized armed forces are integrated into society	Intermediate	Conflict
17	Disarmament is effective	Intermediate	Conflict
31	Government-run military is effective	Intermediate	Conflict
40	Opposition party doesn't attempt to dominate by force	Intermediate	Conflict
41	Paramilitary forces are not present	Intermediate	Conflict
51	Regime-sponsored, non-military armed forces are demobilized	Intermediate	Conflict

4.2.2 Government Sector Model

Table 4-2 lists the input and intermediate nodes/variables of the government sector, with the node numbers of their inputs and outputs.

Table 4-2. Government sector input and intermediate variables

Nd#	NODE Name	Group	Sector
122	Central government exists	Input	Govt
73	Common crime is not a problem	Input	Govt
121	Corruption in public office is not part of culture	Input	Govt
65	Drug cultivation is not a problem	Input	Govt
66	Drug manufacture is not a problem	Input	Govt
67	Drug transshipment is not a problem	Input	Govt
72	Drug use is not a problem	Input	Govt
35	Human rights are protected	Input	Govt
69	Organized crime is not a problem	Input	Govt
45	Police are distinct from the military	Input	Govt
49	Prison structure is adequate	Input	Govt
2	Administration of justice is effective and fair	Intermediate	Govt
6	Central authority is effective	Intermediate	Govt
12	Corruption in central authority is not rampant	Intermediate	Govt
13	Corruption in law enforcement is not rampant	Intermediate	Govt
14	Corruption in social services is not rampant	Intermediate	Govt
70	Crime is not a problem	Intermediate	Govt
68	Drug crime is not a problem	Intermediate	Govt
30	Government police force is effective against crime	Intermediate	Govt
53	Social services are adequate	Intermediate	Govt

Figure 4-5 shows the diagram of the node connections within the government sector.

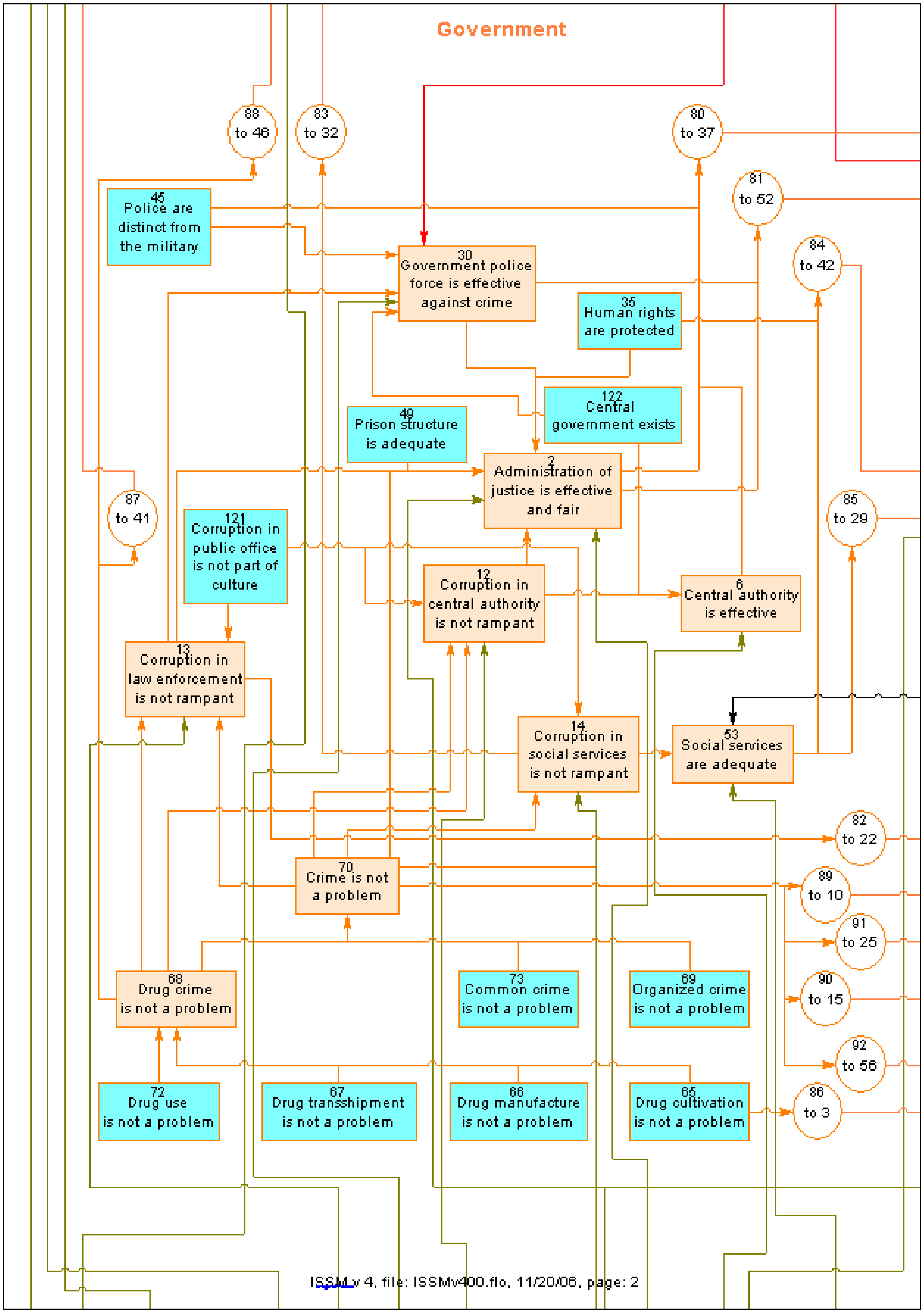


Figure 4-5. Government sector

4.2.3 Needs and Miscellaneous Sector Models

Table 4-4 and Table 4-3 list the input and intermediate nodes/variables of the needs and miscellaneous sectors, with their node numbers.

Table 4-3. Needs sector input and intermediate variables

Nd#	NODE Name	Group	Sector
5	Basic natural resource management is in place	Input	Needs
58	Water distribution infrastructure is sufficient	Input	Needs
26	Food is sufficient	Intermediate	Needs
32	Health infrastructure is adequate	Intermediate	Needs
33	Health requirements are met	Intermediate	Needs
34	Housing stock is sufficient	Intermediate	Needs
48	Potable water is sufficient	Intermediate	Needs

Table 4-4. Miscellaneous sector input and intermediate variables

Nd#	NODE Name	Group	Sector
126	Education infrastructure is adequate	Input	Misc
21	Educational system is tailored toward jobs	Input	Misc
125	Government does not control domestic media's reporting of events	Input	Misc
38	International media have open access to the reporting of events	Input	Misc
43	People perceive that their interests are represented	Input	Misc
44	People's spiritual needs are met	Input	Misc
28	Domestic media is free	Intermediate	Misc
20	Education infrastructure suffices	Intermediate	Misc

Figure 4-6 shows the diagram of the node connections within the needs and miscellaneous sectors.

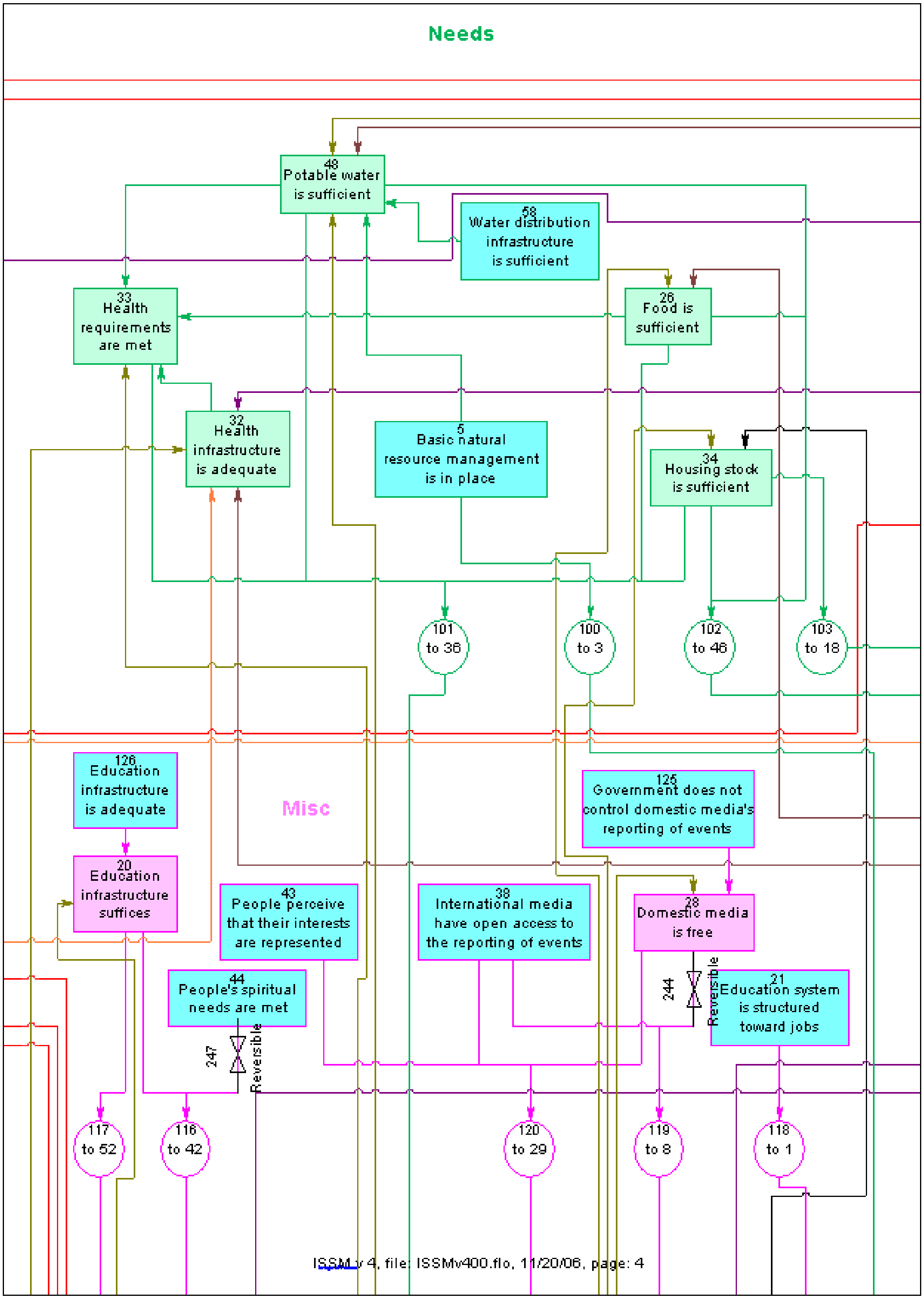


Figure 4-6. Needs and Miscellaneous sectors

4.2.4 Movement Sector Model

Table 4-5 lists the input and intermediate nodes/variables of the movement sector, with their node numbers.

Table 4-5. Movement sector input and intermediate variables

Nd#	NODE Name	Group	Sector
50	Property ownership issues are resolved	Input	Movement
54	Stress migration is not present	Input	Movement
62	There are no expatriates	Input	Movement
64	There are no migrants	Input	Movement
63	There is no displaced population	Input	Movement
7	Changes in population composition improve outlook	Intermediate	Movement
18	Displaced population decreases	Intermediate	Movement
24	Expatriates return to country	Intermediate	Movement
39	Migrants leave country	Intermediate	Movement
47	Population is free to move	Intermediate	Movement
46	Population is not forced to move	Intermediate	Movement

Figure 4-7 shows the diagram of the node connections within the movement sector.

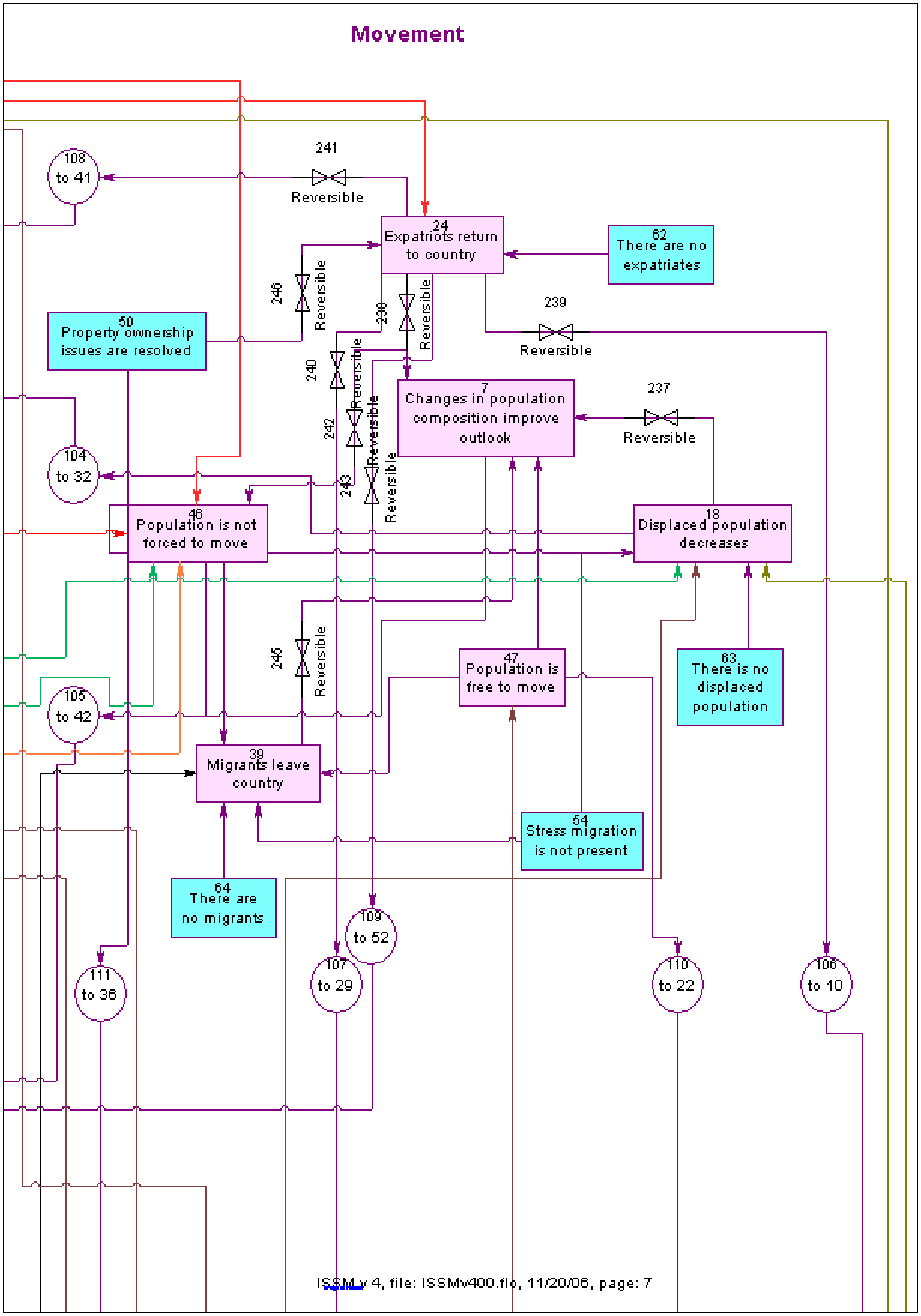


Figure 4-7. Movement sector

4.2.5 Economy Sector Model

Table 4-6 lists the input and intermediate nodes/variables of the economy sector, with their node numbers.

Table 4-6. Economy sector input and intermediate variables

Nd#	NODE Name	Group	Sector
71	Financial system is solid	Input	Economy
124	Foreign investment is available	Input	Economy
1	Acceptable jobs are available	Intermediate	Economy
3	Agricultural system is productive	Intermediate	Economy
10	Commercial sector contributes to national welfare	Intermediate	Economy
15	Critical industries are sound	Intermediate	Economy
22	Efficient markets are in place	Intermediate	Economy
23	Energy supply and distribution are sufficient	Intermediate	Economy
25	Financial system is sufficient	Intermediate	Economy
27	Foreign investment suffices	Intermediate	Economy
55	Telecom infrastructure is in place and maintainable	Intermediate	Economy
56	Tourism industry is robust	Intermediate	Economy
57	Transportation infrastructure is in place	Intermediate	Economy

Figure 4-8 shows the diagram of the node connections within the economy sector.

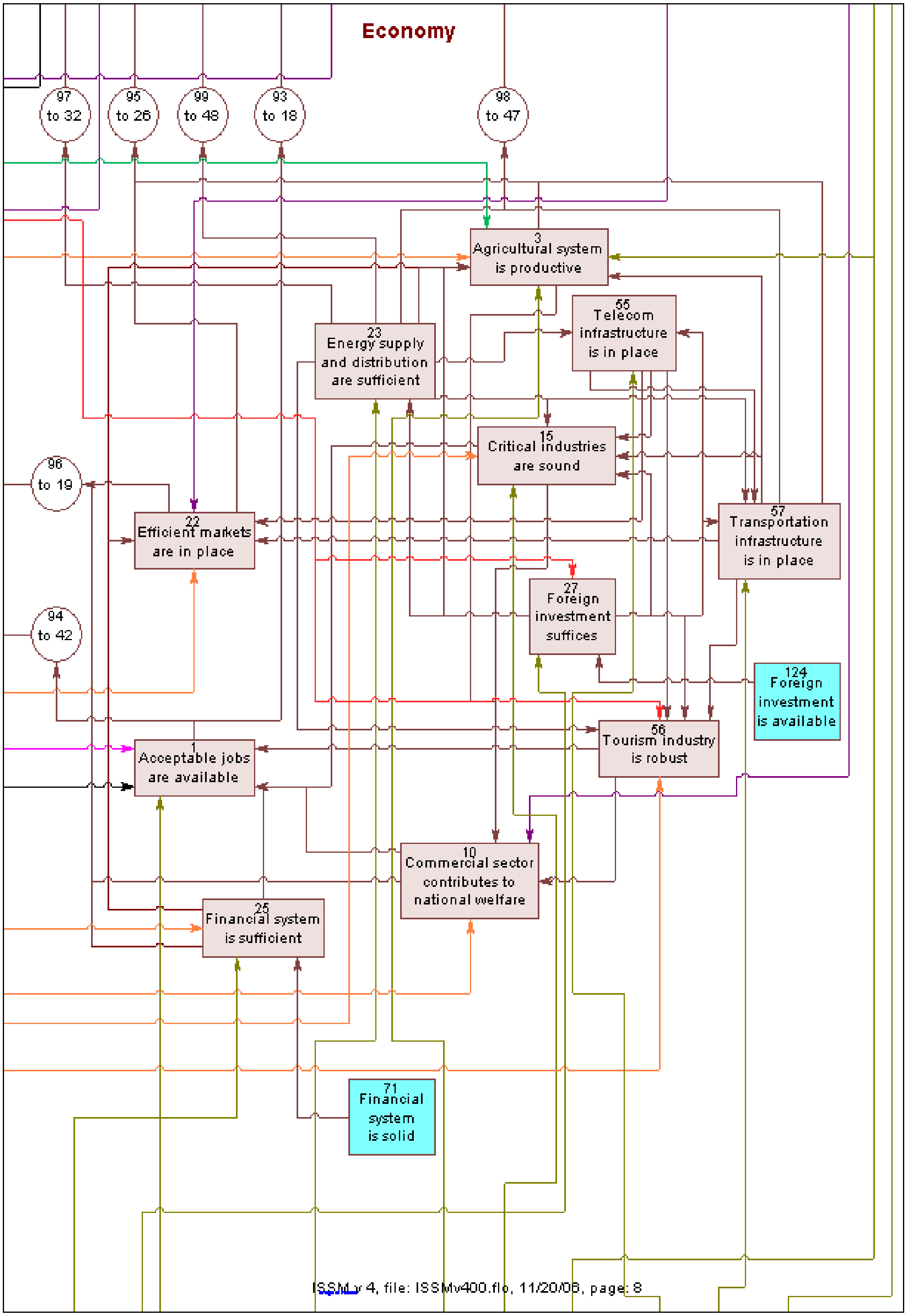


Figure 4-8. Economy sector

4.2.6 Core Sector Model

Table 4-7 lists the nodes/variables of the core sector, with their node numbers.

Table 4-7. Core sector variables

Nd#	NODE Name	Group	Secto
8	Civil (internal) unrest is not present	Core	Core
19	Economy is sound	Core	Core
29	Government has domestic legitimacy	Core	Core
36	Immediate needs of the people are satisfied	Core	Core
37	Institutions of governance are effective and fair	Core	Core
42	People are tolerant of the status quo	Core	Core
52	Safe and secure environment is perceived	Core	Core

Table 4-8 lists the output node/variable, with its node number.

Table 4-8. Output variable

Nd#	NODE Name	Group	Sector
9	Civil stability and durable peace exists	Output	Output

Figure 4-9 shows the diagram of the node connections within the core sector.

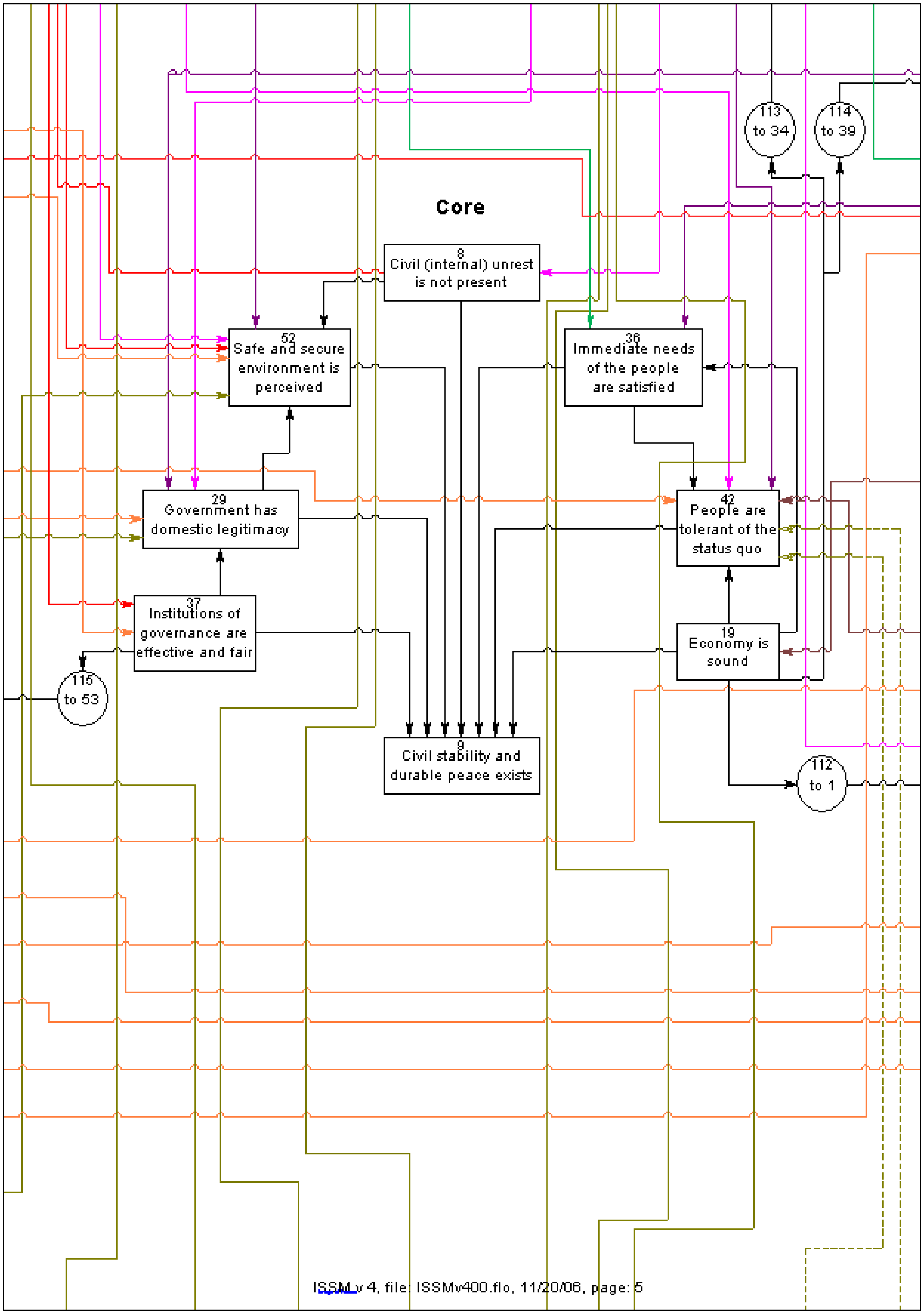


Figure 4-9. Core sector

4.3 EXTERNAL (INTERVENTION) MODEL

The External Inputs consist of on-going interventions by one or more external agents. These interventions may be the uncoordinated efforts of multiple NGOs or the coordinated campaign plan of a military commander or a combination of uncoordinated and coordinated intervention efforts. The use of external inputs in the ISSM is optional.

4.3.1 Normal Factors

Normal intervention factors, as distinct from the special factors, perform in the logic of ISSM exactly as do the factors discussed above. The value of a normal intervention factor participates in the weighted average of all the inputs to each node/variable for which it is an input.

Table 4-9 shows the Conflict sector normal intervention inputs and intermediate variables. The inputs are distinguished by having a Note that describes the contents. Some of the inputs are divided into two parts at the raw data level, indicated by an integral node number for one part and the same number plus 0.1 for the other part. Intermediate variables are distinguished by beginning with "Intervention" in their names.

Table 4-9. Normal Intervention - Conflict sector, inputs and intermediate variables

Nd#	NODE Name	Group	Sector	Note
189	Demobilizing, reducing, or reintegrating military & paramilitary units	Intervention	Conflict	Number affected
189.1	Demobilizing, reducing, or reintegrating military & paramilitary units	Intervention	Conflict	Total number to be affected
186	Establishing demilitarized zones, sanctions, and arms embargoes	Intervention	Conflict	Number of missions
186.1	Establishing demilitarized zones, sanctions, and arms embargoes	Intervention	Conflict	Total number of missions required
191	Establishing observer missions & interposing forces	Intervention	Conflict	Number of troops
191.1	Establishing observer missions & interposing forces	Intervention	Conflict	Number of troops required
188	Implementing weapons control regimes	Intervention	Conflict	Number of missions
188.1	Implementing weapons control regimes	Intervention	Conflict	Total number of missions required
228	Intervention demobilization	Intervention	Conflict	
140	Intervention govt military	Intervention	Conflict	
229	Intervention military retraining	Intervention	Conflict	
230	Intervention peace operations	Intervention	Conflict	
187	Maintaining compliance with peace accord milestones & conditions	Intervention	Conflict	Number of missions
187.1	Maintaining compliance with peace accord milestones & conditions	Intervention	Conflict	Total number of missions required
185	Mediating & negotiating w/ conflicting parties	Intervention	Conflict	Number of missions
185.1	Mediating & negotiating w/ conflicting parties	Intervention	Conflict	Total number of missions required
190	Providing job training and employment for discharged military personnel	Intervention	Conflict	Number trained or employed
190.1	Providing job training and employment for discharged military personnel	Intervention	Conflict	Total to be trained or employed

Table 4-10 shows the normal intervention variables for the Economy sector. The same conventions are used for inputs and intermediate variables as were described for the Conflict sector variables.

Table 4-10. Normal Intervention - Economy sector, inputs and intermediate variables

Nd#	NODE Name	Group	Sector	Note
193	Assisting in economic integration & cooperation	Intervention	Economy	Absolute; sum of inputs
157	Buy local produce	Intervention	Economy	Quantity Purchased
157.1	Buy local produce	Intervention	Economy	Excess Quantity Available
182	Commercial law to improve investment	Intervention	Economy	Absolute; sum of inputs
181	Development of microfinance systems	Intervention	Economy	Quantity Started
181.1	Development of microfinance systems	Intervention	Economy	Quantity at Completion
196	Energy importation	Intervention	Economy	Units imported
196.1	Energy importation	Intervention	Economy	Units needed for importation
184	Insurance system	Intervention	Economy	Absolute; sum of inputs
179	Interbanks payment system	Intervention	Economy	Absolute; sum of inputs
128	Intervention agriculture	Intervention	Economy	
131	Intervention critical industries	Intervention	Economy	
134	Intervention energy	Intervention	Economy	
135	Intervention financial	Intervention	Economy	
137	Intervention investment	Intervention	Economy	
147	Intervention jobs	Intervention	Economy	
231	Intervention natural resources	Intervention	Economy	
145	Intervention telecom	Intervention	Economy	
146	Intervention transportation	Intervention	Economy	
194	Managing natural resources	Intervention	Economy	Amount managed
194.1	Managing natural resources	Intervention	Economy	Amount needing management
178	New currency	Intervention	Economy	Absolute; sum of inputs
183	Public works programs to generate jobs	Intervention	Economy	Quantity Started
183.1	Public works programs to generate jobs	Intervention	Economy	Quantity at Completion
192	Reforming government economic policy	Intervention	Economy	Absolute; sum of inputs
195	Seeking investment capital	Intervention	Economy	Capital found
195.1	Seeking investment capital	Intervention	Economy	Capital needed
158	Support new planting	Intervention	Economy	Quantity Planted
158.1	Support new planting	Intervention	Economy	Quantity Available for Planting
180	Targeted privatization	Intervention	Economy	Quantity Started
180.1	Targeted privatization	Intervention	Economy	Quantity at Completion

Table 4-11 shows the inputs and intermediate variables for the Government sector. The notes that refer to something being available in "0 weeks" contain the number of weeks that you input, rather than 0, in the live model.

Table 4-11. Normal Intervention - Government sector, inputs and intermediate variables

Nd#	NODE Name	Group	Sector	Note
207	(Re)building & monitoring new police force	Intervention	Govt	Number of units
207.1	(Re)building & monitoring new police force	Intervention	Govt	Number of units (re)built
210	Assisting in establishing humane penal systems	Intervention	Govt	Prisons built or refurbished
210.1	Assisting in establishing humane penal systems	Intervention	Govt	Prisons needing work
211	Assisting in establishing/reforming legitimate legal system	Intervention	Govt	Absolute; sum of inputs
198	Conducting constabulary operations	Intervention	Govt	Number of constables needed
198.1	Conducting constabulary operations	Intervention	Govt	Number of constables
201	Conducting nationwide elections	Intervention	Govt	Number conducted
201.1	Conducting nationwide elections	Intervention	Govt	Number required
197	Conducting war crimes investigations, tribunals, etc.	Intervention	Govt	Number under way
197.1	Conducting war crimes investigations, tribunals, etc.	Intervention	Govt	Total number
162	Create local governments	Intervention	Govt	Expected # in place in 0 wks
162.1	Create local governments	Intervention	Govt	Quantity Needed
209	Creating or reforming & monitoring military	Intervention	Govt	Number of units
209.1	Creating or reforming & monitoring military	Intervention	Govt	Number of units (re)built
163	Educate local governments	Intervention	Govt	Expected # trained in 0 wks
163.1	Educate local governments	Intervention	Govt	Quantity Needed
159	Education facilities	Intervention	Govt	Expected # available in 4 wks
159.1	Education facilities	Intervention	Govt	Quantity Needed
160	Education supplies	Intervention	Govt	Quantity Provided
160.1	Education supplies	Intervention	Govt	Quantity Needed
200	Establishing a mechanism for constitutional reform	Intervention	Govt	Absolute; sum of inputs
199	Establishing, staffing & funding effective transition national govt	Intervention	Govt	Absolute; sum of inputs
129	Intervention central authority	Intervention	Govt	
227	Intervention govt corruption	Intervention	Govt	
127	Intervention justice	Intervention	Govt	
130	Intervention LE corruption	Intervention	Govt	
139	Intervention police	Intervention	Govt	
226	Intervention policing	Intervention	Govt	
144	Intervention social services	Intervention	Govt	
225	Intervention social services corruption	Intervention	Govt	
224	Intervention transition	Intervention	Govt	
204	Monitoring and reporting on corruption by govt officials	Intervention	Govt	Number of monitors
204.1	Monitoring and reporting on corruption by govt officials	Intervention	Govt	Number of monitors needed
206	Monitoring government powersharing arrangements	Intervention	Govt	Number of monitors
206.1	Monitoring government powersharing arrangements	Intervention	Govt	Number of monitors needed
212	Monitoring human rights practices	Intervention	Govt	Number of monitors
212.1	Monitoring human rights practices	Intervention	Govt	Number of monitors needed
203	Providing advisors to national govt officials	Intervention	Govt	Number provided
203.1	Providing advisors to national govt officials	Intervention	Govt	Number needed
208	Providing advisors to police & criminal justice organizations & supporting establishment of operations	Intervention	Govt	Number of advisors
208.1	Providing advisors to police & criminal justice organizations & supporting establishment of operations	Intervention	Govt	Number of advisors needed
164	Supply local governments	Intervention	Govt	Quantity of Supplies
164.1	Supply local governments	Intervention	Govt	Quantity Needed
166	Train military forces	Intervention	Govt	Expected # trained in 0 wks
166.1	Train military forces	Intervention	Govt	Quantity Needed
165	Train police forces	Intervention	Govt	Expected # trained in 0 wks
165.1	Train police forces	Intervention	Govt	Quantity Needed
161	Train teachers	Intervention	Govt	Expected # trained in 0 wks
161.1	Train teachers	Intervention	Govt	Quantity Needed
202	Training newly elected national political leaders	Intervention	Govt	Number trained
202.1	Training newly elected national political leaders	Intervention	Govt	Number needing training
205	Transferring control of government functions to host nation officials	Intervention	Govt	Absolute; sum of inputs

Table 4-12 shows the normal intervention variables for the Miscellaneous sector. There are also two additional variables in the Miscellaneous sector that are special factors, which are discussed later.

Table 4-12. Normal Intervention - Miscellaneous sector, inputs and intermediate variables

Nd#	NODE Name	Group	Sector	Note
133	Intervention education	Intervention	Misc	
138	Intervention media	Intervention	Misc	
236	Intervention negative PR	Intervention	Misc	
223	Intervention PR	Intervention	Misc	
214	Promoting civic education	Intervention	Misc	Number of projects
214.1	Promoting civic education	Intervention	Misc	Number of projects needed
215	Sponsoring journalist training & professionalization	Intervention	Misc	Number of journalists
215.1	Sponsoring journalist training & professionalization	Intervention	Misc	Total number of journalists to be trained

Table 4-13 shows the Movement sector normal intervention variables.

Table 4-13. Normal Intervention - Movement sector, inputs and intermediate variables

Nd#	NODE Name	Group	Sector	Note
132	Intervention displaced pop	Intervention	Movement	
216	Reducing likelihood of population movements	Intervention	Movement	Probability (0 - 1.0); average of inputs

Table 4-14 shows the normal intervention variables for the Needs sector. There is an additional variable in the special factors category, discussed later.

Table 4-14. Normal Intervention - Needs sector, inputs and intermediate variables

Nd#	NODE Name	Group	Sector	Note
152	Food distribution	Intervention	Needs	Quantity Distributed
152.1	Food distribution	Intervention	Needs	Quantity Needed
151	Food importation	Intervention	Needs	Quantity Imported
151.1	Food importation	Intervention	Needs	Quantity Needed
136	Intervention food	Intervention	Needs	
141	Intervention health	Intervention	Needs	
142	Intervention housing	Intervention	Needs	
143	Intervention water	Intervention	Needs	
150	Medical treatment	Intervention	Needs	Quantity Treated
150.1	Medical treatment	Intervention	Needs	Quantity Needing Treatment
154	Negotiating bureaucracies to get relief	Intervention	Needs	Quantity Helped
154.1	Negotiating bureaucracies to get relief	Intervention	Needs	Quantity Needing Help
218	Prepositioning humanitarian relief stocks	Intervention	Needs	Amount handled
218.1	Prepositioning humanitarian relief stocks	Intervention	Needs	Amount needed
156	Providing temporary shelter/housing	Intervention	Needs	Quantity Sheltered
156.1	Providing temporary shelter/housing	Intervention	Needs	Quantity Needing Shelter
155	Resettlement processes	Intervention	Needs	Expected # resettled in 0 wks
155.1	Resettlement processes	Intervention	Needs	Quantity Needing Resettlement
153	Water distribution	Intervention	Needs	Quantity Distributed
153.1	Water distribution	Intervention	Needs	Quantity Needed
237	Health infrastructure repair	Intervention	Needs	Quantity finished in 8 wks
237.1	Health infrastructure repair	Intervention	Needs	Quantity Needed
238	Intervention health infrastructure	Intervention	Needs	

Two sectors were added to support intervention, the Physical sector and the Security sector. These sectors are only distinguished within the intervention variables, as they feed into intermediate variables in the other sectors. Table 4-15 shows the input variables of the Physical sector.

Table 4-15. Normal Intervention - Physical sector, input variables

Nd#	NODE Name	Group	Sector	Note
168	Electricity distribution	Intervention	Physical	Quantity available in 0 wks
168.1	Electricity distribution	Intervention	Physical	Quantity Needed
167	Electricity production plants	Intervention	Physical	Quantity available in 52 wks
167.1	Electricity production plants	Intervention	Physical	Quantity Needed
171	Rebuild airports	Intervention	Physical	Quantity available in 0 wks
171.1	Rebuild airports	Intervention	Physical	Quantity Needed
170	Rebuild bridges	Intervention	Physical	Quantity available in 0 wks
170.1	Rebuild bridges	Intervention	Physical	Quantity Needed
174	Rebuild oil pipelines	Intervention	Physical	Quantity available in 0 wks
174.1	Rebuild oil pipelines	Intervention	Physical	Quantity Needed
173	Rebuild oil production	Intervention	Physical	Quantity available in 0 wks
173.1	Rebuild oil production	Intervention	Physical	Quantity Needed
169	Rebuild roads	Intervention	Physical	Quantity available in 0 wks
169.1	Rebuild roads	Intervention	Physical	Quantity Needed
172	Rebuild seaports	Intervention	Physical	Quantity available in 0 wks
172.1	Rebuild seaports	Intervention	Physical	Quantity Needed
177	Rebuild telecommunications	Intervention	Physical	Quantity available in 4 wks
177.1	Rebuild telecommunications	Intervention	Physical	Quantity Needed
176	Rebuild water & sewage treatment facilities	Intervention	Physical	Quantity available in 4 wks
176.1	Rebuild water & sewage treatment facilities	Intervention	Physical	Quantity Needed
175	Rebuild water lines	Intervention	Physical	Quantity available in 0 wks
175.1	Rebuild water lines	Intervention	Physical	Quantity Needed
239	Rebuild railroads	Intervention	Physical	Quantity available in 56 wks
239.1	Rebuild railroads	Intervention	Physical	Quantity Needed

Table 4-16 shows the normal intervention input variables of the Security sector. There are also special factors in the Security sector, discussed below.

Table 4-16. Normal Intervention - Security sector, input variables

Nd#	NODE Name	Group	Sector	Note
219	Establishing confidence-building and security measures	Intervention	Security	Number of missions
219.1	Establishing confidence-building and security measures	Intervention	Security	Number of missions needed
221	Safeguarding institutions of governance and key officials	Intervention	Security	Number of missions
221.1	Safeguarding institutions of governance and key officials	Intervention	Security	Number of missions needed

4.3.2 Special Factors: Multipliers

Multipliers modify other intervention factors, including normal factors, before they are passed into the rest of the ISSM model. The multiplier values are exactly that; the value of the modified factor is multiplied by the values of all multiplier factors that are its inputs.

In the normal node model, a node with input nodes does not have a value except as derived from the weighted sum of its inputs. In this case, the nodes with multiplier inputs has its own value, derived from a user input; however, this value is multiplied by the mulitplier factor input value.

Figure 4-10 illustrates the connections of normal intervention factors. The brown lines indicate intervention. The "nnn" indicates where the node number is placed. The yellow interior indicates an intermediate intervention variable. The blue interior indicates an input variable. The solid arrow is a normal connection. Figure 4-11 shows the multiplier connection. The multiplier's interior is diagonally hatched and the connector is a dashed line.

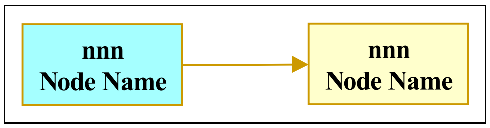


Figure 4-10. Normal intervention connection

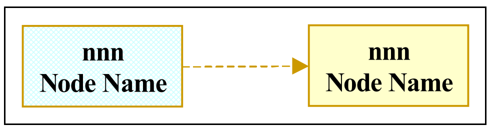


Figure 4-11. Special multipliers intervention connection

Table 4-17 shows the multiplier variables, which are found in the Needs and the Security sectors.

Table 4-17. Multipliers Intervention - Needs and Security sectors, input variables

Nd#	NODE Name	Group	Sector	Note
217	Coordinating NGO activities	Intervention	Needs	Multiplier between 1.0 and 1.25; sum of inputs
235	Providing force security	Intervention	Security	Multiplier between 0 - 1.0; sum of inputs
232	Providing security for HA activities	Intervention	Security	Multiplier between 0 - 1.1; sum of inputs
233	Providing security for PO activities	Intervention	Security	Multiplier between 0 - 1.1; sum of inputs
234	Providing security for Stability activities	Intervention	Security	Multiplier between 0 - 1.1; sum of inputs

4.3.3 Special Factors: Weights

Weight factors act as normal inputs to node/variables; however, the value that is associated with the factor controls the weight in the weighted average calculation, while a fixed value of -3.00 or +3.00 is associated with the normal value place in the calculation. There are only two instances of weight factors, one for positive public information operations, with a weight of +3.00, and one for negative messages, with a weight of -3.00. The values of these factors, which become the weights, are the effectiveness of the message.

Figure 4-12 illustrates the connections of these factors. The interior of the weight factor is hatched with vertical and horizontal lines and the connector is a dashed line.

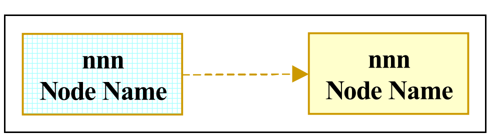


Figure 4-12. Special weights intervention connection

Table 4-18 shows the weights special factors, which are both found in the Miscellaneous sector.

Table 4-18. Weights Intervention - Miscellaneous sector, input variables

Nd#	NODE Name	Group	Sector	Note
213	Conducting benign public information operations	Intervention	Misc	Effectiveness of messages (0 - 100%); sum of inputs
222	Negative impact of intervention (rapes, etc.)	Intervention	Misc	Effectiveness of negative messages (0 - 100%); sum of inputs

4.3.4 Special Factors: Reversible and Variable

Reversible and variable factors allow for the fact that the connections between some nodes are situation dependent. For example, the change in size of a displaced population influences the outlook of the situation. If the displaced population is reduced through returning homes, this results in a positive change in outlook. However, if the displaced population is reduced through genocide, this results in a negative change in outlook.

The standard node models are all designed with a positive inflation parameter (see the discussion of the node model). Reversible and variable factors carry values that replace the inflation parameter for the appropriate connections. If the standard inflation parameter for a particular connection is +0.75, the user can cause a reverse in the sense of the connection for a particular date by setting the value to -0.75. The user can represent abrupt shifts by simply entering the direct reversals or the user can represent gradual shifts by entering a series of numbers for a series of dates with gradual changes, e.g., {+0.75, +0.50, +0.25, 0.00, -0.25, -0.50, -.75}. If no values are entered, the model will use the standard values, so the user must enter values for every date for which a modified inflation value is proper.

Figure 4-13 shows the diagram of node connections for these variables. Most of these factors affect connections between movement nodes, hence the color scheme for the illustrated nodes. The reversible factors do not have node names, rather they are denoted by the pair of nodes whose connection is affected. The logic diagram indicates the presence of a reversible and variable factor with a pair of triangles meeting point to point, the symbol for a valve, with the word "reversible" nearby.

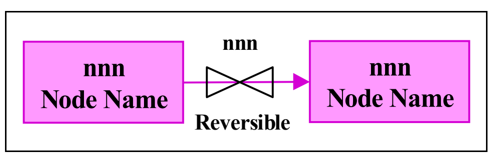


Figure 4-13. Special reversible and variable intervention connection

Table 4-19 shows the reversible factors as intervening at the connection between two nodes. The table also shows the standard Inflation value associated with the factor, absent user modification.

Table 4-19. Reversible Factors

From	To	From Node	To Node	Std Infl
18	7	Displaced population decreases	Changes in population composition improve outlook	1.00
24	7	Expatriates return to country	Changes in population composition improve outlook	0.80
24	10	Expatriates return to country	Commercial sector contributes to national welfare	0.80
24	29	Expatriates return to country	Government has domestic legitimacy	1.00
24	41	Expatriates return to country	Paramilitary forces are not present	0.50
24	46	Expatriates return to country	Population is not forced to move	0.25
24	52	Expatriates return to country	Safe and secure environment is perceived	0.50
28	8	Domestic media is free	Civil (internal) unrest is not present	0.50
39	7	Migrants leave country	Changes in population composition improve outlook	1.00
44	42	People's spiritual needs are met	People are tolerant of the status quo	0.25
50	24	Property ownership issues are resolved	Expatriates return to country	1.00

4.3.5 Intervention Sector Model

Figure 4-14, Figure 4-15, and Figure 4-16 show the diagrams of the node connections within the intervention sector.

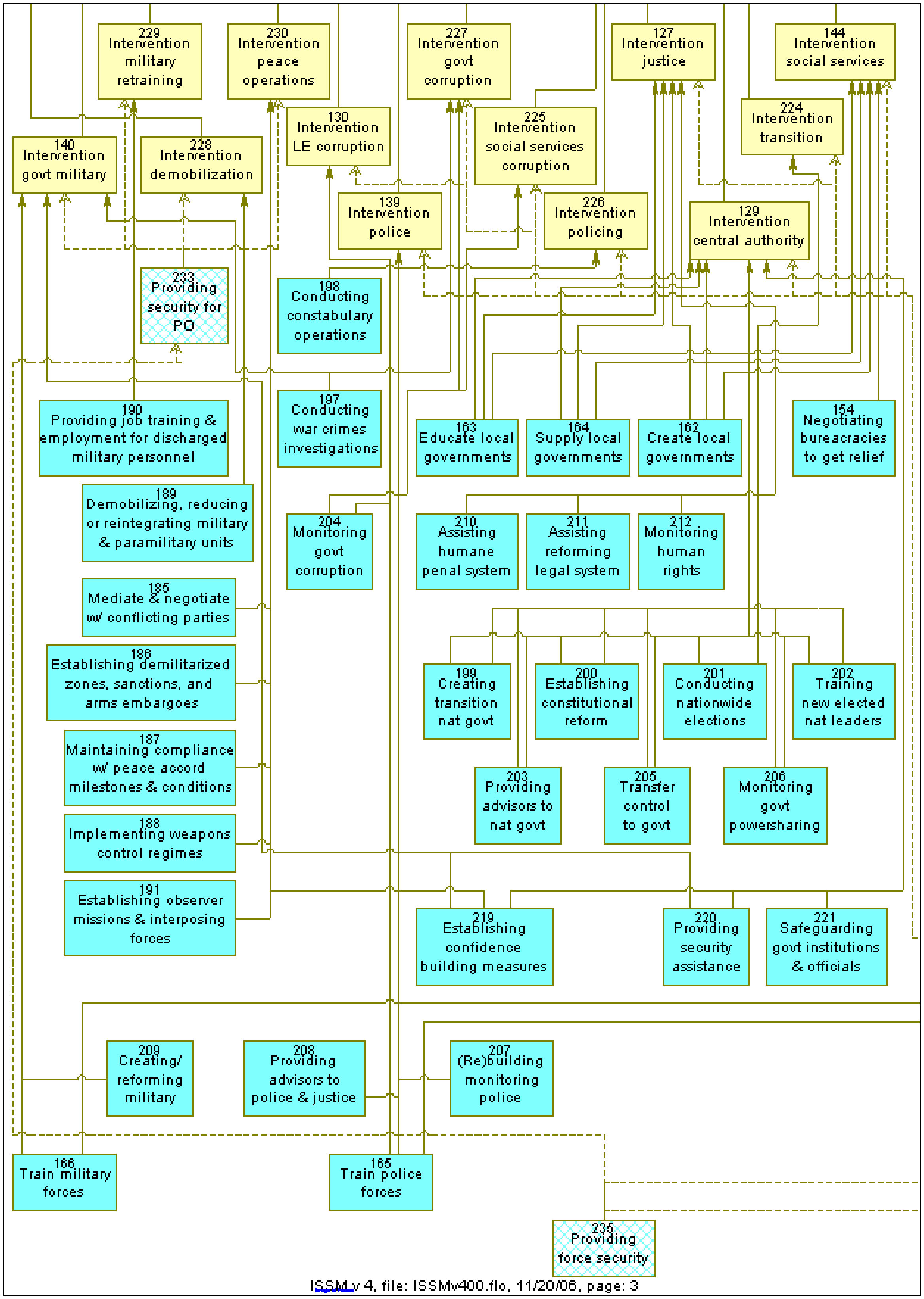


Figure 4-14. Intervention (part 1)

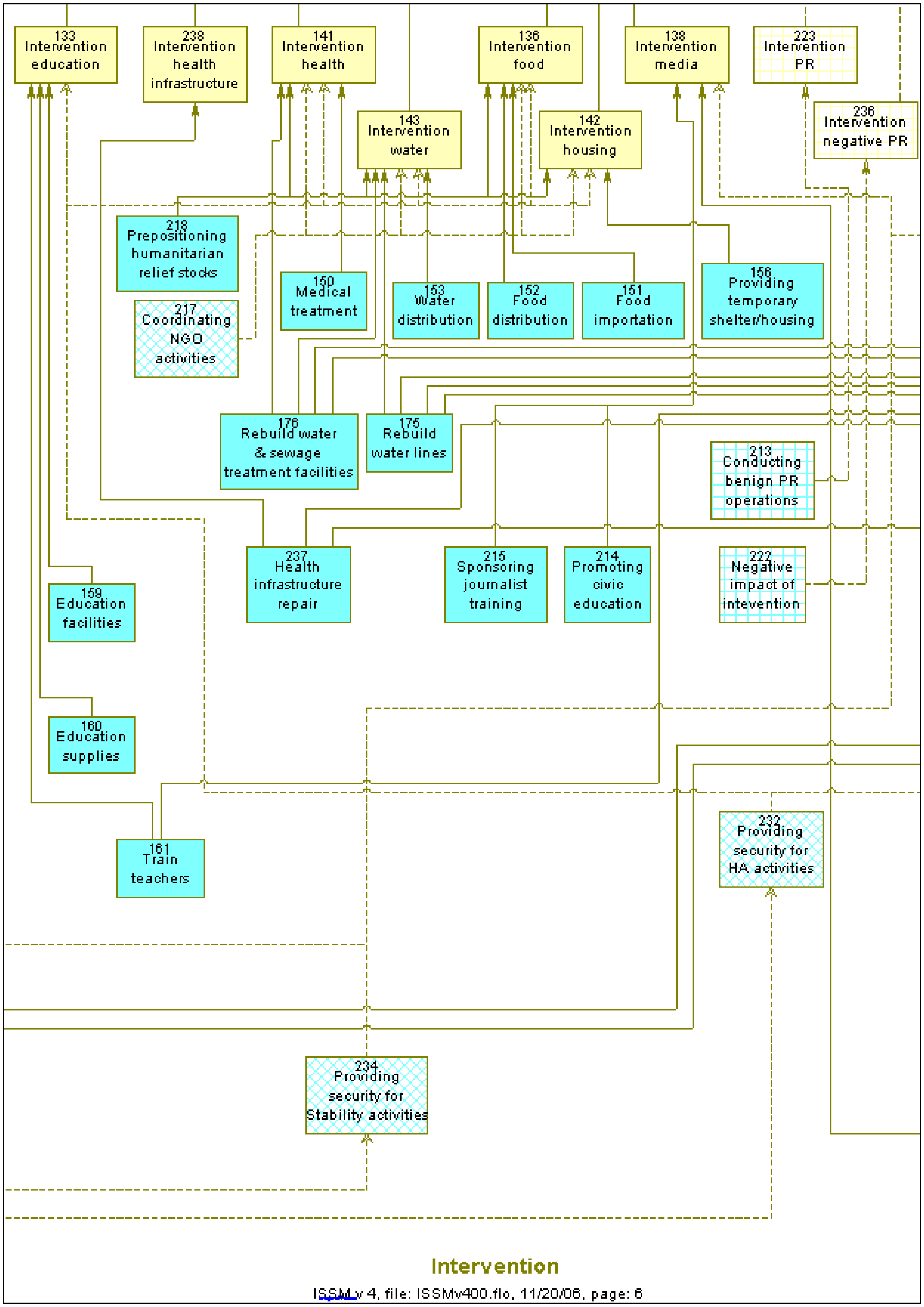


Figure 4-15. Intervention (part 2)

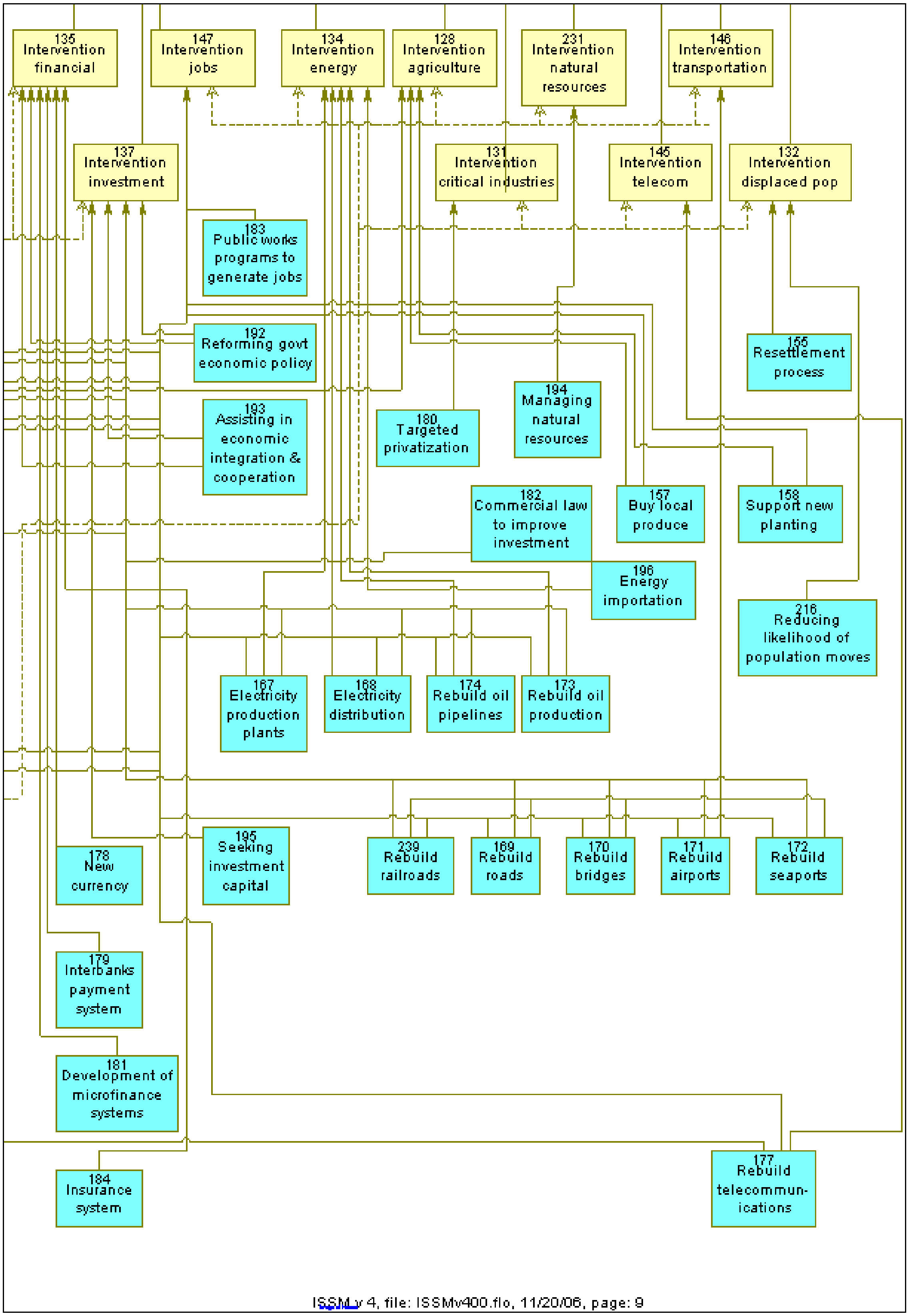


Figure 4-16. Intervention (part 3)

4.4 ISSM MAIN FREE-FORM LOGIC

The ISSM Main allows the user to create logic that processes available data into the data required for the external inputs. The UserWorksheet and the DiamondWorksheet provide this support, the first worksheet for real-world situations and the second for simulated situations, e.g., those simulated using the DIAMOND model.

In its simplest implementation, the user may have more detailed data than that called for in the ExternalInputs sheet. For example, node 171 supports projects to repair or build airports. If the plan is to build three new airports, the values for all dates for node 171.1 (total required airports) would be 3.0 and the entries for node 171 would reflect the start dates for each airport. Since the construction of an airport is a complex process, each airport project might have subprojects, involving runway construction, control tower construction, terminal construction, and support infrastructure construction, each being apportioned a fractional value, adding to 1.0, to reflect the fractional value each subproject will contribute to the construction of the entire airport. Thus the entries for node 171 would reflect the total fractional value of subprojects initiated on or before a given date.

In practice, such a breakdown for multiple airports would be difficult to track. The user might wish to maintain in the UserWorksheet a row for each airport's subprojects, with a total for all of the fractions for each date. This structure is shown in the top half of Figure 4-17.

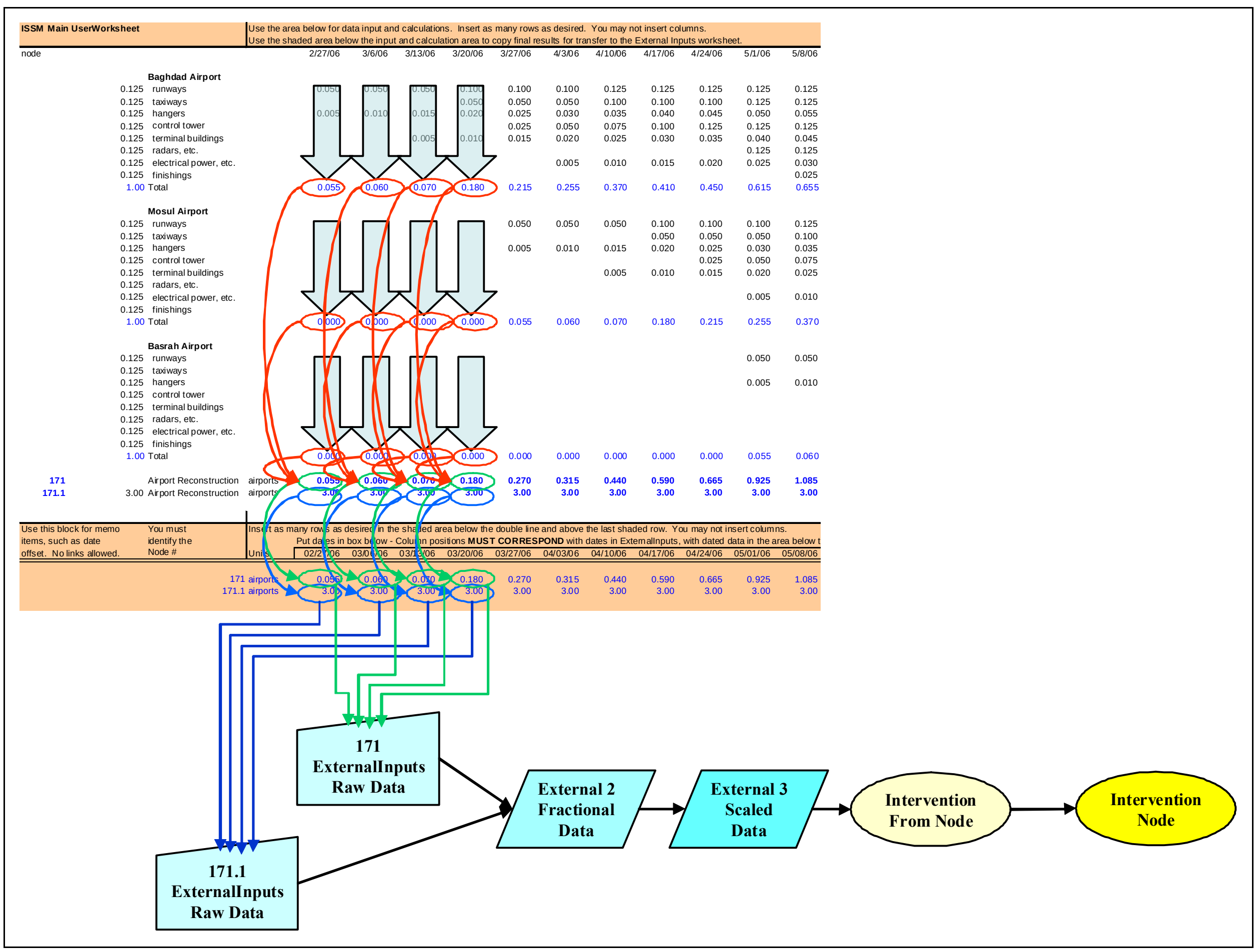


Figure 4-17. ISSM Main free-form logic

The User- and Diamond- Worksheets have the same structure. The white area in the top of the worksheet in the figure contains a mostly unformatted area in which the user defines his inputs and creates any desired combinatorial logic. The broad blue arrows show where the subprojects of each airport are totaled for each date. The red arrows show the airports' progress being totaled to the green ovals for each date. The blue ovals reflect the total desired airport values for each date. The format that is imposed on this area is a column-based identification of dates and data. The bottom half of these worksheets consists of a formatted area to which the final results must be copied (blue and green curved arrows). These worksheets are described in more detail in Section 5.5. The Connect/Disconnect control found in the Controller creates the links from the formatted part of the proper worksheet to the correct row in the ExternalInputs worksheet. The remainder of the processing uses the standardized ISSM Main external inputs logic.

A more complex implementation would result from a need for a non-linear correspondence between available data and the value of a project. For example, consider the impact of school construction on node 159, education facilities. Node 159 is an input to node 133, Intervention education. The mathematics of ExternalInputs, External 2, and External 3 yields a linear connection between the fraction, schools constructed divided by schools needed, and Intervention education. If the number of schools needing construction or reconstruction is a small fraction of the total schools, then this is probably adequate. However, if the fraction is near 1.0, then it may be a poor model. If the user desires to model the construction of schools with the first few schools and the last few schools having marginal impact, a piecewise linear or S-curve model may be more appropriate.

The user can build into UserWorksheet a section in which he or she enters the raw numbers initiated, with a following row that calculates the modified value. The user can then link the modified values into ExternalInputs, yielding the desired non-linear function.

Depending on the needs of the situation and the creativity of the user, more complex implementations are possible. For example, the user might find it necessary to combine inputs from multiple sources, because of suspected unreliability of the data. Or the user might have to combine related inputs to create the desired information. Each of these needs can be met using the UserWorksheet and links to the ExternalInputs worksheet.

4.4.1 DiamondWorksheet

When the ISSM is used with DIAMOND, DIAMOND acts as a surrogate for reality. DIAMOND is a simulation and, as such, has a mechanism for advancing simulated time, producing interactions, and reporting on the results. DIAMOND was not built with the ISSM in mind and does not directly produce the inputs that the ISSM needs. However, the DIAMOND outputs that relate to ISSM interventions can be linked to those interventions through an extra worksheet in ISSM Main. Similarly, the DIAMOND outputs that relate to ISSM inputs can be linked to those inputs through an extra worksheet in the Preprocessor, as discussed later.

Because the data output from DIAMOND for one scenario will be largely the same (in format) as the data output for another scenario, once the logic is built for the extra worksheet to handle DIAMOND output, it does not have to be rebuilt for the next use. This is the justification for a separate version of the ISSM.

Figure 4-18 shows a section of the special sheet, named DiamondWorksheet, within the ISSM Main workbook for receiving the output from DIAMOND that will be processed for use in ExternalInputs.

Node in ExternalInputs into which to put link for row

1st date should correspond to 1st date in ExternalInputs

Put food delivered and food needed in where red place-holder numbers are showing

Node	Formulas		Initial 12/01/12	Month 1 01/01/13
	Needs Intervention Calculations			
	FoodD(i,AOj)=food delivered in AO	FoodD(i,AO1)	4	3
	FoodN(i,AOj)=food needed in AO	FoodN(i,AO1)	4	4
		FoodD(i,AO2)	3.5	2.5
		FoodN(i,AO2)	4	4
		FoodD(i,AO3)	4	3
		FoodN(i,AO3)	4.5	4.5
		FoodD(i,AO4)	4	2.5
		FoodN(i,AO4)	4	4
		FoodD(i,AO5)	4	3
		FoodN(i,AO5)	4	4.5
152	sum over j {FoodD(i,AOj)}	FoodD(i)	19.5	14
152.1	sum over j {FoodN(i,AOj)}	FoodN(i)	20.5	21

Figure 4-18. Section of Extra Worksheet

This section holds the food delivered and needed in each AO in the scenario and calculates the totals for each period, beginning with the initial assignment and continuing for each month. The totals are linked to the cells for each appropriate date for nodes 152 and 152.1 in ExternalInputs through formulas in those cells.

Table 4-20 shows the current groups of calculations in the DiamondWorksheet worksheet and the connections to nodes in the ExternalInputs worksheet. Some of these connections would be useful in all DIAMOND-ISSM studies and others would need modification. For example, in the study from which these were created, there were several parties of interest: Green represented the indigenous government forces; Red represented an indigenous insurgent army, who might use terrorist tactics (Harass mission); Terrorists represented a party of purely terrorist orientation; Blue represented external forces aiding the Green government; and NGO represented the collection of NGOs attempting to aid the population.

Table 4-20. Extra Worksheet to ExternalInputs Connections

Computation	Units	Node	Use
Food delivery	Person Day Rations (thousands)	152	Needs Intervention
Food needed	Person Day Rations (thousands)	152.1	Needs Intervention
Successful food delivery missions	Number	218	Needs Intervention
Attempted food delivery missions	Number	218.1	Needs Intervention
Targets owned by Blue	Scaled number		Intermediate calculation
Targets owned by Green	Scaled number		Intermediate calculation
Targets owned by Red	Scaled number		Intermediate calculation
Targets owned by others	Scaled number		Intermediate calculation
Target ownership Indicator	Scaled number	188	Weapons Control Intervention

4.4.2 Current Simulation Support for External Inputs

Figure 4-19 shows the 29 (of 79) ISSM intervention variables that can be supported by DIAMOND or Pythagoras. Some of these do not yet have DIAMOND queries written to implement the support. Some of them also do not yet have ISSM Preprocessor logic created to implement this support. The majority of the missing links represent interventions that are not called for by the existing scenario's time frame.

Figure 4-20 shows the remaining 50 ISSM intervention variables that require manual creation of data, based on the scenario description and historical precedents. The majority of these links represent interventions that are not called for by the scenario's time frame.

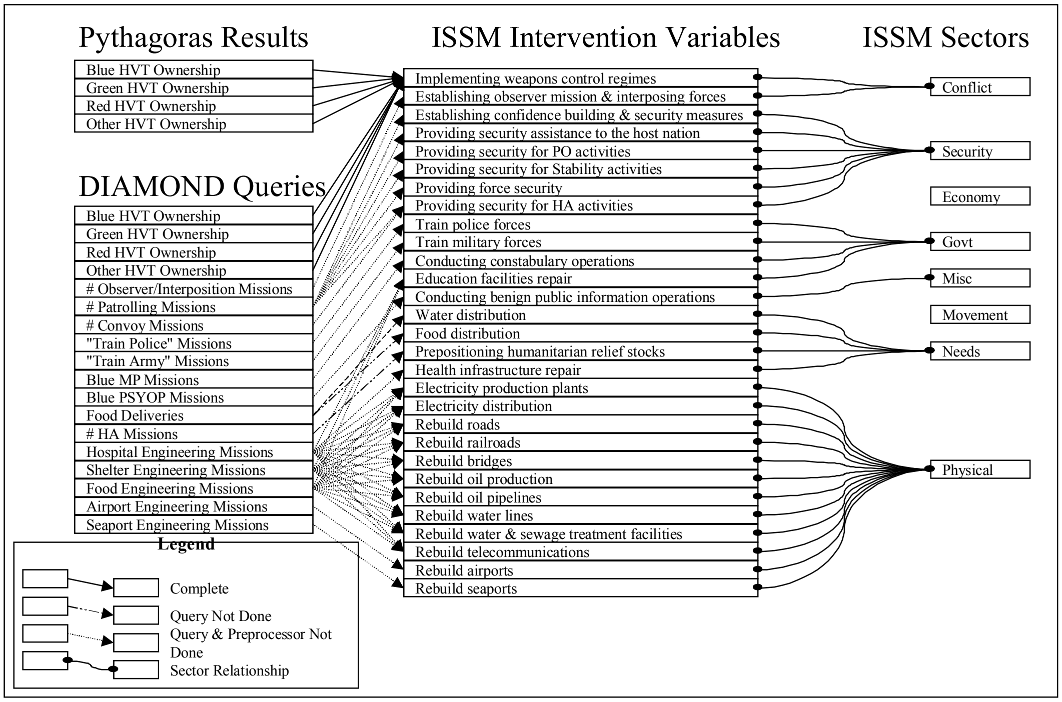


Figure 4-19. ISSM interventions supported by simulations

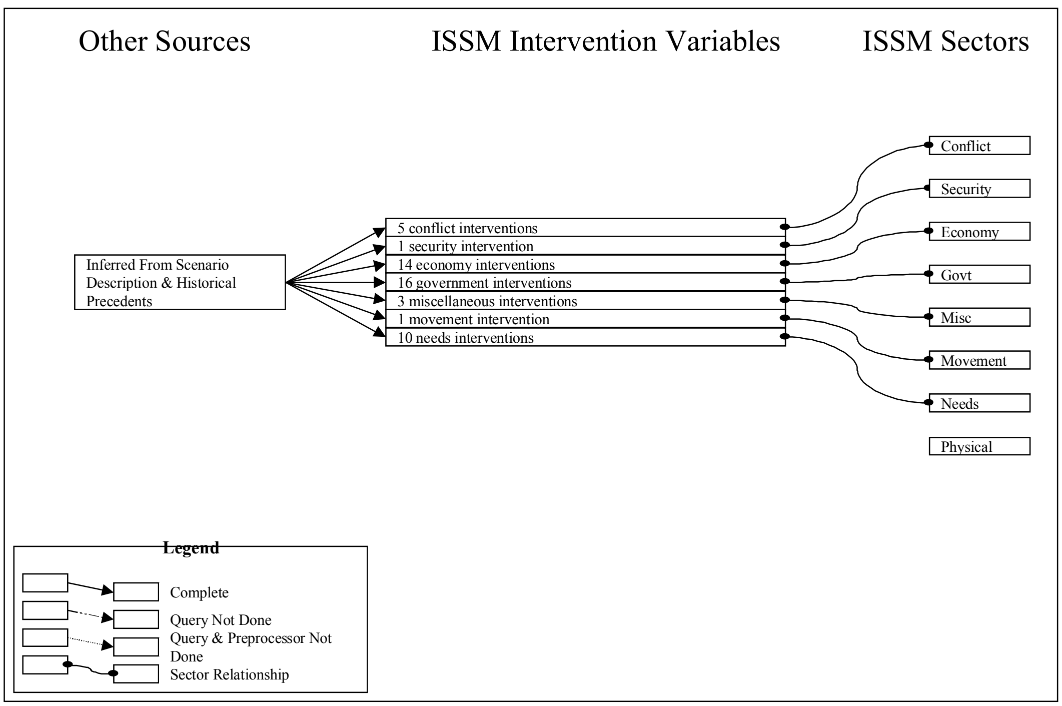


Figure 4-20. ISSM interventions, not supported by simulations

4.5 ISSM MAIN PRINCIPAL LOGIC FLOWS

The explanations to this point have mainly concerned abstract logical structures and their connections. However, these logical structures require concrete implementation to be useful. Section 5 describes the ISSM Main Excel workbook and its worksheets. Figure 4-21 provides a visual transition between the abstract logic and the concrete implementation by showing the principal logic flows among the worksheets.

The upper worksheets in the figure include the external inputs pathway. The user may begin with the UserWorksheet of DiamondWorksheet, which flows to the ExternalInputs worksheet (dotted arrow for optional flow), or the user may begin with ExternalInputs. ExternalInputs feeds into External 2, which feeds External 3, which flows to Intervention (one date column at a time).

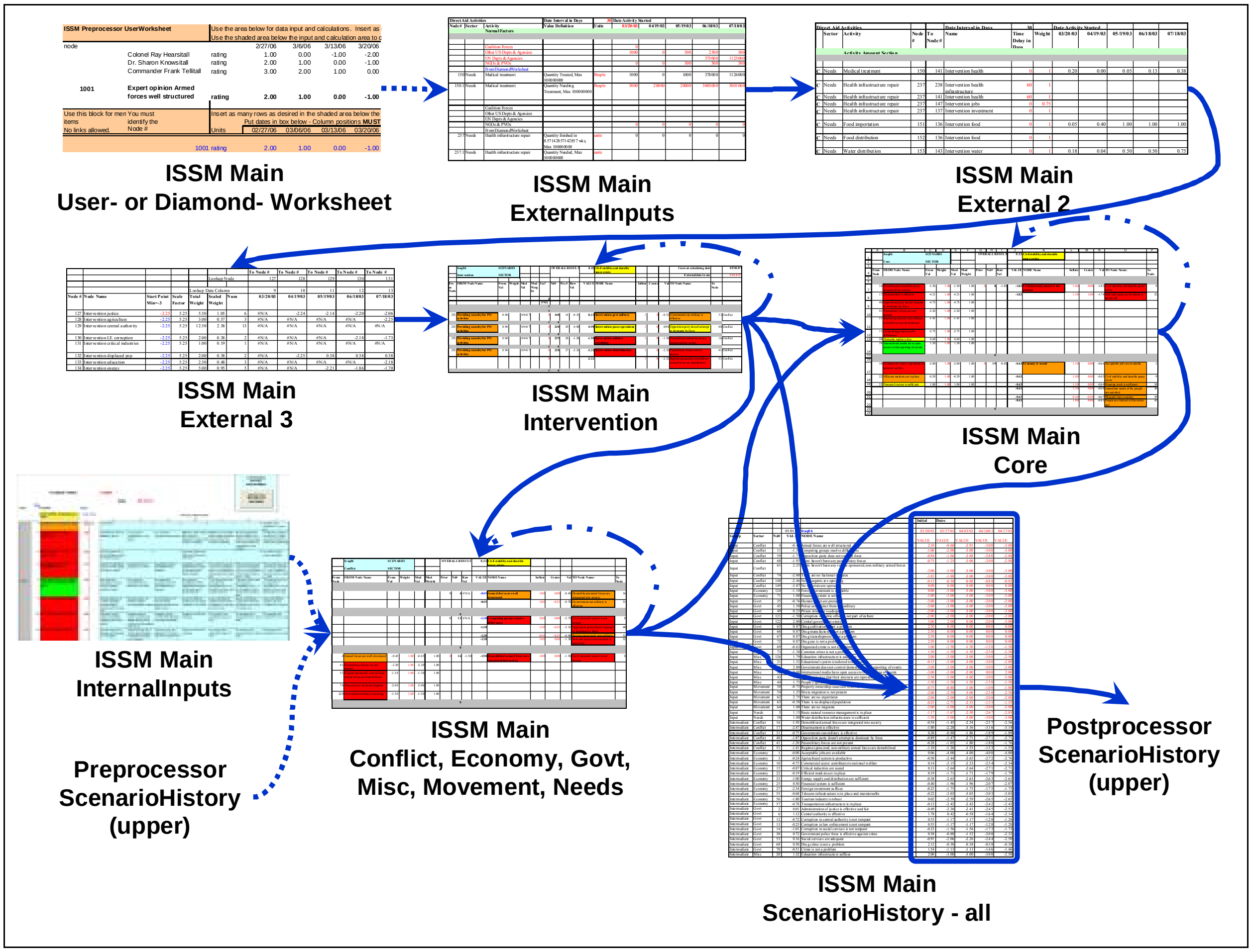


Figure 4-21. ISSM Main principal logic flows

The lower left of the figure shows the internal inputs pathway. The user may begin with the InternalInputs worksheet or may use the output from the Preprocessor (dotted arrows again show optional flows). The internal inputs feed the Conflict, Economy, Govt, Misc, Movement, and Needs worksheets (one date at a time), as does the Intervention worksheet. These worksheets have internal flows (arrows with two dots between dashes) and flows to the Core worksheet, which also has internal flows. The values of all of the nodes for each date are stored in the ScenarioHistory worksheet for display in the charts. They are also transferred to the Postprocessor to be available for use, if needed.

5. ISSM V4.0 MODEL IMPLEMENTATION

This section is provided to familiarize you with the 22 worksheets within the Main ISSM. These are briefly described in the subsections below.

5.1 INSTRUCTIONS WORKSHEET

The Instructions worksheet (Figure 5-1) contains the version information, the ISSM Main banner and a brief description of the ISSM.

ISSM (c) 2003, Hartley Consulting, Oak Ridge, TN
4_03 Version
11/21/06 Date

Hartley Consulting

Interim Semi-static Stability Model

(ISSM)

This model describes the impact on the "civil stability and durable peace" of the values of a set of factors within a single country. This is an instantaneous impact and does not allow for any feedback loops or actions over time. The principal output variable and the input variables are described below. The description includes valuation and sector information.

Negative values negate the variable statement and positive values affirm the statement. Normally, zero is the neutral value. However, some statements require a larger number to attain a neutral effect.

The variables change color to reflect their values:

Green:	**1.00 <= Value <= 4.00**
Yellow:	**0.00 <= Value < 1.00**
Orange:	**-1.00 <= Value < 0.00**
Red:	**-4.00 <= Value < -1.00**

The connections for the entire model are shown on the Diagram worksheet. Each sector has its own color, shown in the node outlines and in the connecting lines. Independent nodes (those with values defined by the inputs above) have a blue fill. Nodes whose values are dependent on the values of other nodes are filled with the color for the sector.

This model was inspired by the model described in *Doing Windows: Non-Traditional Military Responses to Complex Emergencies*, Bradd C. Hayes and Jeffrey I. Sands, CCRP, 1998. However, nodes have been added; some definitions have been changed; and some connections have been changed. In addition, the connecting logic, while similar, is not identical.

Figure 5-1. Instructions worksheet of ISSM Main

5.2 DIAGRAM WORKSHEET

The Diagram worksheet contains the logic diagrams of the ISSM Main. The diagram is broken into parts and is shown as Figure 4-4 through Figure 4-16.

5.3 CONTROLS WORKSHEET

Figure 5-2 shows the top half of the Controls worksheet. It contains the Select Date Axis control, the Select Value Axis Display control, the Select Intervention/Observation control, the Recalculate Data control and the Start New Model controls.

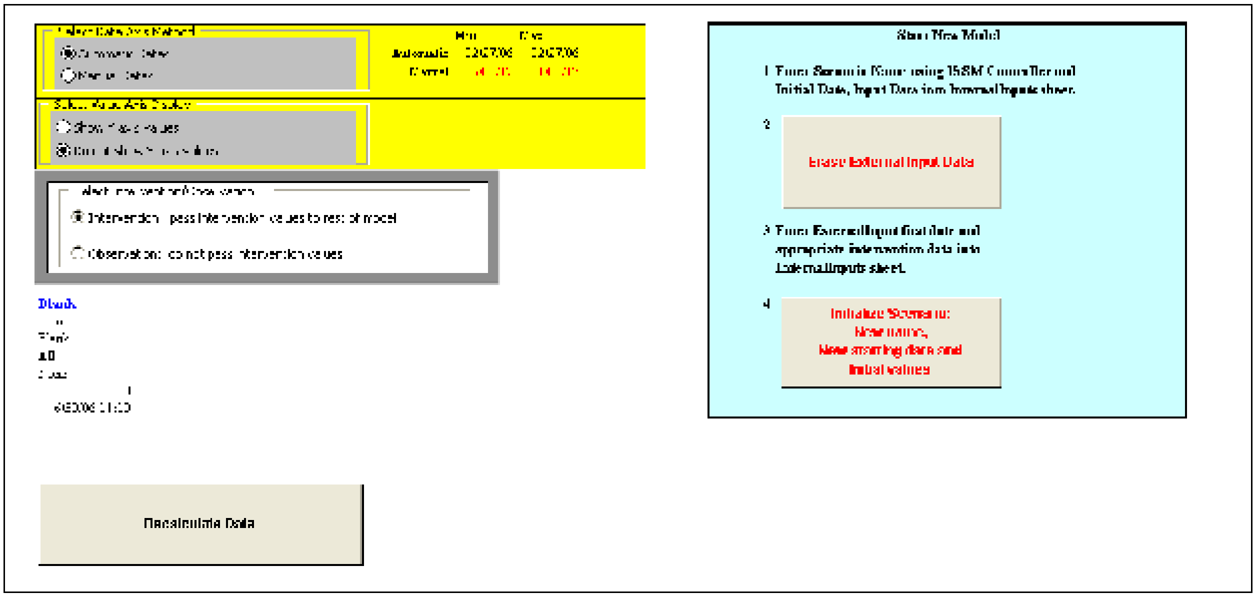


Figure 5-2. Top half of ISSM Main Controls sheet

Figure 5-3 shows the bottom half of the Controls sheet, which contains the 12 Custom Series controls.

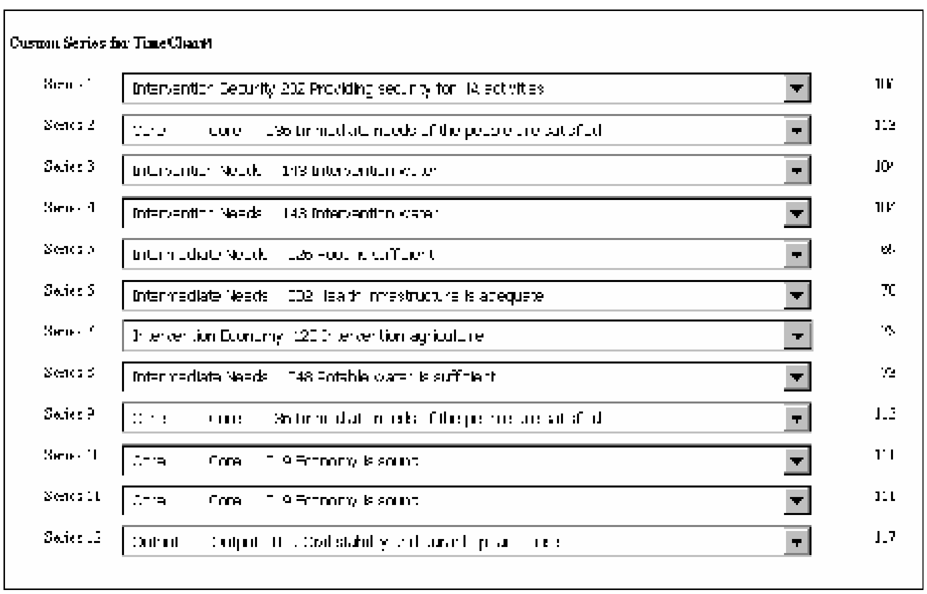


Figure 5-3. Bottom half of ISSM Main Controls sheet

5.4 INTERNALINPUTS WORKSHEET

Figure 5-4 illustrates the contents of the InternalInputs sheet. The input fields are shown in red; however, the scenario name should not be changed on this sheet. You should use the save function of the Controller because any change you make on the InternalInputs sheet to the scenario name will be overwritten when you save the data. The Add New Data control is also found on the InternalInputs sheet.

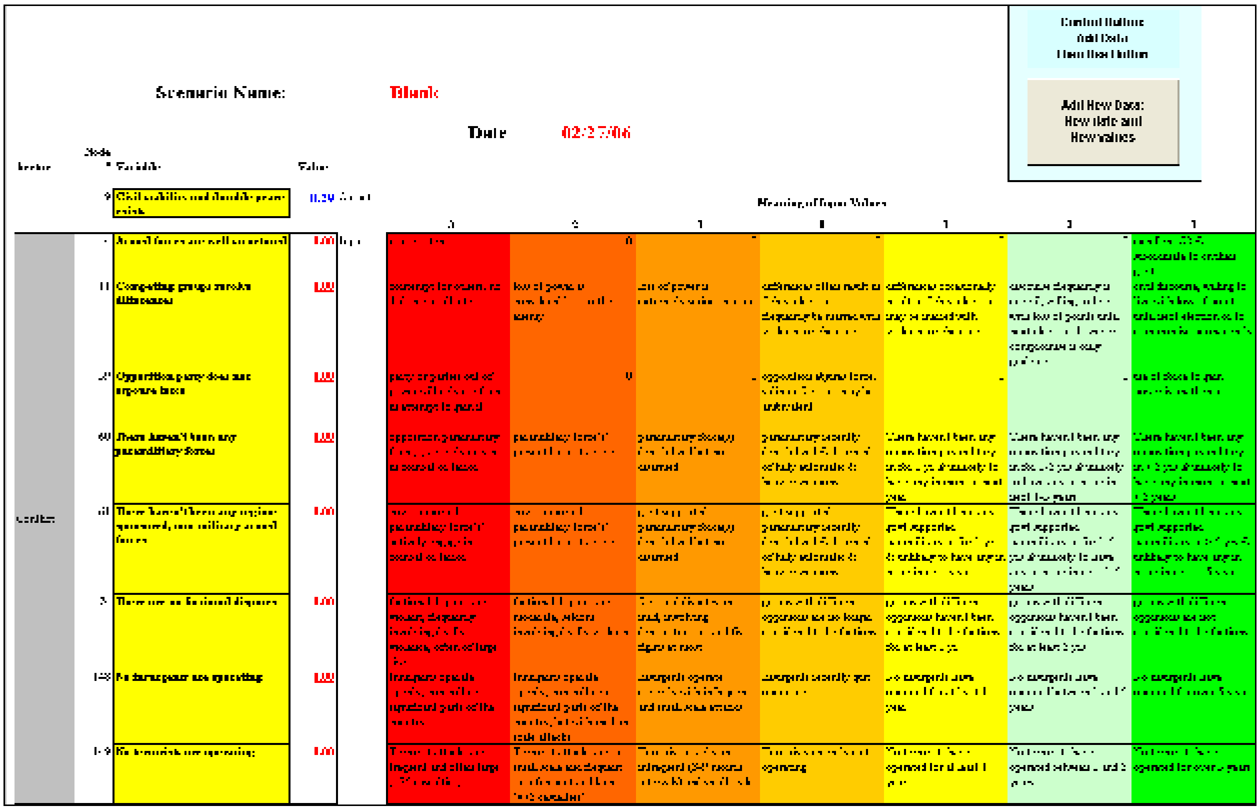


Figure 5-4. Part of InternalInputs sheet

5.5 USER- AND DIAMOND- WORKSHEETS

The ISSM Main workbook contains two structured, but essentially blank, worksheets, named "UserWorksheet," and "DiamondWorksheet." These worksheets allow the user to create free-form logic to calculate the values to be used for the external inputs (Table 7-1) within the ISSM itself and allow the user to retain metadata within the model, rather than in external files. For example, if the user has multiple sources for the data, he may annotate which data comes from each source before passing it on for use in the model. The user may also manipulate the data in any desired fashion in the worksheet prior to passing it on. These manipulations may be as simple as summing data from two sources or as complex as applying non-linear utility functions to the data so that the resulting scaled values reflect the correct relationships within the model.

5.5.1 The UserWorksheet

Figure 5-5 illustrates the concept. In the top half of the worksheet, the user builds in the worksheet a form that allows him to enter the data from available sources, then creates any needed computations based on these data.

The first row must contain the dates for the interventions and these dates must be exactly the same as the dates in the ExternalInputs worksheet.

In this example, the planned statuses (with time offset data noted for manual coordination) of three airports are combined to yield a single airport-reconstruction status on the row containing the value "171" in the first column. The "171" is a user created memorandum to the effect that the data in this row will be needed by node 171 in the ExternalInputs worksheet. For inputs requiring two nodes (as this one does), the user may create a separate row labeled, for example "171.1," or the user may select a cell to hold a constant goal value and take care of the propagation of this goal in the bottom half of the worksheet. There is a column labeled "units" (shown in the lower half) that you may use to define the units for the node.

ISSM Main UserWorksheet			Use the area below for data input and calculations. Insert as many rows as desired. You may not insert columns. Use the shaded area below the input and calculation area to copy final results for transfer to the External Inputs worksheet.											
node				2/27/06	3/6/06	3/13/06	3/20/06	3/27/06	4/3/06	4/10/06	4/17/06	4/24/06	5/1/06	5/8/06
		Baghdad Airport												
	0.125	runways		0.050	0.050	0.050	0.100	0.100	0.100	0.125	0.125	0.125	0.125	0.125
	0.125	taxiways					0.050	0.050	0.050	0.100	0.100	0.100	0.125	0.125
	0.125	hangers		0.005	0.010	0.015	0.020	0.025	0.030	0.035	0.040	0.045	0.050	0.055
	0.125	control tower						0.025	0.050	0.075	0.100	0.125	0.125	0.125
	0.125	terminal buildings				0.005	0.010	0.015	0.020	0.025	0.030	0.035	0.040	0.045
	0.125	radars, etc.											0.125	0.125
	0.125	electrical power, etc.							0.005	0.010	0.015	0.020	0.025	0.030
	0.125	finishings												0.025
	1.00	Total		0.055	0.060	0.070	0.180	0.215	0.255	0.370	0.410	0.450	0.615	0.655
		Mosul Airport												
	0.125	runways						0.050	0.050	0.050	0.100	0.100	0.100	0.125
	0.125	taxiways									0.050	0.050	0.050	0.100
	0.125	hangers						0.005	0.010	0.015	0.020	0.025	0.030	0.035
	0.125	control tower										0.025	0.050	0.075
	0.125	terminal buildings								0.005	0.010	0.015	0.020	0.025
	0.125	radars, etc.												
	0.125	electrical power, etc.											0.005	0.010
	0.125	finishings												
	1.00	Total		0.000	0.000	0.000	0.000	0.055	0.060	0.070	0.180	0.215	0.255	0.370
		Basrah Airport												
	0.125	runways											0.050	0.050
	0.125	taxiways												
	0.125	hangers											0.005	0.010
	0.125	control tower												
	0.125	terminal buildings												
	0.125	radars, etc.												
	0.125	electrical power, etc.												
	0.125	finishings												
	1.00	Total		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.055	0.060
171		Airport Reconstruction	airports	**0.055**	**0.060**	**0.070**	**0.180**	**0.270**	**0.315**	**0.440**	**0.590**	**0.665**	**0.925**	**1.085**
171.1	3.00	Airport Reconstruction	airports	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**
Use this block for memo items, such as date offset. No links allowed.		You must identify the Node #	Insert as many rows as desired in the shaded area below the double line and above the last shaded row. You may not insert columns. Put dates in box below - Column positions **MUST CORRESPOND** with dates in ExternalInputs, with dated data in the area below t											
			Units	02/27/06	03/06/06	03/13/06	03/20/06	03/27/06	04/03/06	04/10/06	04/17/06	04/24/06	05/01/06	05/08/06
		171	airports	0.055	0.060	0.070	0.180	0.270	0.315	0.440	0.590	0.665	0.925	1.085
		171.1	airports	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Figure 5-5. UserWorksheet with sample entries

In the bottom half of the worksheet, the user collects all of the entries that will connect to the ExternalInputs worksheet.

The first step is to place formulas in the "dates" box to copy the dates from the top of the worksheet. Make sure that the resulting dates correspond exactly to the dates in ExternalInputs, including the number of dates, so that the last date in this worksheet corresponds with the last date in ExternalInputs.

The inputs should be in numerical order of the nodes that will be connected. If additional rows are needed, use the Excel "insert row" function to insert rows within the light orange section, which defines the area that will be connected. The user should start the first row of data below the double lines separating the instructions and dates, leaving at least one blank row in case nodes with smaller numerical values need to be inserted later.

In the "Node #" column, place a formula that copies the node number from the top half of the worksheet. If you used a constant goal, use a formula that adds 0.1 to the value for the node number. If you defined the units in the top half, place a formula that copies its value, otherwise, type the definition into the "Units" column. Note that nodes can use "fraction" and "whole" if the logic in the upper half has taken care of the ratio of intervention to goal, whereas nodes 171 and 171.1 both use "airports" because this ratio will be calculated in ExternalInputs.

Within the body of the section, place formulas that copy the values of the proper row, beginning at the desired date. The column identification of the formula will be the same as the column into which the formula is being placed.

When the user selects the "Connect/Disconnect" control in the Controller workbook, it will create the formulas in ExternalInputs to use these values in the proper places.

5.5.2 The DiamondWorksheet

To use the ISSM with DIAMOND, you should use the DiamondWorksheet, rather than the UserWorksheet. The DiamondWorksheet has the same structure; however, it contains pre-built logic to convert DIAMOND outputs to ISSM inputs. You will also need to use the Preprocessor, as some DIAMOND outputs require conversion to create the ISSM observations (internal inputs).

The DIAMOND outputs are entered into the DiamondWorksheet and the manual inputs are entered into the ExternalInputs worksheet. When the user selects the "Connect/Disconnect" control in the Controller workbook, it will create the formulas in ExternalInputs to use these values in the proper places.

5.6 EXTERNALINPUTS WORKSHEET

Figure 5-6 shows two sets of paired external inputs. Figure 5-7 shows another part of the ExternalInputs worksheet that contains fractional input variables. Figure 5-8 shows multiplier inputs.

Direct Aid Activities			Date Interval in Days	7	Date Activity Started	
Node #	**Sector**	**Activity**	**Value Definition**	**Units**	**03/28/03**	**04/04/03**
		Normal Factors				
		Coalition Forces			0	
		Other US Depts & Agencies				
		UN Depts & Agencies				
		NGOs & PVOs			0	100
		Other			1000	500
150	Needs	Medical treatment	Quantity Treated	People	1000	600
150.1	Needs	Medical treatment	Quantity Needing Treatment	People	5000	10000
		Coalition Forces				
		Other US Depts & Agencies			500	4000
		UN Depts & Agencies				
		NGOs & PVOs				
		Other				
151	Needs	Food importation	Quantity Imported	Tons	500	4000
151.1	Needs	Food importation	Quantity Needed	Tons	10000	10000

Figure 5-6. ExternalInputs sheet, showing two-part inputs

Direct Aid Activities			Date Interval in Days	7		
Node #	**Sector**	**Activity**	**Value Definition**	**Units**	**06/20/03**	**06/27/03**
		Normal Factors				
		Coalition Forces			0.1	0.1
		Other US Depts & Agencies				
		UN Depts & Agencies				
		NGOs & PVOs				
		Other				
199	Govt	Establishing, staffing & funding effective transition national govt	Absolute; sum of inputs	Fraction	0.1	0.1
		Coalition Forces				
		Other US Depts & Agencies			0.1	0.1
		UN Depts & Agencies				
		NGOs & PVOs				
		Other				
200	Govt	Establishing a mechanism for constitutional reform	Absolute; sum of inputs	Fraction	0.1	0.1

Figure 5-7. ExternalInputs worksheet, showing fractional inputs

Direct Aid Activities			Date Interval in Days	7		
Node #	**Sector**	**Activity**	**Value Definition**	**Units**	**06/20/03**	**06/27/03**
		Special Factors: Multipliers				
		Coalition Forces			1	1
		Other US Depts & Agencies				
		UN Depts & Agencies				
		NGOs & PVOs				
		Other				
217	Needs	Coordinating NGO activities	Multiplier between 1.0 and 1.25; sum of inputs	Multiplie	1	1
		Coalition Forces			1	1
		Other US Depts & Agencies				
		UN Depts & Agencies				
		NGOs & PVOs				
		Other				
232	Security	Providing security for HA activities	Multiplier between 0 - 1.1; sum of inputs	Fraction	1	1

Figure 5-8. ExternalInputs worksheet, showing multiplier inputs

Figure 5-9 shows a part of the worksheet with weights, which use percentages for the input values.

Direct Aid Activities			**Date Interval in Days**	7		
Node #	**Sector**	**Activity**	**Value Definition**	**Units**	**06/20/03**	**06/27/03**
		Special Factors: Weights				
		Coalition Forces			65	60
		Other US Depts & Agencies				
		UN Depts & Agencies				
		NGOs & PVOs				
		Other				
213	Misc	Conducting benign public information operations	Effectiveness of messages (0 - 100%); sum of inputs	Percent	65	60
		Coalition Forces				
		Other US Depts & Agencies				
		UN Depts & Agencies				
		NGOs & PVOs				
		Other				
222	Misc	Negative impact of intervention (rapes, etc.)	Effectiveness of negative messages (0 - 100%); sum of inputs	Percent		

Figure 5-9. ExternalInputs sheet, showing weights with percentage inputs

Figure 5-10 shows a part of the worksheet containing reversible and variable factors.

Direct Aid Activities			**Date Interval in Days**	7	**Date Activity Started**	
Node #	**Sector**	**Activity**	**Value Definition**	**Units**	**03/28/03**	**04/04/03**
		Special Factors: Reversible & Variable Inflators				
From	**To**	**From Node**	**To Node**	**Std Infl**	**03/28/03**	**04/04/03**
18	7	Displaced population decreases	Changes in population composition improve outlook	1.00	1.00	1.00
24	7	Expatriates return to country	Changes in population composition improve outlook	0.80	0.80	0.80
24	10	Expatriates return to country	Commercial sector contributes to national welfare	0.80	0.80	0.80
24	29	Expatriates return to country	Government has domestic legitimacy	1.00	1.00	1.00

Figure 5-10. ExternalInputs sheet, showing reversible and variable factors

Figure 5-11 shows the part of the ExternalInputs worksheet that is below the input area. This area contains zero values and is copied over the input area when you start a new project.

Direct Aid Activities			Date Interval in Days	7	Date Activity Started		
Node #	Sector	Activity	Value Definition	Units	03/28/03	04/04/03	04/11/03
		"Zero" Values for erasing External Input Values -- DO NOT CHANGE					
		Normal Factors					
		Coalition Forces					
		Other US Depts & Agencies					
		UN Depts & Agencies					
		NGOs & PVOs					
		Other					
					0	0	0
150.1	Needs	Medical treatment	Quantity Needing Treatment	People			
		Coalition Forces					
		Other US Depts & Agencies					
		UN Depts & Agencies					
		NGOs & PVOs					
		Other					
					0	0	0
151.1	Needs	Food importation	Quantity Needed	Tons			

Figure 5-11. ExternalInputs sheet, showing the area containing the zeros

5.7 EXTERNAL 2 WORKSHEET

Figure 5-12 shows part of the External 2 worksheet. It shows one input variable, Node # 237, flowing to four different Intervention variables. It also shows possible variations in Time Delay and Weight. The "C" entries in the first column indicate that the nodes come from composite (two input valued) external inputs.

Direct Aid Activities					Date Interval in Days	7		Date Activity Started	
	Sector	Activity	Node #	To Node #	Name	Time Delay in Days	Weight	02/26/06	03/05/06
		Activity Amount Section							
C	Needs	Medical treatment	150	141	Intervention health	0	1		
C	Needs	Health infrastructure repair	237	238	Intervention health infrastructure	56	1		
C	Needs	Health infrastructure repair	237	141	Intervention health	56	1		
C	Needs	Health infrastructure repair	237	147	Intervention jobs	0	0.75		
C	Needs	Health infrastructure repair	237	137	Intervention investment	0	1		
C	Needs	Food importation	151	136	Intervention food	7	1		

Figure 5-12. External 2 sheet, showing inputs flowing to multiple nodes

Figure 5-13 shows the bottom of the External 2 worksheet, where different calculation types are required to carry the input values onward to the appropriate nodes. The inputs showing no To Node # require special calculations to find the correct nodes. The "S" entries in the first column indicate that the nodes come from single valued external inputs. There are nodes in the upper part with the "S" entry; they are just not shown in Figure 5-12.

Note that while most of the Weight entries are "1," there are a few with fractional values. The effect of a fractional weight value is to reduce the relative contribution of this input among the other inputs to the same "To Node #." These values should not be changed without thorough considerations of the implications.

Direct Aid Activities					Date Interval in Days	7		Date Activity Started	
	Sector	Activity	Node #	To Node #	Name	Time Delay in Days	Weight	02/26/06	03/05/06
		Special Activity Section							
S	Misc	Conducting benign public information operations	213	223	Intervention PR	7	0.8		#VALUE!
S	Misc	Negative impact of intervention (rapes, etc.)	222	236	Intervention negative PR	0	1	#VALUE!	#VALUE!
S	Needs	Coordinating NGO activities	217			7	1		#VALUE!
S	Security	Providing security for HA activities	232			0	1	#VALUE!	#VALUE!
S	Security	Providing security for PO activities	233			0	1	#VALUE!	#VALUE!
S	Security	Providing security for Stability activities	234			0	1	#VALUE!	#VALUE!
S	Security	Providing force security	235			0	1	#VALUE!	#VALUE!

Figure 5-13. External 2 sheet, special activity section

5.8 EXTERNAL 3 WORKSHEET

Figure 5-14 shows a part of the External 3 sheet, in which the variables are converted to the scaled (-3 to +3) values appropriate for nodes. Because your interventions may not start on the same date as your observations, you will not want a zero intervention to suddenly make the situation dramatically worse or better than if you had the intervention function turned off. In Figure 5-14, you see that the first intervention date is 3/28/03. You should check the value for the Output value (Civil stability and durable peace exists) for this date with intervention turned off and use that value as your low value, or Start Point. You can find this value on the ScenarioHistory sheet at about row 123. Rounding of the value is permissible. In the example, the actual value was -1.89 and a value of -2.00 was entered as the first Start Point. The formulas in the following rows copy this value for all the other intervention variables. The result is that a fractional value of 0.0 will be converted to a scaled value of -2.00; 1.0 will be converted to a scaled value of 3.00; and intermediate values will be converted linearly to intermediate scaled values.

							To Node #	**To Node #**
					Lookup Node		127	128
				Lookup Date Column			9	10
Node #	**Node Name**	**Start Point Min=-3**	**Scale Factor**	**Total Weight**	**Scaled Weight**	**Num**	**03/28/03**	**04/04/03**
127	Intervention justice	-2.00	5	4.75	0.95	6	#N/A	#N/A
128	Intervention agriculture	-2.00	5	3.00	0.60	3	#N/A	#N/A
129	Intervention central authority	-2.00	5	11.75	2.35	13	#N/A	#N/A
130	Intervention LE corruption	-2.00	5	2.00	0.40	2	#N/A	#N/A
131	Intervention critical industries	-2.00	5	1.00	0.20	1	#N/A	#N/A
132	Intervention displaced pop	-2.00	5	2.00	0.40	2	#N/A	#N/A
133	Intervention education	-2.00	5	1.50	0.30	3	-2.00	-2.00
134	Intervention energy	-2.00	5	5.00	1.00	5	#N/A	#N/A
135	Intervention financial	-2.00	5	6.00	1.20	6	#N/A	#N/A
136	Intervention food	-2.00	5	3.00	0.60	3	-1.84	-1.62
137	Intervention investment	-2.00	5	14.00	2.80	14	-2.00	-1.99

Figure 5-14. External 3 sheet, showing normal variables

Figure 5-15 shows the part of the External 3 worksheet that handles the multiplier special variables. Note that the columns between the Node Name and the data are blank.

							To Node #	**To Node #**
					Lookup Node		127	128
				Lookup Date Column			9	10
Node #	**Node Name**	**Start Point Min=-3**	**Scale Factor**	**Total Weight**	**Scaled Weight**	**Num**	**03/28/03**	**04/04/03**
217	Coordinating NGO activities							1.00
223	Intervention PR						#N/A	#N/A
236	Intervention negative PR						#N/A	#N/A
232	Providing security for HA activities						#N/A	#N/A
233	Providing security for PO activities						#N/A	#N/A
234	Providing security for Stability activities						#N/A	#N/A
235	Providing force security						#N/A	1.00

Figure 5-15. External 3 sheet, showing special variables

5.9 TIMECHART WORKSHEETS

The four TimeCharts are shown in Figure 5-16, Figure 5-17, Figure 5-18, and Figure 5-19. TimeChart1 graphs the internal inputs and the core variables. TimeChart2 graphs the intervention variables. TimeChart3 graphs the intermediate variables. TimeChart4 allows you to graph any 12 variables simultaneously.

These figures show the TimeCharts with the Value Axis (Y-Axis) Display turned on (on the Controls sheet). Turning the display off simply removes the scale values from the left-hand side of all the charts.

Notice in the first figure that there are three series in the legend with no labels. In this figure Conflict Inputs was selected and that group requires only nine series. Other groups require more or fewer series.

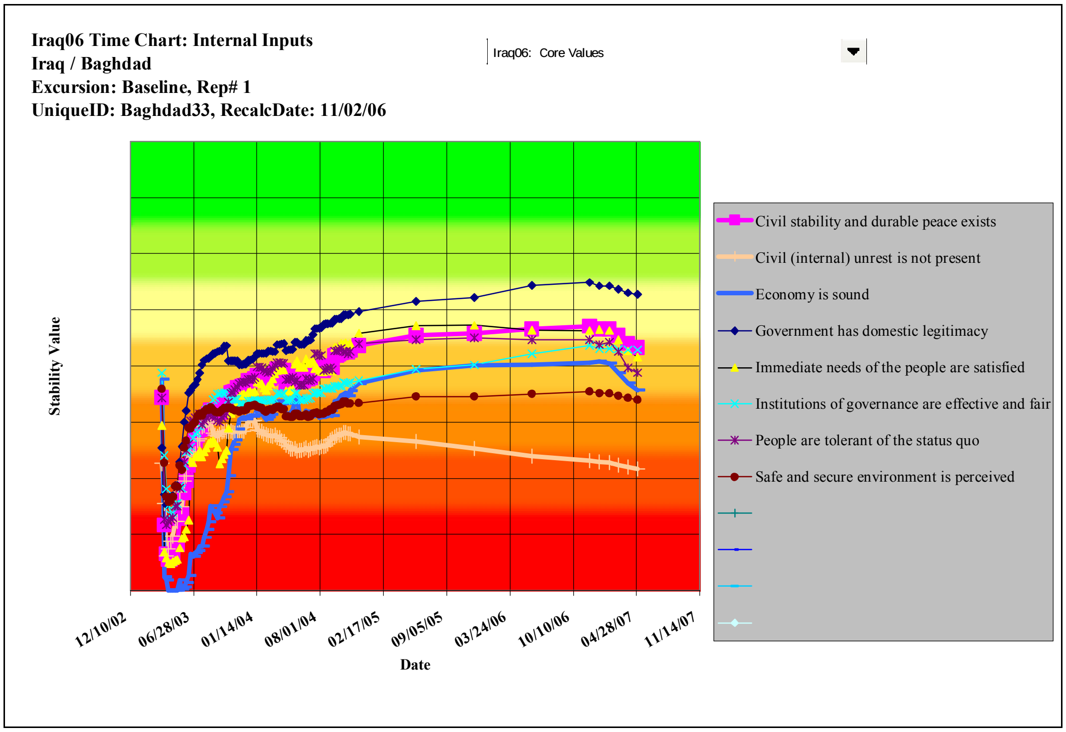


Figure 5-16. TimeChart1

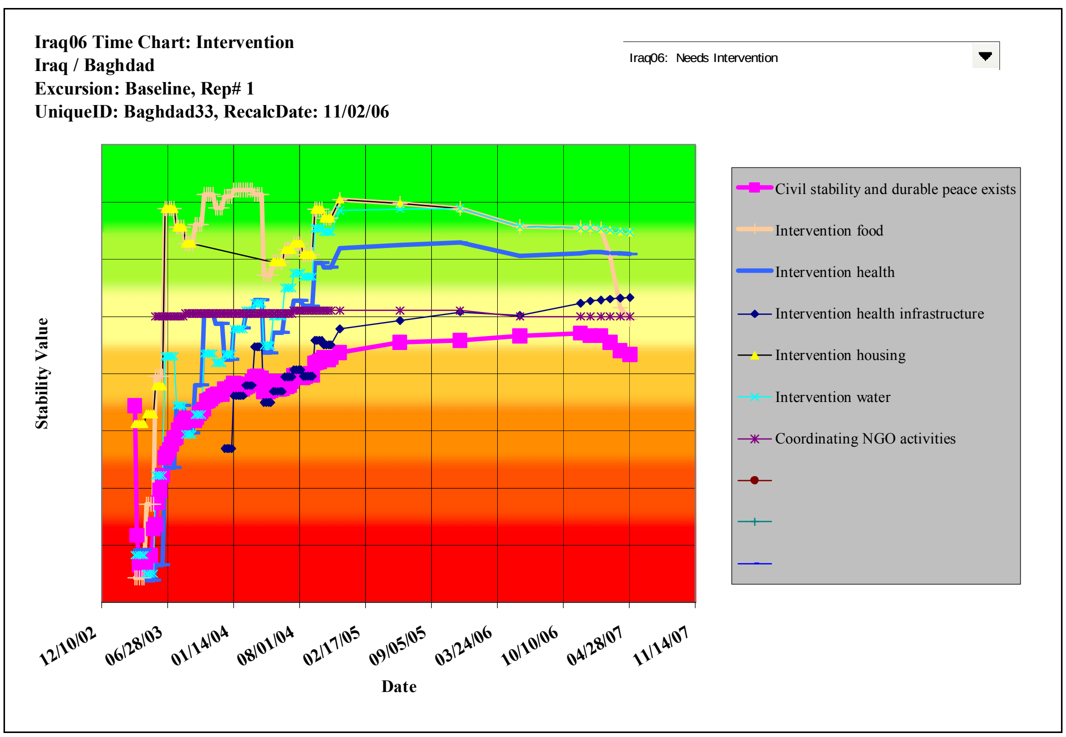


Figure 5-17. TimeChart2

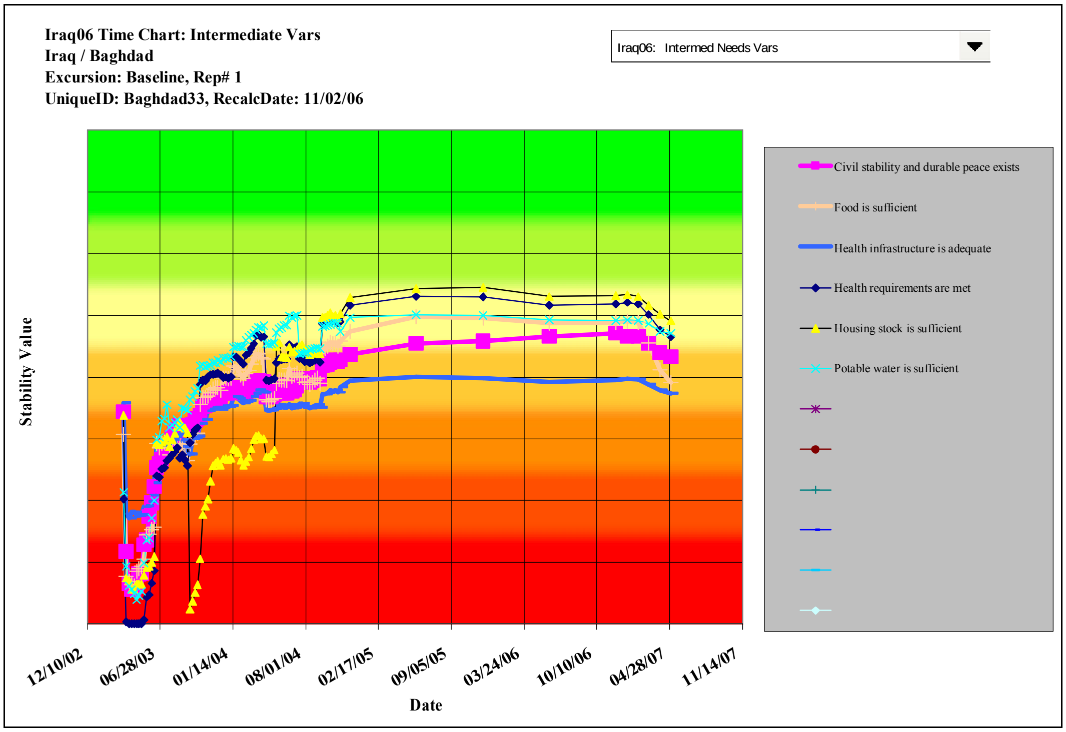


Figure 5-18. TimeChart3

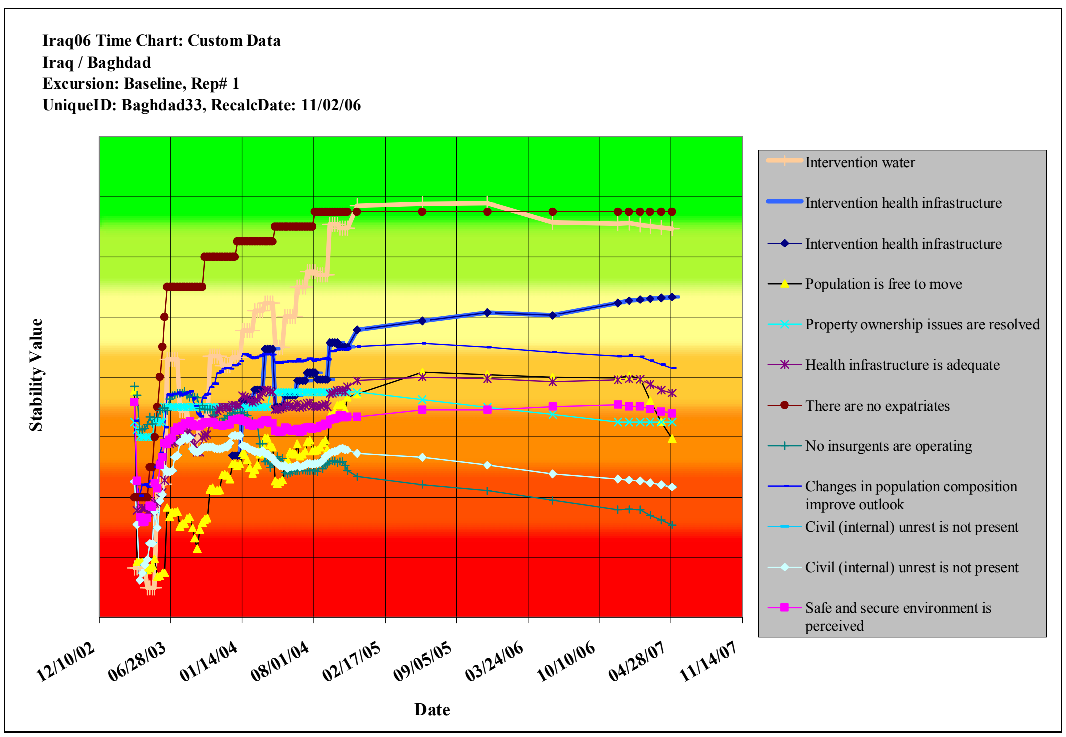


Figure 5-19. TimeChart4

5.10 LOGIC WORKSHEETS

There are eight logic worksheets, Conflict, Economy, Govt, Misc, Movement, Needs, Intervention, and Core. All but the Intervention worksheet have the structure illustrated in Figure 5-20 and Figure 5-21. In the first figure, two input nodes are shown, identified by the lack of From Nodes, and one intermediate node is shown. In the second figure, the single output node is shown, identified by the lack of To Nodes.

	Iraq, Test Scenario	SCENARIO				OVERALL RESULT			0.59	Civil stability and durable peace exists					
	Conflict	SECTOR													
From Node	FROM Node Name	From Val	Weight	Mod Val	Mod Weight	Prior	Nd#	Raw Val	VALUE	NODE Name	Inflate	Center	Val	TO Node Name:	To Node
						0	4	#N/A	-1.00	Armed forces are well structured	1.00	0.00	-1.00	Demobilized armed forces are integrated into society	16
									-1.00		1.00	-0.25	-1.25	Government-run military is effective	31
						0	11	#N/A	-1.00	Competing groups resolve differences	2.00	0.00	-2.00	Civil (internal) unrest is not present	8
									-1.00		1.50	-0.25	-1.75	Opposition party doesn't attempt to dominate by force	40
									-1.00		0.50	-0.25	-0.75	Regime-sponsored, non-military	51
									-1.00		1.00	0.00	-1.00	Safe and secure environment is perceived	52
4	Armed forces are well structured	-1.00	1.00	-1.00	1.00	0	16	-0.52	-0.52	Demobilized armed forces are integrated into society	1.00	0.00	-0.52	Civil (internal) unrest is not present	8
41	Paramilitary forces are not present	-1.09	1.00	-1.09	1.00										
51	Regime-sponsored, non-military armed forces are demobilized	-0.50	1.00	-0.50	1.00										
74	There are no factional disputes	-1.00	1.00	-1.00	1.00										
229	Intervention military retraining	1.02	1.00	1.02	1.00										

Figure 5-20. Part of Conflict worksheet

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1		Iraq, Test Scenario	SCENARIO				OVERALL RESULT			0.59	Civil stability and durable peace exists					
2		Core	SECTOR													
3																
4	From Node	FROM Node Name	From Val	Weight	Mod Val	Mod Weight	Prior	Nd#	Raw Val	VALUE	NODE Name	Inflate	Center	Val	TO Node Name:	To Node
76																
77	8	Civil (internal) unrest is not present	-0.75	1.00	-0.75	1.00	0	9	0.59	0.59	Civil stability and durable peace exists					
78	19	Economy is sound	-1.14	1.00	-1.14	1.00										
79	29	Government has domestic legitimacy	2.05	1.00	2.05	1.00										
80	36	Immediate needs of the people are satisfied	-0.11	1.00	-0.11	1.00										
81	37	Institutions of governance are effective and fair	1.58	1.00	1.58	1.00										
82	42	People are tolerant of the status quo	1.26	1.00	1.26	1.00										
83	52	Safe and secure environment is perceived	1.22	1.00	1.22	1.00										
84																

Figure 5-21. Part of Core worksheet

Figure 5-22 shows a part of the Intervention worksheet. Note that the first node shows one From Node and two To Nodes. The From Node will always be a multiplier, as the Nodes are all inputs and multipliers are the only things that can affect an input. One node in this figure has two From Nodes, both multipliers. Several nodes have no From Nodes, meaning they are not affected by multipliers. They also have no To Nodes because they are weights and their effects must be calculated differently from normal intervention nodes. Note also the two rows below the header rows, which contain a 0 and a #N/A entry. These are used to turn on and off the use of external inputs. Figure 5-23 shows the results of turning off the external inputs. The #N/A value is copied down the Use? column and propagates through the values.

	Iraq, Test Scenario	SCENARIO						OVERALL RESULT		0.59	Civil stability and durable peace exists				Current calculating date		09/18/03
	Intervention	SECTOR													External date to use		09/12/03
Fro m Node	FROM Node Name	From Val	Weight	Mod Val	Mod Weig ht	Use?	Nd#	Pos #	Raw Val	VALUE	NODE Name	Inflate	Center	Val	TO Node Name:	To Node	
						0											
						#N/A											
						0											
234	Providing security for Stability activities	0.95		0.95		0	226	24	0.38	0.38	Intervention policing	1	0	0.38	Administration of justice is effective and fair	2	Govt
						0				0.38		1	0	0.38	Safe and secure environment is perceived	52	Core
						0											
234	Providing security for Stability activities	0.95		0.95		0	224	22	#N/A	#N/A	Intervention transition	1	0	#N/A	Government has domestic legitimacy	29	Core
						0											
232	Providing security for HA activities	0.81		0.8075		0	133	7	1.52	1.52	Intervention education	1	0	1.52	Education infrastructure suffices	20	Misc
						0											
234	Providing security for Stability activities	0.95		0.95		0	138	12	1.64	1.64	Intervention media	1	0	1.64	Domestic media is free	28	Misc
						0											
232	Providing security for HA activities	0.81		0.8075		0	132	6	1.34	1.34	Intervention displaced pop	1	0	1.34	Displaced population decreases	18	Movement
						0											
232	Providing security for HA activities	0.81		0.8075		0	136	10	2.42	2.42	Intervention food	1	0	2.42	Food is sufficient	26	Needs
217	Coordinating NGO activities	1.05		1.05		0											
						0											
232	Providing security for HA activities	0.81		0.8075		0	141	15	1.97	1.97	Intervention health	1	0	1.97	Health requirements are met	33	Needs
217	Coordinating NGO activities	1.05		1.05		0											
						0											
232	Providing security for HA activities	0.81		0.8075		0	142	16	2.54	2.54	Intervention housing	1	0	2.54	Housing stock is sufficient	34	Needs
217	Coordinating NGO activities	1.05		1.05		0											
						0											
232	Providing security for HA activities	0.81		0.8075		0	143	17	1.78	1.78	Intervention water	1	0	1.78	Potable water is sufficient	48	Needs
217	Coordinating NGO activities	1.05		1.05		0											
						0											
						0											
						0	223	32	0.20	0.20	Intervention PR						
						0											
						0	236	33	0.10	0.10	Intervention negative PR						
						0											
						0	217	31	1.05	1.05	Coordinating NGO activities						
						0											
235	Providing force security	0.95		0.95		0	232	34	0.81	0.81	Providing security for HA activities						
						0											
235	Providing force security	0.95		0.95		0	233	35	0.95	0.95	Providing security for PO activities						
						0											
235	Providing force security	0.95		0.95		0	234	36	0.95	0.95	Providing security for Stability activities						
						0											
						0	235	37	0.95	0.95	Providing force security						
						0											

Figure 5-22. Part of Intervention worksheet

	Iraq, Test Scenario	SCENARIO						OVERALL RESULT		-0.19	Civil stability and durable peace exists				Current calculating date		09/18/03
	Intervention	SECTOR													External date to use		09/12/03
Fro m Node	FROM Node Name	From Val	Weight	Mod Val	Mod Weig ht	Use?	Nd#	Pos #	Raw Val	VALUE	NODE Name	Inflate	Center	Val	TO Node Name:	To Node	
						0											
						#N/A											
						#N/A											
234	Providing security for Stability activities	#N/A		1		#N/A	226	24	0.40	#N/A	Intervention policing	1	0	#N/A	Administration of justice is effective and fair	2	Govt
						#N/A				#N/A		1	0	#N/A	Safe and secure environment is perceived	52	Core
						#N/A											

Figure 5-23. Intervention worksheet with external inputs turned off

5.11 SCENARIOHISTORY WORKSHEET

Figure 5-24 shows part of the input section of the ScenarioHistory worksheet. This is the part of the worksheet that can be modified (red numbers).

					Initial	Dates
			09/18/03	**Iraq, Test Scenario**	3/22/03	3/28/03
Group	**Sector**	**Nd#**	**VALUE**	**NODE Name**		
Input	Conflict	4	-1.00	Armed forces are well structured	2.00	0.00
Input	Conflict	11	-1.00	Competing groups resolve differences	-1.00	-2.00
Input	Conflict	59	-1.00	Opposition party does not espouse force	-1.00	-1.00
Input	Conflict	60	-2.00	There haven't been any paramilitary forces	-1.00	-2.00
Input	Conflict	61	1.50	There haven't been any regime-sponsored, non-military armed forces	-3.00	-3.00
Input	Conflict	74	-1.00	There are no factional disputes	-2.00	-2.00
Input	Conflict	148	0.00	No insurgents are operating	0.00	0.00
Input	Conflict	149	-1.50	No terrorists are operating	0.00	0.00
Input	Economy	124	-2.00	Foreign investment is available	0.00	-3.00
Input	Economy	71	-2.00	Financial system is solid	-1.00	-3.00

Figure 5-24. Input section of ScenarioHistory sheet

Figure 5-25 shows a portion of the results section of the ScenarioHistory worksheet. This is where the results are recorded and is not editable by the user.

					Initial	Dates
			09/18/03	**Iraq, Test Scenario**	3/22/03	3/28/03
Group	**Sector**	**Nd#**	**VALUE**	**NODE Name**		
Intermediate	Conflict	16	-0.90	Demobilized armed forces are integrated into society	-0.56	-1.18
Intermediate	Conflict	17	-1.04	Disarmament is effective	-1.76	-2.03
Intermediate	Conflict	31	-0.54	Government-run military is effective	0.21	-0.57
Intermediate	Conflict	40	-1.18	Opposition party doesn't attempt to dominate by force	-0.91	-1.35
Intermediate	Conflict	41	-0.09	Paramilitary forces are not present	-0.13	-0.53
Intermediate	Conflict	51	-0.31	Regime-sponsored, non-military armed forces are demobilized	-1.06	-1.19
Intermediate	Economy	1	-3.04	Acceptable jobs are available	-0.02	-2.39

Figure 5-25. Results section of ScenarioHistory sheet

Figure 5-26 shows a portion of the custom series section of the ScenarioHistory worksheet. This section creates the display of variables for the controls used to create TimeChart4. The values are recorded in the TimeChartData sheet.

					Initial	Dates
			09/18/03	**Iraq, Test Scenario**	3/22/03	3/28/03
Group	**Sector**	**Nd#**	**VALUE**	**NODE Name**		
5	9	4				
Custom Series Data Area						
Group	**Sector**	**Nd#**		`Group        Sector   Nd# NODE Name`		
Input	Conflict	004		`Input        Conflict 004 Armed forces are well structured`		
Input	Conflict	011		`Input        Conflict 011 Competing groups resolve differences`		
Input	Conflict	059		`Input        Conflict 059 Opposition party does not espouse for`		
Input	Conflict	060		`Input        Conflict 060 There haven't been any paramilitary f`		
Input	Conflict	061		`Input        Conflict 061 There haven't been any regime-sponsor`		
Input	Conflict	074		`Input        Conflict 074 There are no factional disputes`		

Figure 5-26. Custom series section of ScenarioHistory sheet

5.12 TIMECHARTDATA WORKSHEET

Figure 5-27 shows a part of the TimeChartData sheet that holds the data for displaying TimeChart1. The row containing the dates and the following row that contains the output variable are always present. Directly below the section in the figure are sections containing the variables and data for each of the possible TimeChart1 displays. The control that you use on the TimeChart changes the number (shown as 3 here) to reflect the choice. The cell below contains a formula to calculate which section of variables and data is meant. Formulas in the actual display section (the part shown in the figure) use the result (23 here) to retrieve the desired variables and values.

	Blank						
	□Blank / All□Excursion: None, Rep# 0□UniqueID: Blank, RecalcDate: 06/30/06						
Time Chart: Inte	Blank Time Chart: Internal Inputs□Blank / All□Excursion: None, Rep# 0□UniqueID: Blank, RecalcDate: 06/30/06						
1							
Blank: Stability & Peace							
Blank: Core Values							
Blank: Conflict Inputs							
Blank: Economy Inputs							
Blank: Govt Inputs							
Blank: Misc Inputs							
Blank: Movement Inputs							
Blank: Needs Inputs							
2							
12	Holding cell for formulas	-0.57					
	Date	02/27/06					
	Civil stability and durable peace exists	0.29	0.00	0.00	0.00	0.00	0.00
	Civil (internal) unrest is not present	-0.57	0.00	0.00	0.00	0.00	0.00
	Economy is sound	-0.10	0.00	0.00	0.00	0.00	0.00
	Government has domestic legitimacy	0.12	0.00	0.00	0.00	0.00	0.00
	Immediate needs of the people are satisfied	-0.06	0.00	0.00	0.00	0.00	0.00
	Institutions of governance are effective and fair	-0.17	0.00	0.00	0.00	0.00	0.00
	People are tolerant of the status quo	0.03	0.00	0.00	0.00	0.00	0.00
	Safe and secure environment is perceived	-0.11	0.00	0.00	0.00	0.00	0.00

Figure 5-27. TimeChart1 part of TimeChartData worksheet

Below all the TimeChart1 data there are similar sections for TimeChart2 and TimeChart3. Below these lies the data for Time Chart4, as shown in Figure 5-28. The calculations for TimeChart4 differ from those for the other Time Charts. The formulas in the Node column use the output of the Custom controls to calculate the node numbers of the selected variables. This information is used to retrieve the names and values of the variables.

Time Chart 4 Data			
	3	4	5
Node	**Node Name**		
232	Providing security for HA activities	#N/A	#N/A
36	Immediate needs of the people are satisfied	-0.56392	-1.835117
143	Intervention water	#N/A	0.262875
143	Intervention water	#N/A	0.262875
26	Food is sufficient	0.001562	-1.426226
32	Health infrastructure is adequate	-0.86322	-1.941623
128	Intervention agriculture	#N/A	#N/A
48	Potable water is sufficient	-1.6	-2.534281
36	Immediate needs of the people are satisfied	-0.56392	-1.835117
19	Economy is sound	0.215243	-1.948706
19	Economy is sound	0.215243	-1.948706
9	Civil stability and durable peace exists	-0.31926	-1.599246

Figure 5-28. TimeChart4 part of TimeChartData worksheet

5.13 CONSTANTS WORKSHEET

The Constants worksheet contains the connections between node number and name and other attributes of the nodes. All variables are listed here except for the special reversible factors, which do not have node numbers. Numerous formulas throughout the workbook access information from this sheet. The colored area contains the anchor information to help you decide what the value should be for an input variable.

Nd#	NODE Name	Group	Sector	Note	Influence notes	-3	-2	-1	0	1	2
1	Acceptable jobs are available	Intermediate	Economy								
2	Administration of justice is effective and fair	Intermediate	Govt								
3	Agricultural system is productive	Intermediate	Economy								
4	Armed forces are well structured	Input	Conflict			non-existent					
5	Basic natural resource management is in place	Input	Needs	two parts: infrastructure & govt/private management system; missing=-3, bad=-2, moderately bad=-1, fair=0, moderately good=1, good=2, excellent=3		infrastructure and govt/private management missing	avg of two parts is -2	avg=-1	avg=0	avg=1	avg=2

Figure 5-29. Part of Constants sheet

6. ISSM V4.0 MODEL INPUTS

The ISSM Main has two kinds of inputs, referred to as internal and external inputs. The internal inputs represent observations of the state of the situation, whereas the external inputs represent actions to change the situation. The internal inputs may be entered directly into the ISSM Main or indirectly through the Preprocessor. The external inputs are entered only through the ISSM Main.

This section defines each input, provides data sources for most of the inputs and distributions of the data values for many of the sources, and provides formulas for combining different data types to calculate the input values in some instances. The discussions of the inputs also provide a conceptual framework for understanding the variables to support consistency of input valuation in the time dimension within a particular model and across the set of possible country models.

6.1 INTERNAL MODEL

The internal inputs are grouped into six sectors: conflict, government, needs, miscellaneous, movement, and economy. The similarities among the inputs in each sector make understanding them easier; however, there are also similarities across the sectors. Table 6-1 provides a means of finding where an input is discussed, given its node number.

Table 6-1. Cross Reference of Internal Nodes and Sections Describing Them

Node Number	Section Number	Section Name
4	6.1.1.1	Armed forces are well structured
5	6.1.3.1	Basic natural resource management is in place
11	6.1.1.2	Competing groups resolve differences
21	6.1.3.5	Educational system is tailored toward jobs
35	6.1.2.1	Human rights are protected
38	6.1.3.7	International media have open access to the reporting of events
43	6.1.3.8	People perceive that their interests are represented
44	6.1.3.9	People's spiritual needs are met
45	6.1.2.2	Police are distinct from the military
49	6.1.2.3	Prison structure is adequate
50	6.1.4.1	Property ownership issues are resolved
54	6.1.4.2	Stress migration is not present
58	6.1.3.2	Water distribution infrastructure is sufficient
59	6.1.1.3	Opposition party does not espouse force
60	6.1.1.4	There haven't been any paramilitary forces
61	6.1.1.5	There haven't been any regime-sponsored, non-military armed forces
62	6.1.4.3	There are no expatriates
63	6.1.4.5	There is no displaced population
64	6.1.4.4	There are no migrants
65	6.1.2.4	Drug cultivation is not a problem
66	6.1.2.5	Drug manufacture is not a problem
67	6.1.2.6	Drug transshipment is not a problem
69	6.1.2.9	Organized crime is not a problem
71	6.1.5.1	Financial system is solid
72	6.1.2.7	Drug use is not a problem

Node Number	Section Number	Section Name
73	6.1.2.8	Common crime is not a problem
74	6.1.1.6	There are no factional disputes
121	6.1.2.10	Corruption in public office is not part of culture
122	6.1.2.11	Central government exists
124	6.1.5.2	Foreign investment is available
125	6.1.3.6	Government does not control domestic media's reporting of events
126	6.1.3.4	Education infrastructure is adequate
148	6.1.1.7	No insurgents operating
149	6.1.1.8	No terrorists are operating

6.1.1 Conflict Sector Model

The conflict sector contains eight input variables. The conflict sector contains combat-related variables, but it also contains variables reflecting a broader definition of conflict that includes disagreement and its resolution.

6.1.1.1 Armed forces are well structured

The basic scale anchors for the input variable (node number 4), "armed forces are well structured," are shown in Figure 6-1.

-3	-2	-1	0	1	2	3
non-existent						excellent C2 & subordinate to civilian govt

Figure 6-1. Armed forces are well structured (1)

If you use the preprocessor, you might use the following four variables as input.

Note	-3	-2	-1	0	1	2	3
control of military	There is no organized military	Military command is fragmented and has little or no control over military personnel	Military command is not in complete control of military personnel	Civilian govt & military act independently	Civilian govt partly controls military or the military is a strong partner in govt	Civilian govt mostly controls military or the govt is a military govt	Civilian govt controls military
size of military	no military	.27% of GDP spent on military	.45% of GDP spent on military	.7% of GDP spent on military	1.1% or 19% of GDP spent on military	1.8% or 11.5% of GDP spent on military	3%-7% GDP spent on military
competence of military	no military	bulk of military is incapable of combat actions, prone to looting, wanton killing, etc.	portions of military are incapable of combat actions	capable of defense in place and small unit actions	capable of conduct set-piece battles with little maneuver required	capable of conducting modern battles of maneuver against comparably sized enemy	equal to U.S.
morale, motivation	none	mass desertions when things go against them	frequent desertions when things go against them	ambivalence toward difficult actions	submit to necessity of serving nation's needs	willing to serve nation's needs	proud to serve nation's needs

Figure 6-2. Armed forces are well structured (2)

The first variable, "control of the military," will have to be obtained by observation; however, it should not be difficult to determine, using the anchors defined in Figure 6-2.

The second variable, "size of the military," has a wrap-around at the top end. That is, up to a certain point, bigger is better; however, after that point, bigger is worse, based on the assumption that too large a military either indicates stability problems or can lead to stability problems.

Determining a reasonable formula to scale the size of a particular country's military is the problem. Several factors are important, potential threats, nature of the potential threats, size of the country, size of the economy, etc. The simplest single numerical measure begins with the dollar-denominated amount of expenditure on the military. This measure can be compared to the Gross Domestic Product (GDP) or to the size of the population.

Figure 6-3 shows the distribution of scaled military expenditures as a percent of GDP for 170 countries. Two equations are used in the scaling. Equation 1 applies when the result is less than or equal to 3.0; otherwise, Equation 2 applies. %GDP is the number as a percent (1% = 1.0, not 0.01).

$$ScaledMilExp\%GDP = (\log_{10}(\%GDP) + 0.15) * 3 / 0.81 \quad 1$$

$$ScaledMilExp\%GDP = 6 - (\log_{10}(\%GDP + 0.15) * 3 / 0.81 \quad 2$$

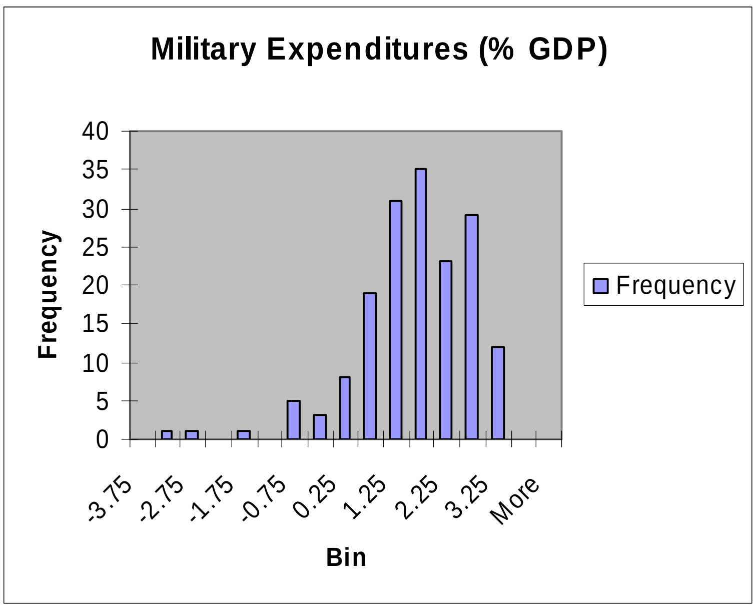


Figure 6-3. Military expenditures (% GDP)

Note that the figure is top heavy. A good scaled variable should have either an approximately normal distribution or an approximately uniform distribution.

Figure 6-4 shows the distribution of scaled military expenditures per capita, using Equation 3.

$$ScaledMilExpPerCapita = 1.72 * (\log_{10}(\$ / person) - 1.5) \quad 3$$

This is more nearly a normal distribution. However, the differences in the two indicate that both contain relevant information, suggesting a combination. Equation 4 is a simple average of the two indicators of military size.

$$ScaledMilExp = (ScaledMilExp\%GDP + ScaledMilExpPerCapita) / 2 \quad 4$$

Figure 6-5 shows the resulting combination, which is fair approximation to a normal distribution. The results, as applied to individual countries, are not out of line; although the addition of an expert opinion variable (mentioned below) could improve the results.

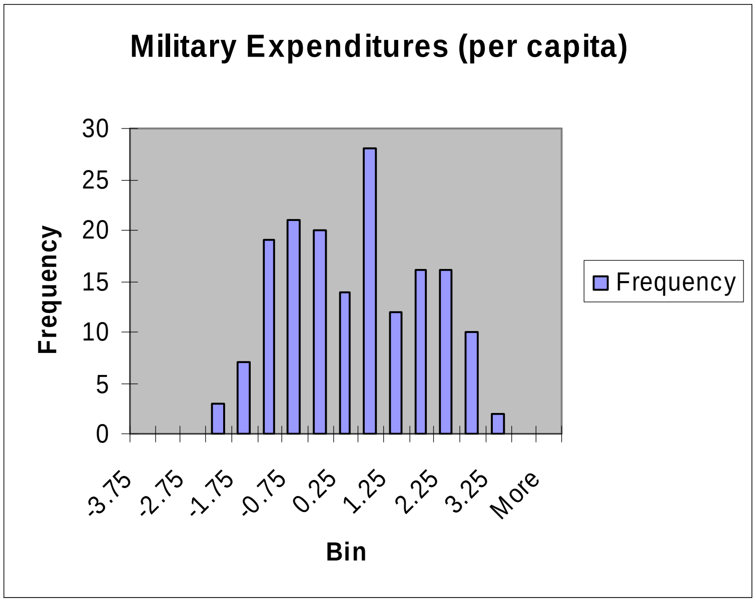


Figure 6-4. Military expenditures (per capita)

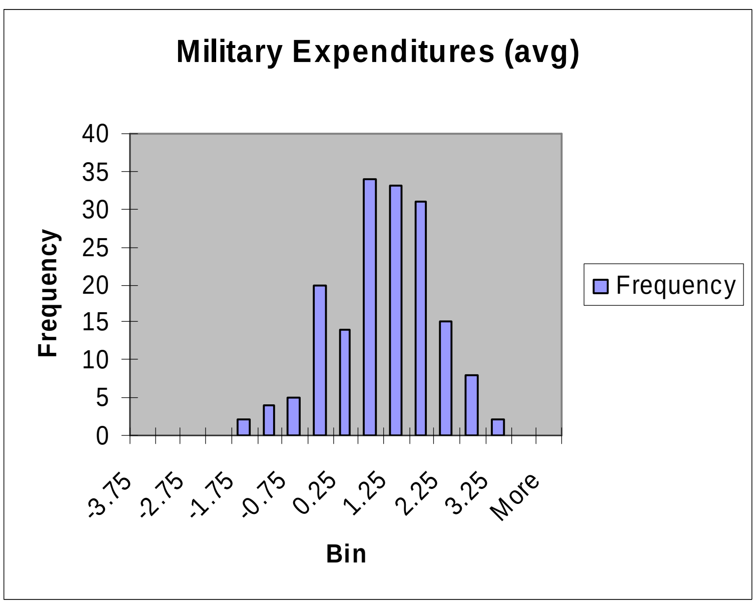


Figure 6-5. Military expenditures (avg)

The third variable that is defined as a preprocessor input to the "armed forces are well structured" variable is "competence of the military." Valuing this variable will require expert advice; however, that should not be difficult if the anchors shown in Figure 6-2 are used.

The fourth variable is "morale, motivation." This variable, while difficult to assess, is important in distinguishing forces that will not perform well (or as well as expected), despite being otherwise well structured. The anchors shown in Figure 6-2 will help in valuing this variable.

The final variable is identical in meaning to the basic variable, but should be called "expert opinion …." This variable takes into account all of the relevant factors, but is produced entirely as an expert's opinion. The concept is that numerical data are useful, but are often inadequate, often irregularly available or untimely, and sometimes biased. Further, a decomposition of the basic variable may not capture all aspects of the problem. The expert opinion can balance inadequacies and bias effects and can smooth out irregular availability and approximate the most current situation.

These five variables are most easily combined in the Preprocessor as a weighted average, with the weights defined by the user. The best advice is to always set the weight of the expert opinion variable to 1.0 and vary the weights of the other variables as appropriate. If there is some reason to vary the weights over time or if you wish to combine the variables with a non-linear equation, you will have to build the formulas to do so in the UserWorksheet of the Preprocessor, passing the final result to the basic variable.

6.1.1.2 Competing groups resolve differences

Figure 6-6 shows the anchors for the "competing groups resolve differences" input variable (node number 11). This variable calls for an expert opinion on the status of discourse among groups in the country. In this variable, "groups" include the "factions" found in a later variable, but may be a larger set. For example, in one country Catholics and Protestants may be relevant groups, but not factions, whereas in Northern Ireland, Catholics and Protestants are relevant groups and are factions. The emphasis in this variable is in the relationship among groups with respect to governing, whereas in the later variable, the emphasis is broader than access to legitimate power. You may find it easier to create a preprocessor variable for each pair of groups within the country, creating a value for each pairing.

-3	-2	-1	0	1	2	3
contempt for others, no dialogue at all, etc.	loss of power is considered loss to the enemy	loss of power is extremely serious matter	differences often result in fights, elections frequently be marred with violence or cheating	differences occasionally result in fights, elections may be marred with violence or cheating	discourse frequently is uncivil, willing to live with loss of points until next election; however, compromise is only grudging	civil discourse, willing to live with loss of points until next election or to compromise permanently

Figure 6-6. Competing groups resolve differences

The final variable is identical in meaning to the basic variable, but should be called "expert opinion …." This variable takes into account all of the relevant factors, but is produced entirely as an expert's opinion. The concept is that numerical data are useful, but are often inadequate, often irregularly available or untimely, and sometimes biased. Further, a decomposition of the basic variable may not capture all aspects of the problem. The expert opinion can balance inadequacies and bias effects and can smooth out irregular availability and approximate the most current situation.

These variables are most easily combined in the Preprocessor as a weighted average, with the weights defined by the user. The best advice is to always set the weight of the expert opinion variable to 1.0 and vary the weights of the other variables as appropriate, perhaps related to the combined sizes of the pair as compared to the population as a whole. If there is some reason to vary the weights over time or if you wish to combine the variables with a non-linear equation, you will have to build the formulas to do so in the UserWorksheet of the Preprocessor, passing the final result to the basic variable.

6.1.1.3 Opposition party does not espouse force

Figure 6-7 shows the anchors for the "opposition party does not espouse force" input variable (node number 59). This variable calls for an expert opinion on the status of belief in the use of force against the government among groups in the country. These groups include political parties and factions. This variable differs from a later variable on factional disputes in its focus on the degree of willingness to use force as opposed to the amount of violence that actually occurs. You may find it easier to create a preprocessor variable for each opposition group within the country, creating a value for each group.

-3	-2	-1	0	1	2	3
party or parties out of power willingly use force in attempt to gain it			opposition abjures force, splinter factions may be ambivalent			use of force to gain power is anathema

Figure 6-7. Opposition party does not espouse force

The final variable is identical in meaning to the basic variable, but should be called "expert opinion …." This variable takes into account all of the relevant factors, but is produced entirely as an expert's opinion. The concept is that numerical data are useful, but are often inadequate, often irregularly available or untimely, and sometimes biased. Further, a decomposition of the basic variable may not capture all aspects of the problem. The expert opinion can balance inadequacies and bias effects and can smooth out irregular availability and approximate the most current situation.

These variables are most easily combined in the Preprocessor as a weighted average, with the weights defined by the user. The best advice is to always set the weight of the expert opinion variable to 1.0 and vary the weights of the other variables as appropriate, perhaps related to the size of the group as compared to the population as a whole. If there is some reason to vary the weights over time or if you wish to combine the variables with a non-linear equation, you will have to build the formulas to do so in the UserWorksheet of the Preprocessor, passing the final result to the basic variable.

6.1.1.4 There haven't been any paramilitary forces

Figure 6-1 shows the anchor definitions for the input variable (node number 60) "there haven't been any paramilitary forces." This variable refers to all paramilitary forces and militias of groups that oppose the country's government. In its largest form, this would include revolutionary forces or the side in a civil war that does not compose the recognized government. It includes insurgents, but may or may not include terrorists. Terrorists such as the Baader Meinhof gang would not be included, whereas Hamas would be.

-3	-2	-1	0	1	2	3
opposition paramilitary force(s) actively engage in combat or terror	paramilitary force(s) present but not active	paramilitary force(s) demobilized but not disarmed	paramilitary recently demobilized & disarmed of fully automatic & heavier weapons	There haven't been any opposition paramilitary in for 1 yr & unlikely to have any in more in next year	There haven't been any opposition paramilitary in for 1-5 yrs & unlikely to have any in more in next 1-5 years	There haven't been any opposition paramilitary in > 5 yrs & unlikely to have any in more in next > 5 years

Figure 6-8. There haven't been any paramilitary forces

If there are multiple groups with paramilitary forces, the user might find it easier to keep track of the situation with separate preprocessor variables.

The final variable is identical in meaning to the basic variable, but should be called "expert opinion …." This variable takes into account all of the relevant factors, but is produced entirely as an expert's opinion. The concept is that numerical data are useful, but are often inadequate, often irregularly available or untimely, and sometimes biased. Further, a decomposition of the basic variable may not capture all aspects of the problem. The expert opinion can balance inadequacies and bias effects and can smooth out irregular availability and approximate the most current situation.

These variables are most easily combined in the Preprocessor as a weighted average, with the weights defined by the user. The best advice is to always set the weight of the expert opinion variable to 1.0 and vary the weights of the other variables as appropriate, perhaps related to the relative sizes of the militias. If there is some reason to vary the weights over time or if you wish to combine the variables with a non-linear equation, you will have to build the formulas to do so in the UserWorksheet of the Preprocessor, passing the final result to the basic variable.

6.1.1.5 There haven't been any regime-sponsored, non-military armed forces

Figure 6-9 shows the anchors for the input variable (node number 61) "there haven't been any regime-sponsored, non-military armed forces." This variable refers to paramilitary forces that are not parts of opposition groups, but rather on the government's side.

-3	-2	-1	0	1	2	3
govt supported paramilitary force(s) actively engage in combat or terror	govt supported paramilitary force(s) present but not active	govt supported paramilitary force(s) demobilized but not disarmed	govt supported paramilitary recently demobilized & disarmed of fully automatic & heavier weapons	There haven't been any govt supported paramilitary in for 1 yr & unlikely to have any in more in next year	There haven't been any govt supported paramilitary in for 1-5 yrs & unlikely to have any in more in next 1-5 years	There haven't been any govt supported paramilitary in > 5 yrs & unlikely to have any in more in next > 5 years

Figure 6-9. There haven't been any regime-sponsored, non-military forces

As with the opposition paramilitary forces, if there are multiple groups of regime-sponsored paramilitary forces, the user might find it easier to keep track of the situation with separate preprocessor variables.

The final variable is identical in meaning to the basic variable, but should be called "expert opinion …." This variable takes into account all of the relevant factors, but is produced entirely as an expert's opinion. The concept is that numerical data are useful, but are often inadequate, often irregularly available or untimely, and sometimes biased. Further, a decomposition of the basic variable may not capture all aspects of the problem. The expert opinion can balance inadequacies and bias effects and can smooth out irregular availability and approximate the most current situation.

These variables are most easily combined in the Preprocessor as a weighted average, with the weights defined by the user. The best advice is to always set the weight of the expert opinion variable to 1.0 and vary the weights of the other variables as appropriate, perhaps related to the relative sizes of the militias. If there is some reason to vary the weights over time or if you wish to combine the variables with a non-linear equation, you will have to build the formulas to do so in the UserWorksheet of the Preprocessor, passing the final result to the basic variable.

6.1.1.6 There are no factional disputes

Figure 6-10 shows the anchors for the input variable (node number 74) "there are no factional disputes." This variable differs from the earlier variable concerning competing groups in its restriction to groups that are more cohesive than general groups and are more prone to violence in prosecuting their aims. This variable also differs in its focus on the amount of violence that occurs. This variable differs from the earlier variable concerning espousing force in that factions are presumed to espouse force and the focus of this variable is the amount of violence that occurs, rather than the degree of belief in the use of force. The objects of the force in factional disputes need not be the government, but will often be other factions. You may find it easier to create a preprocessor variable for each faction within the country, creating a value for each faction.

-3	-2	-1	0	1	2	3
factional disputes are violent, frequently involving deadly violence, often of large size	factional disputes are moderate, seldom involving deadly violence	factional disputes are mild, involving demonstrations and fist fights at most	groups with different oppinions are no longer considered to be factions	groups with different oppinions haven't been considered to be factions for at least 1 yr	groups with different oppinions haven't been considered to be factions for at least 5 yrs	groups with different oppinions are not considered to be factions

Figure 6-10. There are no factional disputes

The user may find the formula below useful in creating a baseline value (Robbins, Matthew. 2005. *Investigating the Complexities of Nationbuilding: a Sub-National Regional Perspective*, Thesis AFIT/GOR/ENS/06-16, Air Force Institute of Technology, WPAFB, Ohio). The number of ethno-linguistic groups in the population is p. $PopDist_i$ is the fraction of the population in the i^{th} group. The sum over the groups must equal 1.0. The sum of the squared fractions measures the probability that two randomly drawn individuals from a given country speak the same language. The largest risk of conflict is when the sum of squared fractions is nearest to 0.5 (e.g., with two equal sized groups) and at the smallest risk when the sum of squared fractions is nearest 0.0 or 1.0 (very many small sized groups and only one group, respectively). (Robbins from Collier, P., Hoeffler, A. and Soderbom, M. 2001. "On the Duration of Civil War." Policy Working Paper 2861, World Bank, Washington, DC.). According to Robbins, Collier et al found that increasing/decreasing this function to the extremes yields a reduction in risk (from the center point) by a factor of eight.

$$Fractionalization = 1 - 3.5 * \left(0.5 - \sum_{i=1}^{p} PopDist_i^2 \right)^2 \qquad 5$$

Subtracting the sum of squared fractions sets the "bad" point to zero, so that squaring the result yields a variable that increases from zero to 0.25, which is "good," whether it results from a single, very dominant group or very many small groups. The squaring also creates more separation from the "bad" value as the situation improves. Multiplying by 3.5 and subtracting from one yields a variable that ranges from a best possible value of 0.125 to a worst value of 1.0.

The following formula converts this variable to a scaled variable that ranges from -3.0 (worst case) to +3.0 (best case).

$$ScaledFractionalization = -6 * (Fractionalization - 0.125) / 0.875 + 3 \qquad 6$$

If the user includes this variable, he should also add a variable relating to the conditions on the ground, because the ScaledFractionalization variable only deals with a propensity.

The final variable is identical in meaning to the basic variable, but should be called "expert opinion …." This variable takes into account all of the relevant factors, but is produced entirely as an expert's opinion. The concept is that numerical data are useful, but are often inadequate, often irregularly available or untimely, and sometimes biased. Further, a decomposition of the basic variable may not capture all aspects of the problem. The expert opinion can balance inadequacies and bias effects and can smooth out irregular availability and approximate the most current situation.

These variables are most easily combined in the Preprocessor as a weighted average, with the weights defined by the user. The best advice is to always set the weight of the expert opinion variable to 1.0 and vary the weights of the other variables as appropriate, perhaps related to the size of the faction as compared to the population as a whole. If there is some reason to vary the weights over time or if you wish to combine the variables with a non-linear equation, you will have to build the formulas to do so in the UserWorksheet of the Preprocessor, passing the final result to the basic variable.

6.1.1.7 No insurgents operating

Figure 6-11 shows the anchors for the input variable (node number 148) "no insurgents operating." Insurgents are defined as military or paramilitary forces that operate against the government with the principal intent of replacing the government and forming a new government in its place. Insurgents may or may not use terrorist tactics; however, to be regarded as insurgents, the desire for legitimate political power must be paramount.

-3	-2	-1	0	1	2	3
Insurgents operate openly, controlling significant parts of the country	Insurgents operate openly, controlling no significant parts of the country, but with medium scale attacks	Insurgents operate covertly with infrequent and small scale attacks	Insurgents recently quit operating	No insurgents have operated for at least 1 year	No insurgents have operated between 1 and 5 years	No insurgents have operated for over 5 years

Figure 6-11. No insurgents operating

If there are multiple insurgent groups operating in a country, you may find it easier to create multiple preprocessor variables to account for each group. In complex situations, you may wish to decompose each of these variables further. For example, you may create a variable to compare the size of the insurgent force to the government's armed forces, another to measure the amount of combat (e.g., brigade-equivalent days of combat), another to measure the civilian and NGO losses caused by combat, another to measure the territorial ownership by the insurgent group, and another to measure the combat damage to facilities.

The final variable is identical in meaning to the basic variable, but should be called "expert opinion …." This variable takes into account all of the relevant factors, but is produced entirely as an expert's opinion. The concept is that numerical data are useful, but are often inadequate, often irregularly available or untimely, and sometimes biased. Further, a decomposition of the basic variable may not capture all aspects of the problem. The expert opinion can balance inadequacies and bias effects and can smooth out irregular availability and approximate the most current situation.

These variables are most easily combined in the Preprocessor as a weighted average, with the weights defined by the user. The best advice is to always set the weight of the expert opinion variable to 1.0 and vary the weights of the other variables as appropriate, perhaps related to the size of the insurgent group as compared to the government's armed forces. If there is some reason to vary the weights over time or if you wish to combine the variables with a non-linear equation, you will have to build the formulas to do so in the UserWorksheet of the Preprocessor, passing the final result to the basic variable.

6.1.1.8 No terrorists are operating

Figure 6-12 shows the anchors for the input variable (node number 149) "no terrorists are operating." Terrorists are defined by the nature of their actions and their goals. Each terrorist act is aimed at creating fear and terror in the population and government of the country and, often, in the population and governments of other countries. Terrorists differ in their motives, which include monetary gain (banditry), nihilism (political destruction), local political change (including wealth redistribution and religious rule), and transnational political change (including geographical changes to national boundaries). Terrorists are not motivated by the desire to replace a country's government with themselves, as are insurgents. This distinction may blur at times as a particular group's motivations may not be pure or clear to outsiders.

-3	-2	-1	0	1	2	3
Terrorist attacks are frequent and often large (>75 casualties)	Terrorist attacks are or small scale and frequent or infrequent and large (>75 casualties)	Terrorist attacks are infrequent (3-9 month intervals) and small scale	Terrorists recently quit operating	No terrorists have operated for at least 1 year	No terrorists have operated between 1 and 5 years	No terrorists have operated for over 5 years

Figure 6-12. No terrorists are operating

If there are multiple terrorist groups operating in a country, you may find it easier to create multiple preprocessor variables to account for each group. In complex situations, you may wish to decompose each of these variables further. For example, you may create a variable to to measure the civilian losses caused by terror, another to measure the government losses caused by terror, another to measure the damage to facilities, and another to measure the number of terror events.

The final variable is identical in meaning to the basic variable, but should be called "expert opinion ...." This variable takes into account all of the relevant factors, but is produced entirely as an expert's opinion. The concept is that numerical data are useful, but are often inadequate, often irregularly available or untimely, and sometimes biased. Further, a decomposition of the basic variable may not capture all aspects of the problem. The expert opinion can balance inadequacies and bias effects and can smooth out irregular availability and approximate the most current situation.

These variables are most easily combined in the Preprocessor as a weighted average, with the weights defined by the user. The best advice is to always set the weight of the expert opinion variable to 1.0 and vary the weights of the other variables as appropriate. If there is some reason to vary the weights over time or if you wish to combine the variables with a non-linear equation, you will have to build the formulas to do so in the UserWorksheet of the Preprocessor, passing the final result to the basic variable.

6.1.2 Government Sector Model

The government sector contains 11 inputs that relate to government issues. Some of the inputs (such as the drugs inputs) could be considered part of the economy sector; however, they have more connections to the intermediate variables in the government sector (corruption, crime control) and are thus included here.

6.1.2.1 Human rights are protected

Figure 6-13 shows the anchors for the input variable (node number 35) "human rights are protected." Human rights is an amorphous concept and thus difficult to measure. The Freedom House (www.freedomhouse.org) organization defines civil liberties as the freedoms to develop views, institutions and personal autonomy apart from the state. The group's definition of civil liberties includes freedom of expression and association, the right to hold demonstrations, religious freedom, and personal rights such as freedom of education, ownership, and travel. Other factors included in this category include the independence of the judiciary, rule of law, degree of freedom from government terror, and freedom from imprisonment for reasons of belief or conscience. There is a good correlation between this measure and the concept of human rights.

-3	-2	-1	0	1	2	3
concept is laughable	lip service only	desirable goal	enshrined in law, not always followed	enshrined in law, usually followed	enshrined in law, almost always followed	only breaches of human rights are remarkable

Figure 6-13. Human rights are protected

Freedom House gives the following definitions of its anchors:

- Countries with a rating of 1 generally have an established and equitable rule of law with free economic activity. Citizens enjoy a full range of civil liberties.
- A rating of 2 indicates some deficiencies, but these countries are still relatively free.
- A rating of 3, 4, or 5 may indicate partial compliance with all of the elements of civil liberties; it may also indicate complete freedom in some areas coupled with complete denial in others. Countries with these ratings experience varying degrees of censorship, political terror, and prevention of free association.
- Countries with a rating of 6 enjoy partial rights—a few social and religious freedoms and some restricted business activity. In general, however, these citizens experience severely restricted expression and association coupled with political terror (e.g. political prisoners).
- A rating of 7 indicates virtually no freedom. Freedom House notes that a poor rating for a country "is not necessarily a comment on the intentions of the government, but may indicate real restrictions on liberty caused by non-governmental terror."

The equation below converts the Freedom House civil liberties score to a scaled human rights value.

$$ScaledHumanRights = 4 - CivilLiberties \qquad 7$$

Figure 6-14 shows the distribution of this variable for 190 countries.

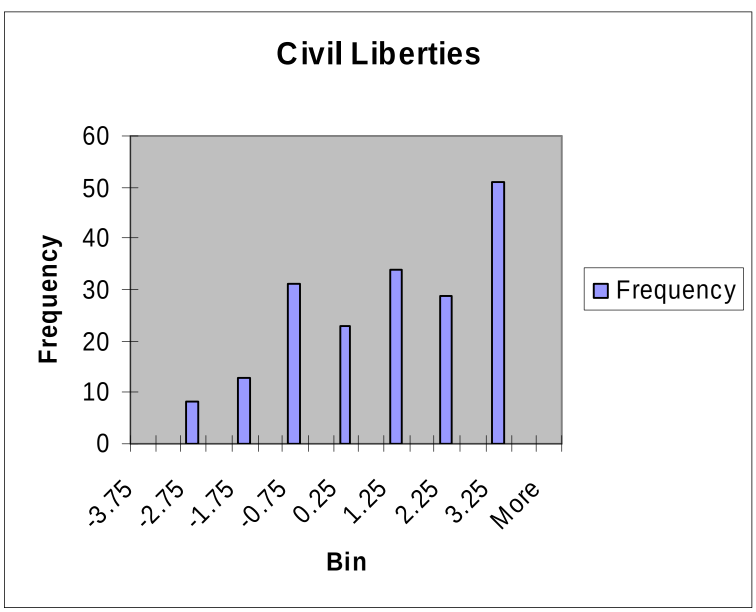


Figure 6-14. Civil liberties converted to scaled human rights

6.1.2.2 Police are distinct from the military

Figure 6-16 shows the anchors for the input variable (node number 45) "police are distinct from the military." It is relatively simple to determine values for this variable using the anchor values.

-3	-2	-1	0	1	2	3
police force is part of military	some police not in military	most police not part of military	police force now distinct	police force only recently distinct (1 yr)	police force has been distinct from 1 -5 years	police force has been distinct for at least 5 yrs

Figure 6-15. Police are distinct from the military

6.1.2.3 Prison structure is adequate

Figure 6-16 shows the anchors for the input variable (node number 49) "prison structure is adequate." This variable consists of three components: relative prison capacity, prison conditions, and treatment of prisoners.

-3	-2	-1	0	1	2	3
prisons routinely used for torture	some torture in prisons	occasional torture or simply bad conditions in prisons	no institutionalized torture, many prisons ok	most prisons ok	all prisons ok, some good; adequate numbers of prisons	prisons exist in adequate numbers & "humane"

Figure 6-16. Prison structure is adequate

Relative prison capacity can be measured directly (although with some uncertainty in some countries). The following equation converts the number of prisoners divided by the number of prisoners that can be held in the country's prisons into a scaled relative prison capacity value.

$$Capacity = -8 * \log_{10}(Numprisoners / Totcapacity) \quad 8$$

Figure 6-17 shows the distribution of this variable for 125 countries.

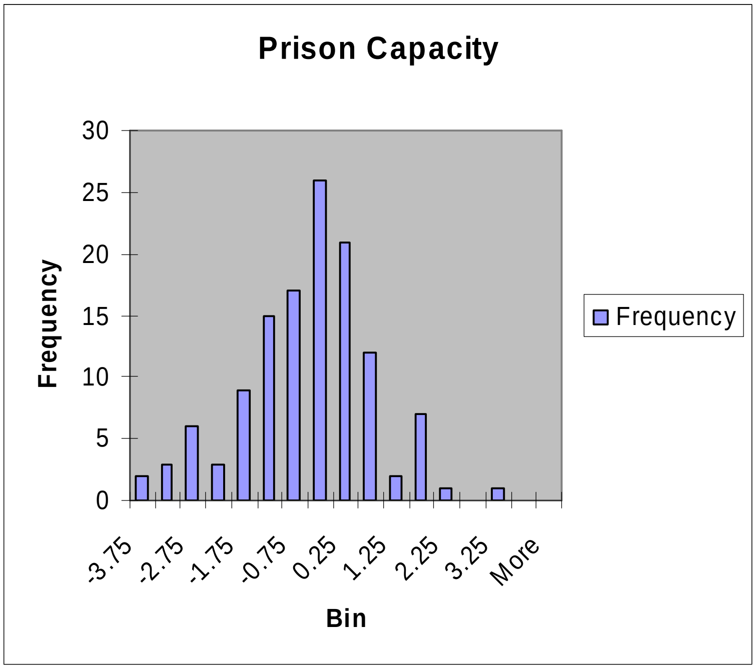


Figure 6-17. Scaled relative prison capacity

Figure 6-18 shows the anchors for the two non-numerically components of "prison structure is adequate."

Note	**-3**	**-2**	**-1**	**0**	**1**	**2**	**3**
Condition of Prisons	no formal prisons exist	prisons are dirty, have horrible sanitation facilities, no health care, no lighting, no exercise facilities, etc.	prisons are dirty, have poor sanitation, poor health care, poor lighting, no exercise facilities, and no educational facilities	prisons are clean, have good sanitation, moderate health care, moderate lighting, minimal or no exercise facilities, and no educational facilities	prisons are clean, have good sanitation, good lighting, good health care, only minimal exercise facilities, and minimal educational facilities	prisons are clean, have good sanitation, good lighting, good health care, only moderate exercise facilities, and moderate educational facilities	prisons are in excellent condition
Treatment of Prisoners	frequent torture at whim of guards	routine torture for some classes of prisoner	occassional torture for some classes of prisoner	no institutionalized torture	no torture	good treatment	excelent treatment

Figure 6-18. Additional prison preprocessor variables

The final variable is identical in meaning to the basic variable, but should be called "expert opinion …." This variable takes into account all of the relevant factors, but is produced entirely as an expert's opinion. The concept is that numerical data are useful, but are often inadequate, often irregularly available or untimely, and sometimes biased. Further, a decomposition of the basic variable may not capture all aspects of the problem. The expert opinion can balance inadequacies and bias effects and can smooth out irregular availability and approximate the most current situation.

These variables are most easily combined in the Preprocessor as a weighted average, with the weights defined by the user. The best advice is to always set the weight of the expert opinion variable to 1.0 and vary the weights of the other variables as appropriate. If there is some reason to vary the weights over time or if you wish to combine the variables with a non-linear equation, you will have to build the formulas to do so in the UserWorksheet of the Preprocessor, passing the final result to the basic variable.

6.1.2.4 Drug cultivation is not a problem

Figure 6-19 shows the anchors for the input variable (node number 65) "drug cultivation is not a problem."

-3	-2	-1	0	1	2	3
drug cultivation is major economic or cultural factor	drug cultivation is significant economic or cultural factor in many areas	drug cultivation is significant economic or cultural factor in some areas	drug cultivation exists but mostly not significant economic or cultural factor	drug cultivation exists but not significant economic or cultural factor	drug cultivation exists but is minor economic or cultural factor	drug cultivation is insignificant or non-existent

Figure 6-19. Drug cultivation is not a problem

Without access to detailed intelligence, assigning values is difficult. However, the CIA World Fact Book provides enough information to make rough estimates. Countries listed as the largest producers of opium and cocaine were assigned values of -3.0; second largest were assigned values of -2.5; third largest and countries described as major growers were assigned values of -2.0. Countries that were described as "producers" were assigned values of -1.5. Countries described as "minor" growers or with notations implying minor status (e.g., "for domestic use only") were assigned values of 1.0. Countries that appeared to be between major and minor were assigned values of -0.5. Countries not listed as growing drugs were assigned values of 2.0 (as a compromise for lack of better data). Figure 6-20 shows the resulting distribution for 230 countries.

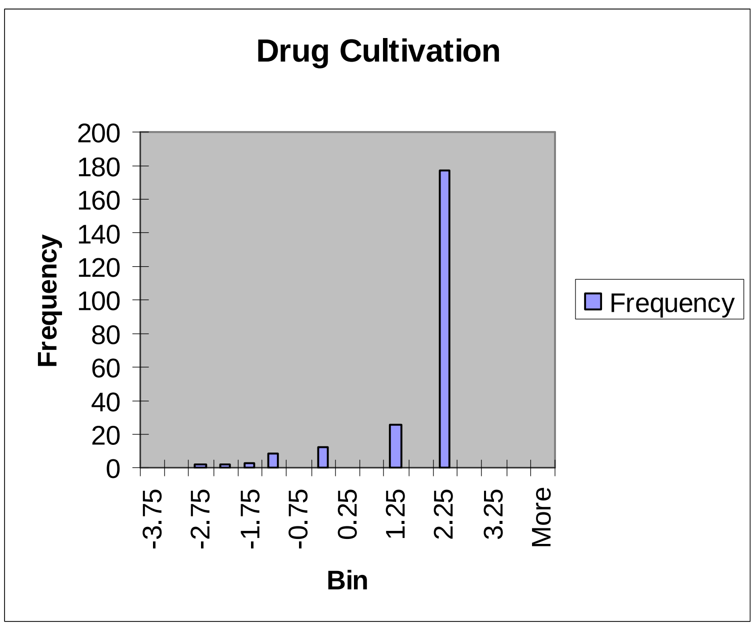


Figure 6-20. Drug cultivation

6.1.2.5 Drug manufacture is not a problem

Figure 6-21 shows the anchors for the input variable (node number 66) "drug manufacture is not a problem." Drug manufacture includes the conversion of agricultural products to narcotic products, such as coca to cocaine, the conversion of one narcotic product to another, such as opium to heroin, and the creation of synthetic products, such as methamphetamine.

-3	-2	-1	0	1	2	3
drug manufacture is major economic or cultural factor	drug manufacture is significant economic or cultural factor in many areas	drug manufacture is significant economic or cultural factor in some areas	drug manufacture exists but mostly not significant economic or cultural factor	drug manufacture exists but not significant economic or cultural factor	drug manufacture exists but is minor economic or cultural factor	drug manufacture is insignificant or non-existent

Figure 6-21. Drug manufacture is not a problem

Without access to detailed intelligence, assigning values is difficult. However, the CIA World Fact Book provides enough information to make rough estimates. Countries described as major manufactures were assigned values of -2.5 and countries described as having many labs were assigned values of -2.0. Countries that were described as "producers" were assigned values of -1.5. Countries described as "minor" manufacturers were assigned values of 1.0. Countries that appeared to be between major and minor were assigned values of -0.5. Countries not listed as manufacturing drugs were assigned values of 2.0 (as a compromise for lack of better data). Figure 6-22 shows the resulting distribution for 230 countries.

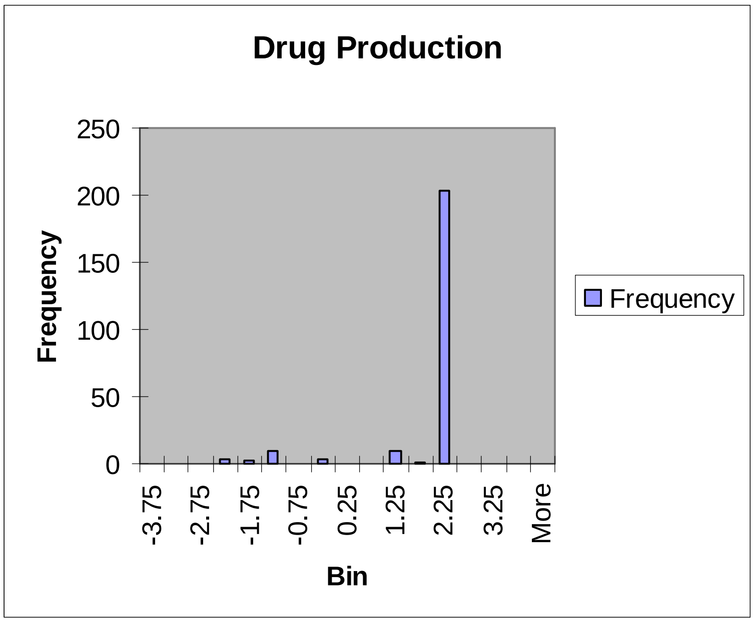


Figure 6-22. Drug production

6.1.2.6 Drug transshipment is not a problem

Figure 6-23 shows the anchors for the input variable (node number 67) "drug transshipment is not a problem."

-3	-2	-1	0	1	2	3
drug transshipment is major economic or cultural factor	drug transshipment is significant economic or cultural factor in many areas	drug transshipment is significant economic or cultural factor in some areas	drug transshipment exists but mostly not significant economic or cultural factor	drug transshipment exists but not significant economic or cultural factor	drug transshipment exists but is minor economic or cultural factor	drug transshipment is insignificant or non-existent

Figure 6-23. Drug transshipment is not a problem

Without access to detailed intelligence, assigning values is difficult. However, the CIA World Fact Book provides enough information to make rough estimates. Countries described primary transshippers were assigned values of -3.0; important transshippers were assigned values of -2.5; and major transshippers were assigned values of -2.0. Countries described as active transshipment points or of medium use were assigned values of -1.5. Countries that were described as being "used as" transshipment points were assigned values of 0.0. Countries described as "minor" transshippers were assigned values of 1.0. Countries not listed as transshipping drugs were assigned values of 2.0 (as a compromise for lack of better data). Figure 6-24 shows the resulting distribution for 230 countries.

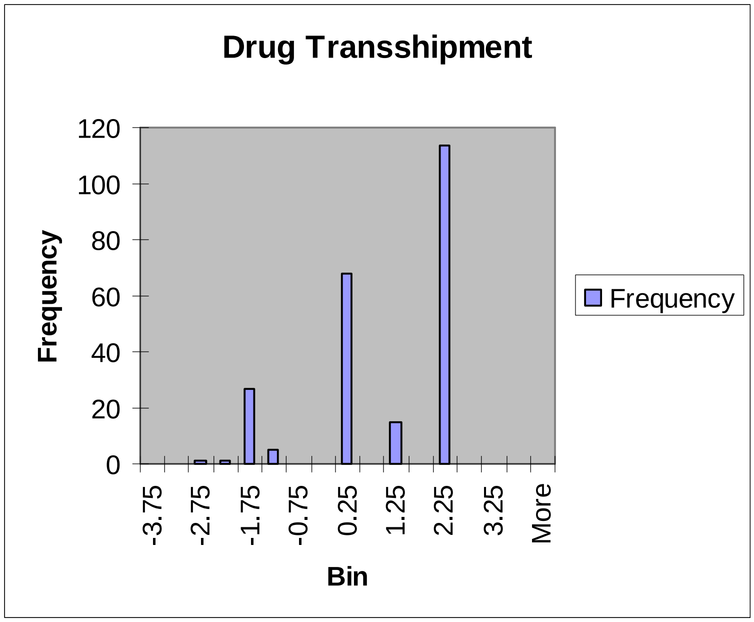


Figure 6-24. Drug transshipment

6.1.2.7 Drug use is not a problem

Figure 6-25 shows the anchor points for the input variable (node number 72) "drug use is not a problem."

-3	-2	-1	0	1	2	3
drug use is major economic or cultural factor	drug use is significant economic or cultural factor in many areas	drug use is significant economic or cultural factor in some areas	drug use exists but mostly not significant economic or cultural factor	drug use exists but not significant economic or cultural factor	drug use exists but is minor economic or cultural factor	drug use is insignificant or non-existent

Figure 6-25. Drug use is not a problem

Without access to detailed intelligence, assigning values is difficult. However, the CIA World Fact Book provides enough information to make rough estimates. Countries described largest consumer were assigned values of -3.0; major "consumers" were assigned values of -2.5; and "consumers" were assigned values of -2.0. Countries described as "users" were assigned values of -1.0. Countries described as "minor" users were assigned values of 1.0. Countries not listed as using drugs were assigned values of 2.0 (as a compromise for lack of better data). Figure 6-26 shows the resulting distribution for 230 countries.

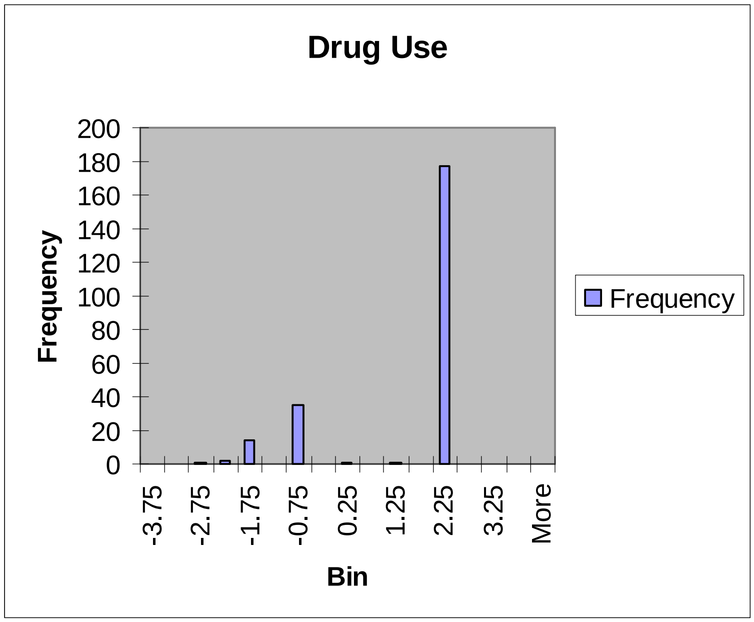


Figure 6-26. Drug use

6.1.2.8 Common crime is not a problem

Figure 6-27 shows the anchors for the input variable (node number 73) "common crime is not a problem." Unbiased measures of crime are difficult to find. Ideally, one would want a composite picture of all types of crime that could be compared internationally. Unfortunately, crime statistics are often measures, not of the level of crime, but of the level of reporting of crime, especially for low impact crimes. Thus an increase of reported crime may be a sign of improving health of a society, rather than of decreasing health. Further, some crimes may have societal definitions or there may be stigmas against reporting them. Homicide is the crime which may be least affected by these problems and is chosen as the best proxy for measuring the common crime rate.

-3	-2	-1	0	1	2	3
common crime is major economic or cultural factor	common crime is significant economic or cultural factor in many areas	common crime is significant economic or cultural factor in some areas	common crime exists but mostly not significant economic or cultural factor	common crime exists but not significant economic or cultural factor	common crime exists but is minor economic or cultural factor	common crime is insignificant or non-existent

Figure 6-27. Common crime is not a problem

The equation below shows the formula for converting homicides per 100,000 population to a scaled value for common crime.

$$ScaledCommonCrime = 2.1*(0.75 - \log_{10}(Homicides/100000)) \qquad 9$$

Figure 6-28 shows the distribution of this statistic for 80 countries.

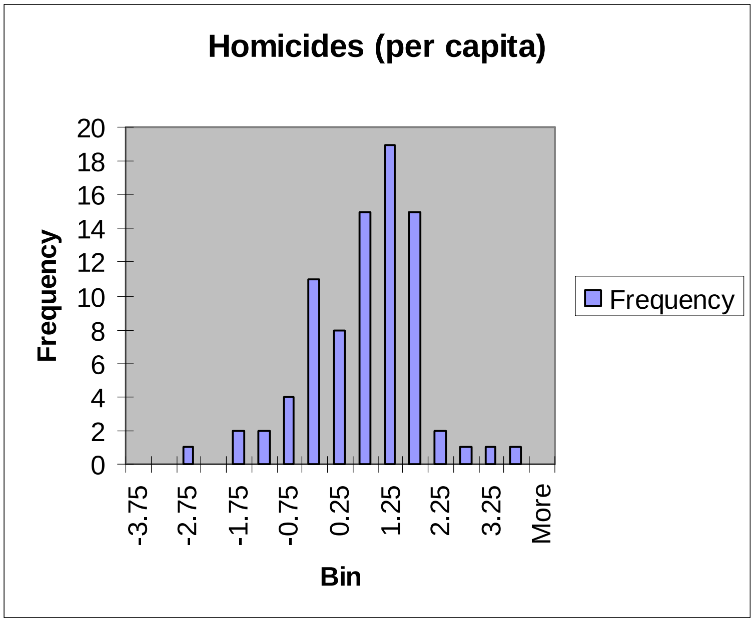


Figure 6-28. Homicides (per capita)

6.1.2.9 Organized crime is not a problem

Figure 6-29 shows the anchors for the input variable (node number 69) "organized crime is not a problem." As yet, no good source has been identified for valuing this variable.

-3	-2	-1	0	1	2	3
organized crime is major economic or cultural factor	organized crime is significant economic or cultural factor in many areas	organized crime is significant economic or cultural factor in some areas	organized crime exists but mostly not significant economic or cultural factor	organized crime exists but not significant economic or cultural factor	organized crime exists but is minor economic or cultural factor	organized crime is insignificant or non-existent

Figure 6-29. Organized crime is not a problem

6.1.2.10 Corruption in public office is not part of culture

Figure 6-30 shows the anchors for the input variable (node number 121) "corruption in public office is not part of culture."

-3	-2	-1	0	1	2	3
public officials require corrupt actions to perform "duty"; accepted practice	public officials expect corrupt actions to perform "duty"; accepted practice	public officials often receive corrupt actions to perform "duty"; accepted practice	public officials often receive corrupt actions to perform "duty"; not accepted practice	public officials sometimes receive corrupt actions to perform "duty"; not accepted practice	few public officials receive corrupt actions to perform "duty"; against public ethics	few public officials receive corrupt actions to perform "duty"; vigorously prosecuted

Figure 6-30. Corruption in public office is not part of culture

Transparency International (www.transparency.org) produces a corruption perception index (CPI) that can be used here. It relates to perceptions of the degree of corruption as seen by business people, academics and risk analysts, and ranges between 0 (highly clean) and 10 (highly corrupt). The CPI focuses on corruption in the public sector. It defines corruption as the abuse of public office for private gain. It includes police corruption, business corruption, political corruption, etc. The equation below converts the CPI score into a scaled value between -3.0 and +3.0.

$$ScaledCorruption = -6 * CPI / 10 + 3 \qquad (10)$$

Figure 6-31 shows the distribution of this statistic for 130 countries.

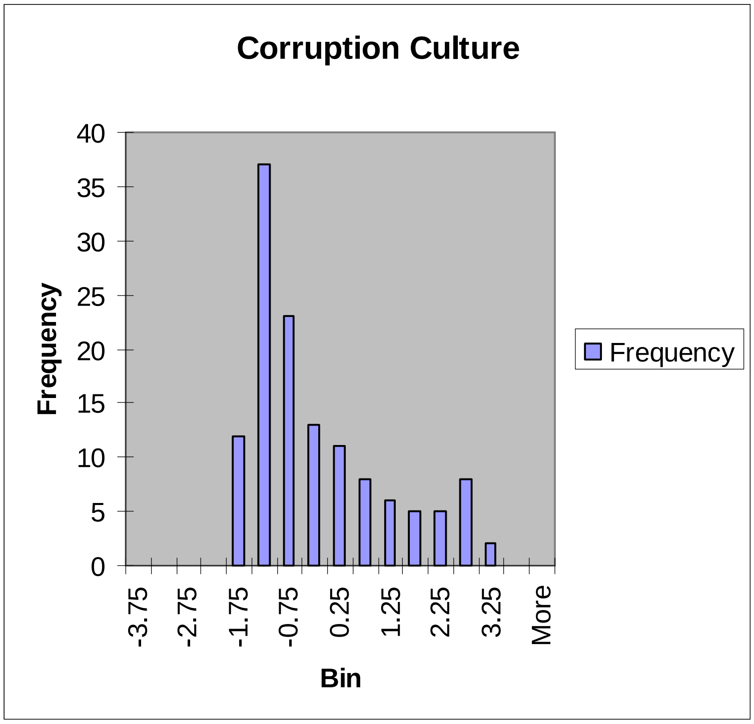


Figure 6-31. Corruption culture

6.1.2.11 Central government exists

Figure 6-32 shows the anchors for the input variable (node number 122) "central government exists." The meaning of "very small areas" is 5% of the country's area or less and not including major population centers. The meaning of "sizable areas" is 5-30% of the country's area, including less than a third of its major population centers. The meaning of "in name only" is that the central government controls the capital and those places where the armed forces are – when they are there, but is the internationally recognized government of the country.

-3	-2	-1	0	1	2	3
no central govt at all	central govt in name only	central govt does not control sizable areas	central govt controls all but very small areas	central govt controls all & has planned succession, etc.	central govt been there from 1- 5 yrs, stable succession, etc.; or been there > 5 yrs, but has weak points	central govt been there > 5 yrs, stable succession, etc.

Figure 6-32. Central government exists

6.1.3 Needs and Miscellaneous Sector Models

The needs sector contains two inputs (with a third suggested as a future input) that relate to basic human physical needs. The miscellaneous sector contains six inputs that relate to education and media, political and religious freedom.

6.1.3.1 Basic natural resource management is in place

Figure 6-33 shows the anchors for the input variable (node number 5) "basic natural resource management is in place."

-3	-2	-1	0	1	2	3
infrastructure and govt/private management missing	infrastructure and govt/private management bad	infrastructure and govt/private management moderately bad	infrastructure and govt/private management fair	infrastructure and govt/private management moderately good	infrastructure and govt/private management good	infrastructure and govt/private management excellent

Figure 6-33. Basic natural resource management is in place

No direct sources for world-wide statistics have been found. However, there are statistics that bear on the two issues that this variable feeds, potable water and the agriculture system. The Food and Agriculture Organization (FAO) of the United Nations, Land and Water Development Division, maintains a database that contains information on the water that is withdrawn from the country's water resources for domestic and agricultural uses (http://www.fao.org/waicent/faoinfo/agricult/agl/aglw/aquastat/dbase/index.stm). The data support calculating the water withdrawn in cubic meters per inhabitant per year for each use. While the two figures could be added together for the direct calculation of a water resource management variable, this might obscure problems in only one of the measures. Therefore, scaled variables are calculated for each and then combined. The equations for the separate measures are shown below.

$$ScaledDomesticWater = 3.2 * \log_{10}(DomesticWaterUsePerCapita) - 5.0 \tag{11}$$

$$ScaledAgricultWater = 1.2 * \log_{10}(AgriWaterUsePerCapita) - 1.5 \tag{12}$$

$$WaterManagement = 1.25 * (ScaledDomesticWater + ScaledAgricultWater) / 2 \tag{13}$$

The statistics for 155 countries are shown in the figures below.

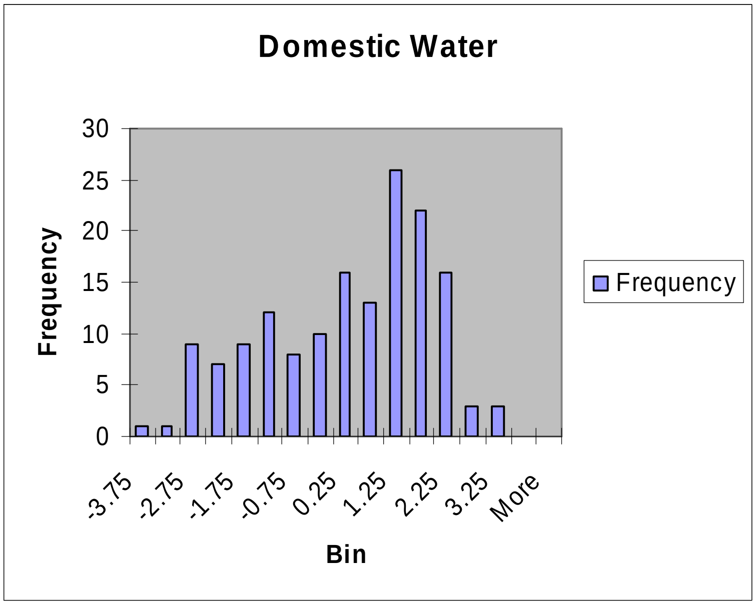


Figure 6-34. Domestic water use

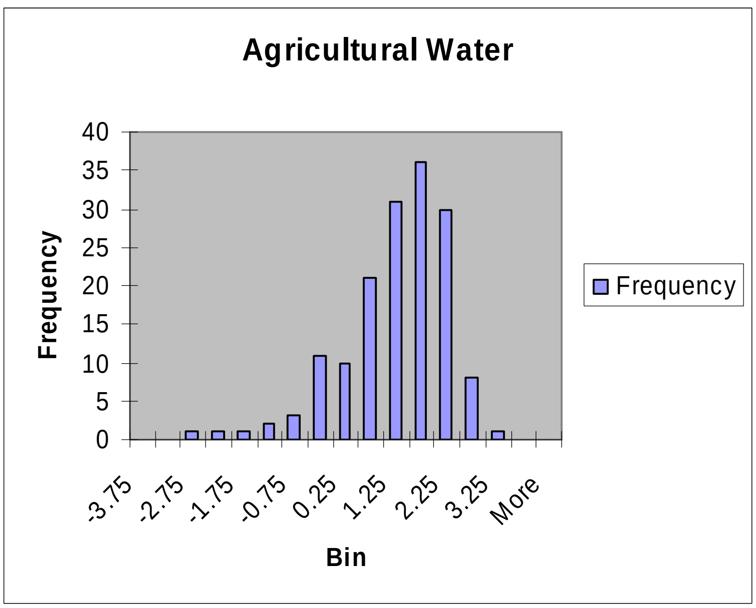


Figure 6-35. Agricultural water use

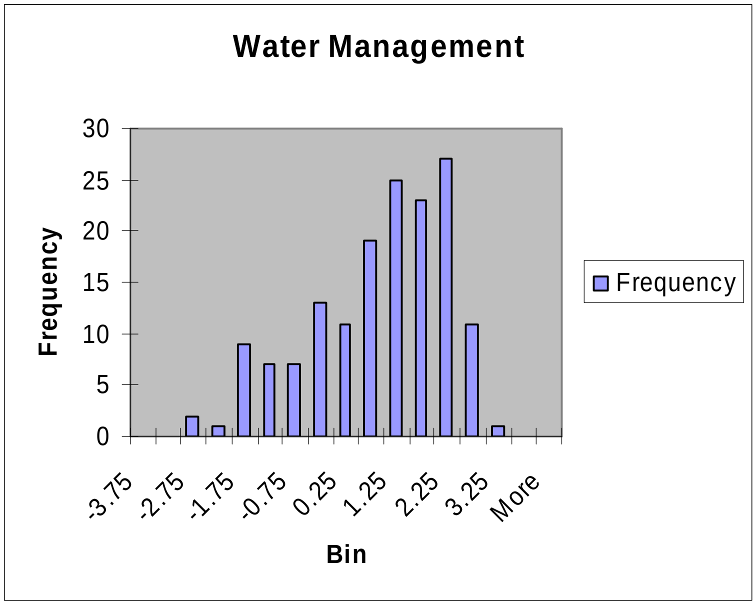


Figure 6-36. Water management

6.1.3.2 Water distribution infrastructure is sufficient

Figure 6-37 shows the anchors for the input variable (node number 58) "water distribution infrastructure is sufficient."

-3	-2	-1	0	1	2	3
water distribution missing	water distribution bad	water distribution moderately bad	water distribution fair	water distribution moderately good	water distribution good	water distribution excellent

Figure 6-37. Water distribution infrastructure is sufficient

This variable only feeds the potable water variable and a good source for this data has been found at the WorldBank Group web site (http://devdata.worldbank.org/data-query) in the form of percent of the population (1% = 1, not 0.01) with access to improved water sources. The calculations are shown in the following equations.

$$ScaledPotable = -6*(\log_{10}(110 - PopPercent)) + 9 \qquad 14$$

Figure 6-38 shows the distribution of this statistic for 180 countries.

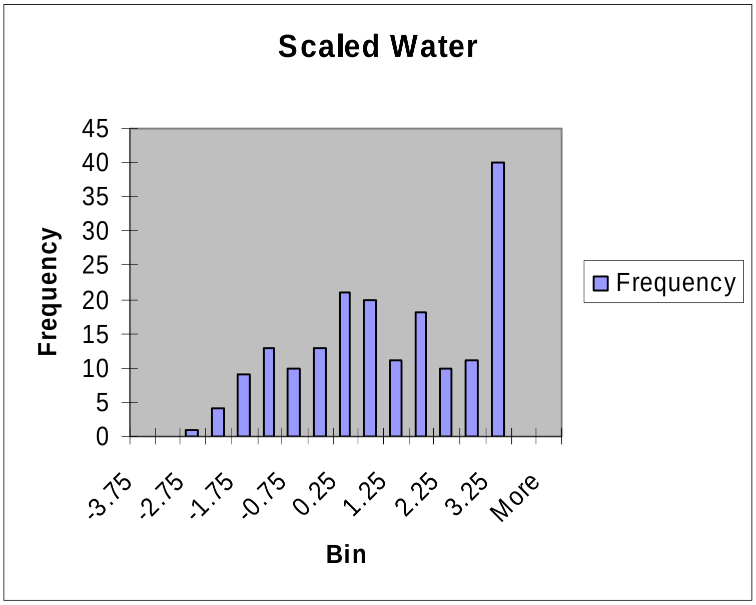


Figure 6-38. Potable water

6.1.3.3 There are no major disease issues (e.g., HIV/AIDS) (possible future input variable)

Several diseases can present major threats to the stability of a country. The impact depends on the effects of the disease and its prevalence. One example is HIV/AIDS, for which there is currently no cure. The disability of those infected negatively affects the society and economy of a country. Further, the death of children's parents leaves the future viability of some countries seriously at risk.

The equation below converts the adult prevalence rate in percent (1% = 1, not 0.01) to a scaled disease impact variable. Values above +3.0 and below -3.0 are then capped at those levels to create the input values for the variable.

$$ScaledHIVAIDS = -2 * \log_{10}(adultHIVAIDSrate) \tag{15}$$

The scaling of this variable is based on the distribution of data for 165 countries, shown in Figure 6-39.

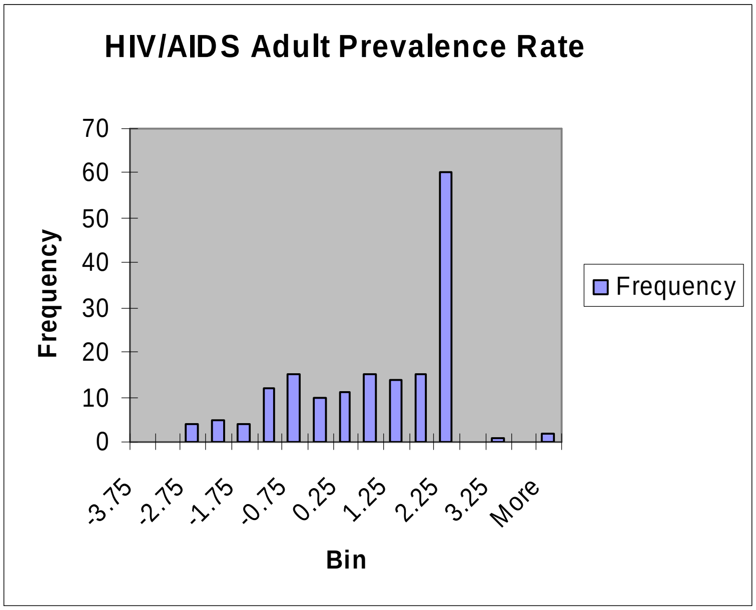


Figure 6-39. HIV/AIDS adult prevalence rate

Similar variables and equations can be created for other diseases.

The final variable is identical in meaning to the basic variable, but should be called "expert opinion …." This variable takes into account all of the relevant factors, but is produced entirely as an expert's opinion. The concept is that numerical data are useful, but are often inadequate, often irregularly available or untimely, and sometimes biased. Further, a decomposition of the basic variable may not capture all aspects of the problem. The expert opinion can balance inadequacies and bias effects and can smooth out irregular availability and approximate the most current situation.

These variables are most easily combined in the Preprocessor as a weighted average, with the weights defined by the user. The best advice is to always set the weight of the expert opinion variable to 1.0 and vary the weights of the other variables as appropriate. If there is some reason to vary the weights over time or if you wish to combine the variables with a non-linear equation, you will have to build the formulas to do so in the UserWorksheet of the Preprocessor, passing the final result to the basic variable.

6.1.3.4 Education infrastructure is adequate

Figure 6-40 shows the anchors for the input variable (node number 126) "education infrastructure is adequate."

-3	-2	-1	0	1	2	3
education infrastructure does not exist	some educational infrastructure in some places	most places have close to K-12 (or equivalent)	full K-12 (or equivalent) in place	full K-12 (or equivalent) & some colleges in place	full K-12 (or equivalent), college & graduate school system exists	full K-12 (or equivalent), college & graduate school system exists & is world class

Figure 6-40. Education infrastructure is adequate

While a detailed analysis of the educational infrastructure is superior, per capita spending on education probably can serve as a useful proxy measure. The equation below converts 2004 spending in dollars per capita to this variable. Values above +3.0 and below -3.0 are then capped at those levels to create the input values for the variable.

$$ScaledEduInfra = 2 * (\log_{10}(dollars / person) - 0.56) - 3 \qquad 16$$

Figure 6-41 shows the distribution of this statistic for 130 countries.

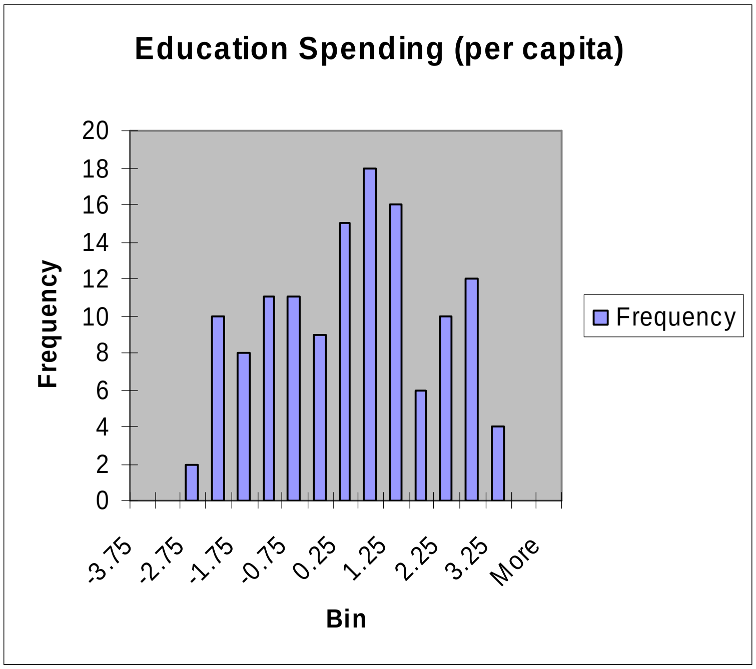


Figure 6-41. Education spending (per capita)

6.1.3.5 Educational system is tailored toward jobs

Figure 6-42 shows the anchors for the input variable (node number 21) "educational system is tailored toward jobs." The thrust of this variable is that the educational system produces enough people in the variety needed for the society's job needs.

-3	-2	-1	0	1	2	3
no system	only systems are aimed only at religious, etc., ends	some job requisite skills taught, e.g., reading, writing, arithmetic	most of system is aimed at blue collar type jobs	some higher education, plus strong effort to impart blue collar rqd skills	adequate standard & higher education	complete range of education for all types of jobs offered & used

Figure 6-42. Educational system is tailored toward jobs

A detailed methodology for valuing this variable could be quite complex. However, the average years of schooling for adults probably yields a satisfactory proxy. One could imagine, as a counterexample, a society in which all adults had graduate degrees and no one wanted to be a plumber. Since no such society currently exists, the proxy appears reasonably adequate. The equation below converts average adult schooling into the desired rating. Values above +3.0 and below -3.0 are then capped at those levels to create the input values for the variable.

$$ScaledEduSystem = 7 * AvgAdultSchooling / 12 - 4 \qquad 17$$

Figure 6-43 shows the distribution of this statistic for 100 countries.

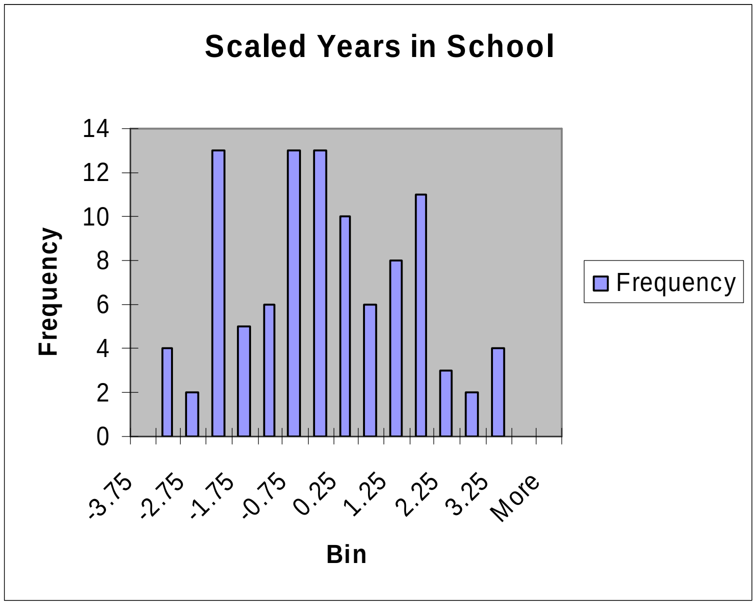


Figure 6-43. Scaled years in school

6.1.3.6 Government does not control domestic media's reporting of events

Figure 6-44 shows the anchors for the input variable (node number 125) "government does not control domestic media's reporting of events."

Several factors in the External Model are listed as reversible and variable factors. Changes in this input variable may affect one of these factors. The standard presumption is that reduced government control of the media implies an improvement in civil unrest; however, this need not always be the case. For example, in some circumstances, a freer press may better inform people of the country's problems, leading to more civil unrest (a decline in the variable's value).

-3	-2	-1	0	1	2	3
domestic media is govt organ	govt media + strongly controlled private media	govt media + weakly controlled private media or no govt media, but moderate govt censorship	no govt media + weak censorship	no govt media, only occasional censorship	no govt media, only rare censorship	govt control is extremely rare (e.g., US)

Figure 6-44. Government does not control domestic media's reporting of events

This variable and the following variable require two raw inputs (plus the expert opinion input). The first input is common to both variables. It is the Freedom House (www.freedomhouse.org) score on Freedom of the Press, described as follows:

> Countries are given a total score from 0 (best) to 100 (worst) on the basis of a set of 23 methodology questions divided into three subcategories. Our examination of the level of press freedom in each country currently comprises 23 methodology questions divided into three broad categories: the legal environment, the political environment, and the economic environment.

The equation below converts the Freedom of the Press (FreeMedia) score into a scaled variable. Values above +3.0 and below -3.0 are then capped at those levels to create the input values for the variable.

$$ScaledFreeMedia = 8 * (100 - FreeMedia) / 100 - 4 \qquad 18$$

Figure 6-45 shows the distribution of this statistic for 195 countries.

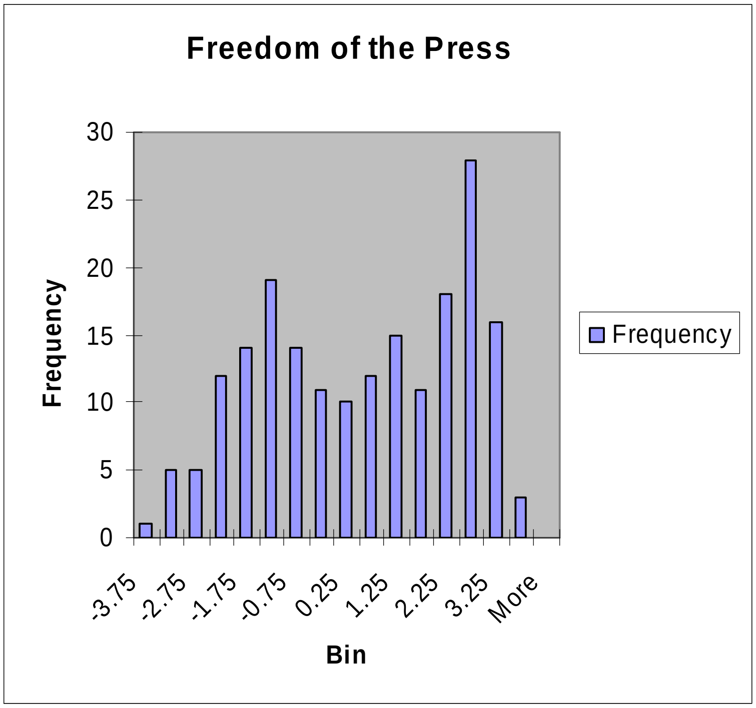


Figure 6-45. Freedom of the press

The second variable relates directly to domestic media, the existence of government organs and the extent of censorship.

The final variable is identical in meaning to the basic variable, but should be called "expert opinion …." This variable takes into account all of the relevant factors, but is produced entirely as an expert's opinion. The concept is that numerical data are useful, but are often inadequate, often irregularly available or untimely, and sometimes biased. Further, a decomposition of the basic variable may not capture all aspects of the problem. The expert opinion can balance inadequacies and bias effects and can smooth out irregular availability and approximate the most current situation.

These variables are most easily combined in the Preprocessor as a weighted average, with the weights defined by the user. The best advice is to always set the weight of the expert opinion variable to 1.0 and vary the weights of the other variables as appropriate. If there is some reason to vary the weights over time or if you wish to combine the variables with a non-linear equation, you will have to build the formulas to do so in the UserWorksheet of the Preprocessor, passing the final result to the basic variable.

6.1.3.7 International media have open access to the reporting of events

Figure 6-46 shows the anchors for the input variable (node number 38) "international media have open access to the reporting of events."

-3	-2	-1	0	1	2	3
no international media allowed	international media only report what govt allows	international media mostly censored	international media not censored but have limited access	international media have moderate access	free access	free access + active support

Figure 6-46. International media have open access to the reporting of events

This variable and the preceding variable require two raw inputs (plus the expert opinion input). The first input is common to both variables. It is the Freedom House (www.freedomhouse.org) score on Freedom of the Press, described as above.

The second variable relates directly to foreign media, the access permitted by the government organs and the extent of censorship.

The final variable is identical in meaning to the basic variable, but should be called "expert opinion …." This variable takes into account all of the relevant factors, but is produced entirely as an expert's opinion. The concept is that numerical data are useful, but are often inadequate, often irregularly available or untimely, and sometimes biased. Further, a decomposition of the basic variable may not capture all aspects of the problem. The expert opinion can balance inadequacies and bias effects and can smooth out irregular availability and approximate the most current situation.

These variables are most easily combined in the Preprocessor as a weighted average, with the weights defined by the user. The best advice is to always set the weight of the expert opinion variable to 1.0 and vary the weights of the other variables as appropriate. If there is some reason to vary the weights over time or if you wish to combine the variables with a non-linear equation, you will have to build the formulas to do so in the UserWorksheet of the Preprocessor, passing the final result to the basic variable.

6.1.3.8 People perceive that their interests are represented

Figure 6-47 shows the anchors for the input variable (node number 43) "people perceive that their interests are represented."

-3	-2	-1	0	1	2	3
convinced their opinions are irrelevant	believe have almost no influence	believe have little influence	believe have some influence	believe have influence	believe have considerable influence	believe have ultimate control

Figure 6-47. People perceive that their interests are represented

Political rights enable people to participate freely in the political process. In this case, political process refers to the system by which the polity chooses the authoritative policy makers and attempts to make binding decisions affecting the national, regional or local community. A system is genuinely free or democratic to the extent that the people have a choice in determining the nature of the system and its leaders. It is primarily an electoral definition of political rights and includes such criteria as the holding of regular elections, the presence and number of opposition parties, size of the opposition vote, regular and/or recent transfers of power, fairness and openness of the campaign environment, and so on. Other political issues which are considered include the amount of military influence on government and the degree of foreign involvement.

Freedom House (www.freedomhouse.org) gives the following definitions of its anchors:

- A rating of 1 indicates free and fair elections, political competition, and autonomy for all citizens, including minority groups.

- A rating of 2 indicates that a country is less free--there may be some corruption, violence, political discrimination against minorities, and military influence on politics.
- These same factors play a progressively larger role in countries with a ranking of 3, 4, or 5--citizens of these countries typically experience some political rights (e.g. freedom to organize somewhat controversial groups, reasonably free referenda) along with more damaging influences (e.g. civil war, heavy military involvement, one-party dominance).
- Countries and territories with political rights rated 6 are ruled by military juntas, one-party dictatorships, religious hierarchies, or autocrats. There may be a few local elections or some minority representation.
- For countries with a rating of 7, political rights are basically nonexistent due to extremely oppressive regimes, civil war, extreme violence or warlord rule.

The equation below converts the Freedom House rating to a scaled perception of representation value.

$$ScaledPerception = 4 - PoliticalRights \quad 19$$

Figure 6-48 shows the distribution of this variable for 190 countries.

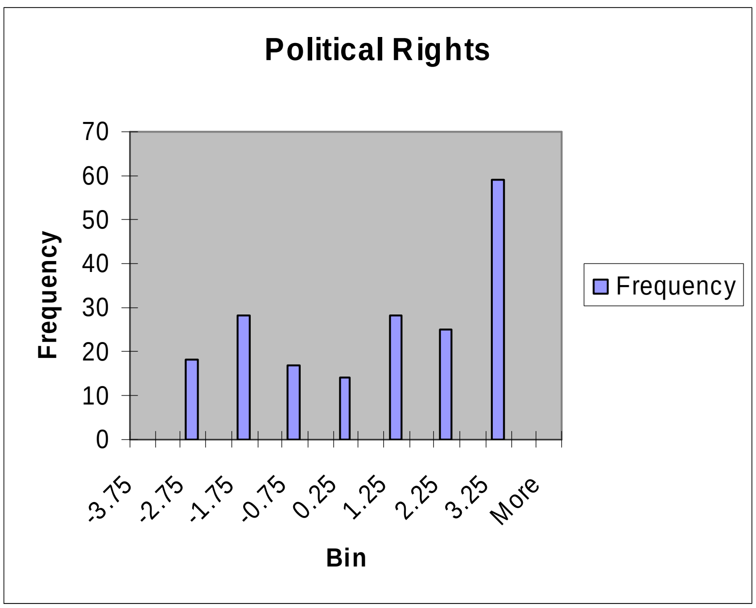


Figure 6-48. Political rights converted to scaled perception of representation

6.1.3.9 People's spiritual needs are met

Figure 6-49 shows the anchors for the input variable (node number 44) "people's spiritual needs are met."

Several factors in the External Model are listed as reversible and variable factors. Changes in this input variable may affect one of these factors. The standard presumption is that an improvement in meeting people's spiritual needs implies an increase in people's tolerance of the status quo; however, this need not always be the case. For example, in some circumstances, as people's spiritual needs are increasingly met, they may increasingly realize that the status quo is unsatisfactory.

-3	-2	-1	0	1	2	3
almost all are prevented from meeting spiritual needs	a large minority are prevented from meeting spiritual needs	a large minority are hindered from meeting spiritual needs	some are hindered from meeting spiritual needs	only a few are hindered from meeting spiritual needs	except for those endangering others, all can have spiritual needs met	except for those endangering others, all find it easy to have spiritual needs met

Figure 6-49. People's spiritual needs are met

The U.S. State Department produces a report on international religious freedom each year (http://www.state.gov/g/drl/irf/); however, this report is in a text format. The Association of Religion Data Archives (ARDA) (www.thearda.com) contains data that are coded from these and other reports. These data can be downloaded and used to create preprocessor variables for "people's spiritual needs are met."

The suggested data for use here are three indices supplied in the ARDA data and described in Grim, Brian J. and Roger Finke (2006), "International Religion Indexes: Government Regulation, Government Favoritism, and Social Regulation of Religion," Interdisciplinary Journal of Research on Religion 2 (Article 1), (http://www.religjournal.com). This article describes how the indices are computed from the State Department report and describes the statistical validation of their compositions. The three indices are as follows:

- GRI, Government regulation of religion index: this refers to actions of the state that deny religious freedom. Government regulation includes laws, policies and administrative actions that impinge on the practice, profession or selection of religion, notwithstanding any codified prohibition of the same.
- GFI, Government favoritism of religion index: this refers to actions of the state that provide one religion or a small group of religions special privileges, support or favorable permissions.
- SRI, Social regulation of religion index: this refers to actions and restrictions by other religious groups or associations or the culture as a whole that affect the practice, profession or selection of religion.

Using Factor Analysis, Grim and Finke show that GRI and GFI are separate, nearly orthogonal components and that GRI and SRI are separate, but related components. The relationship seems natural because government practices, even those of autocratic governments, must align to some degree with the general cultural practices of the population.

The following equations convert the indices to scaled variables.

$$ScaledGRI = -6 * GRI / 10 + 3 \tag{20}$$

$$ScaledGFI = -6 * GFI / 10 + 3 \tag{21}$$

$$ScaledSRI = -6 * SRI / 10 + 3 \tag{22}$$

The following figures show the distributions of these statistics for 240 countries.

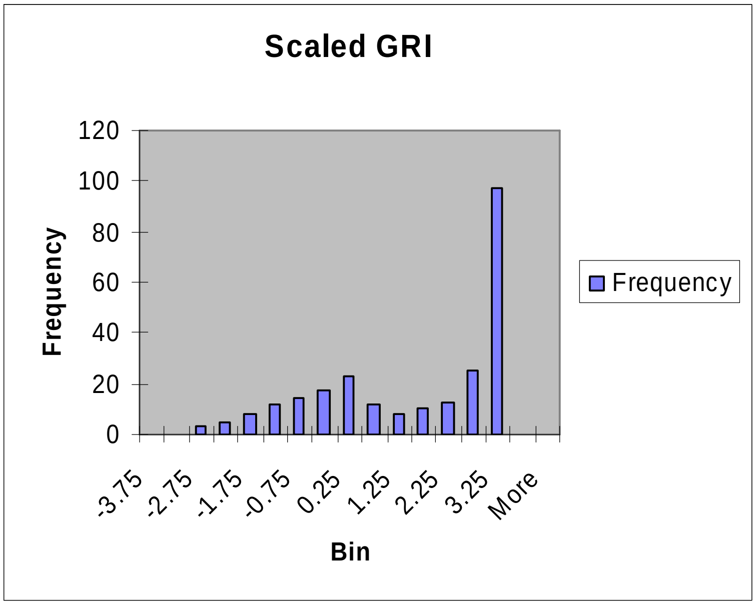


Figure 6-50. Scaled GRI

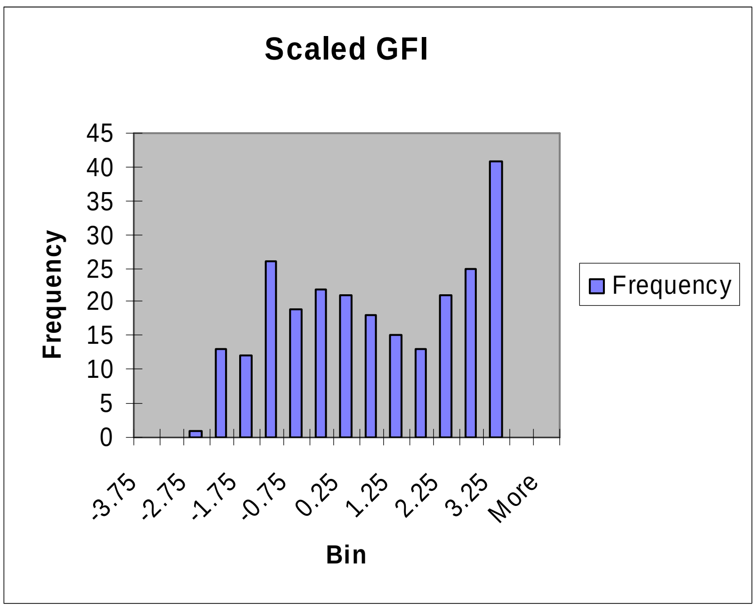


Figure 6-51. Scaled GFI

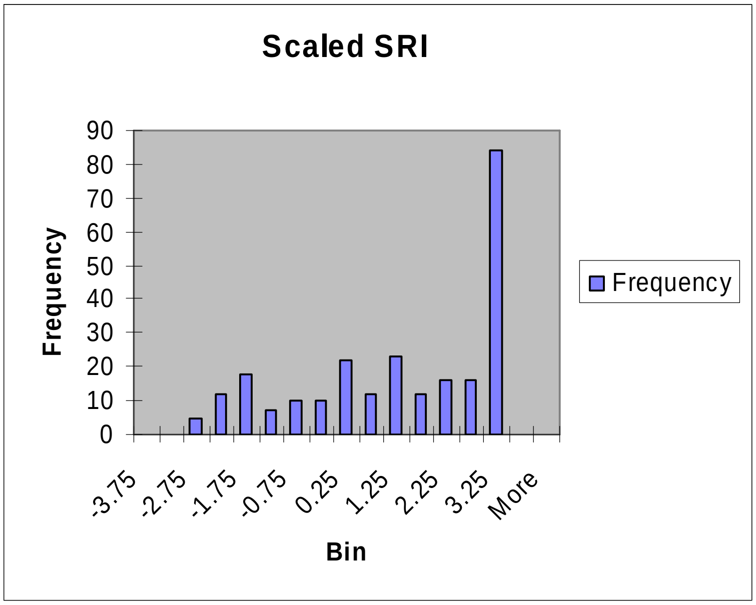


Figure 6-52. Scaled SRI

The final variable is identical in meaning to the basic variable, but should be called "expert opinion …." This variable takes into account all of the relevant factors, but is produced entirely as an expert's opinion. The concept is that numerical data are useful, but are often inadequate, often irregularly available or untimely, and sometimes biased. Further, a decomposition of the basic variable may not capture all aspects of the problem. The expert opinion can balance inadequacies and bias effects and can smooth out irregular availability and approximate the most current situation.

These variables are most easily combined in the Preprocessor as a weighted average, with the weights defined by the user. The best advice is to always set the weight of the expert opinion variable to 1.0 and vary the weights of the other variables as appropriate. If there is some reason to vary the weights over time or if you wish to combine the variables with a non-linear equation, you will have to build the formulas to do so in the UserWorksheet of the Preprocessor, passing the final result to the basic variable.

Figure 6-53 shows the result of combining GRI, GFI, and SRI (without an expert opinion variable) with the weights 3, 1, and 2, respectively.

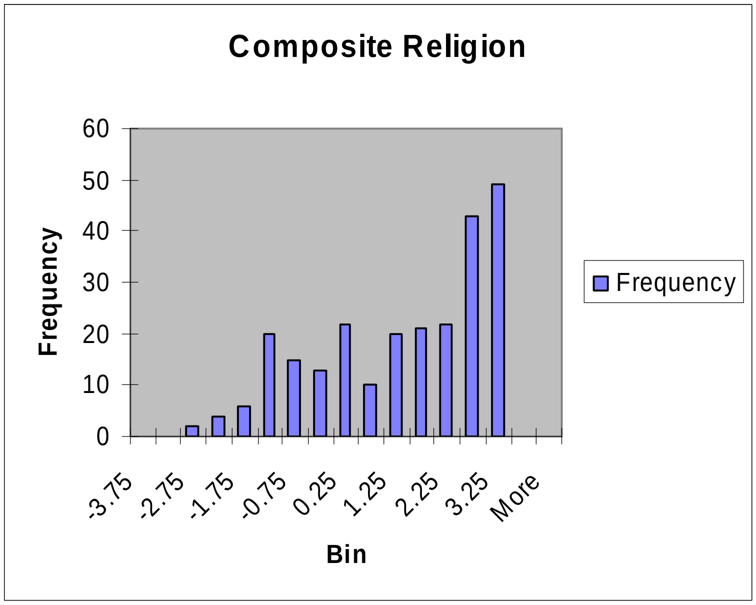


Figure 6-53. Composite religion variable

6.1.4 Movement Sector Model

The movement sector contains five inputs that relate to various kinds of undesirable population movement and the property ownership issues input, which is often involved as a cause or result in such population movement.

6.1.4.1 Property ownership issues are resolved

Figure 6-54 shows the anchors for the input variable (node number 50) "property ownership issues are resolved." No source for creating a distribution of this statistics for numerous countries has been discovered. Therefore these anchors will have to suffice.

Several factors in the External Model are listed as reversible and variable factors. Changes in this input variable may affect one of these factors. The standard presumption is that an improvement in the property ownership variable implies an increase in expatriates returning to the country; however, this need not always be the case. For example, if property disputes are resolved by revoking the property rights of all expatriates, the implication might be zero or reversed.

-3	-2	-1	0	1	2	3
a large percentage (>10%) of the property is claimed by more than one person & reclaiming it would involve violence	a large percentage of the property is claimed by more than one person & reclaiming it might involve violence	a large percentage of the property is claimed by more than one person & reclaiming it might involve scattered violence	a large percentage of the property is claimed by more than one person	a moderate percentage (3-10%) of the property is claimed by more than one person	a small percentage (<3%) of the property is claimed by more than one person	virtually no property is claimed by more than one person

Figure 6-54. Property ownership issues are resolved

6.1.4.2 Stress migration is not present

Figure 6-55 shows the anchors for the input variable (node number 54) “stress migration is not present.” Stress migration is indicated by the existence of expatriates, refugees, and internally displaced persons. Analysis of data on expatriate numbers, refugees, and displaced persons (from the CIA World Factbook) permits more exact calculations, based on the total number of expatriates, refugees, and displaced persons and the population of the country (with expatriates added back in). (The World Factbook directly lists refugees and displaced persons in each country. To find expatriates for a given country, all countries have to be searched to find refugees hosted there from the desired country.)

Several factors in the External Model are listed as reversible and variable factors. Changes in this input variable may affect one of these factors. The standard presumption is that an improvement in the stress migration variable implies an increase in “changes in population composition improve outlook”; however, this need not always be the case. For example, if the number of migrants or displaced decreases because they die or are killed, the implication would be reversed.

-3	-2	-1	0	1	2	3
migration >20% of population	migration 10-20%	migration 5-10%	migration <2%	some pressure for migration	little pressure for migration	no pressure for migration

Figure 6-55. Stress migration is not present

The calculations cannot be performed on the separate scaled values for expatriates, refugees, and displaced persons (see below), but must be performed directly. The equations for converting the percentage of total movement (1% = 1, not 0.01) are given below. If ExpatPct < 0.01% then set ScaledExpat = 2.99.

$$TotalPct = 100 * (Expats + refugees + Displaced) / (Population + Expats) \qquad 23$$

$$ScaledTotal = 3 * (-\log 10(TotalPct) - 0.1837385) / 2.02 \qquad 24$$

The distribution for this statistic is given in Figure 6-56.

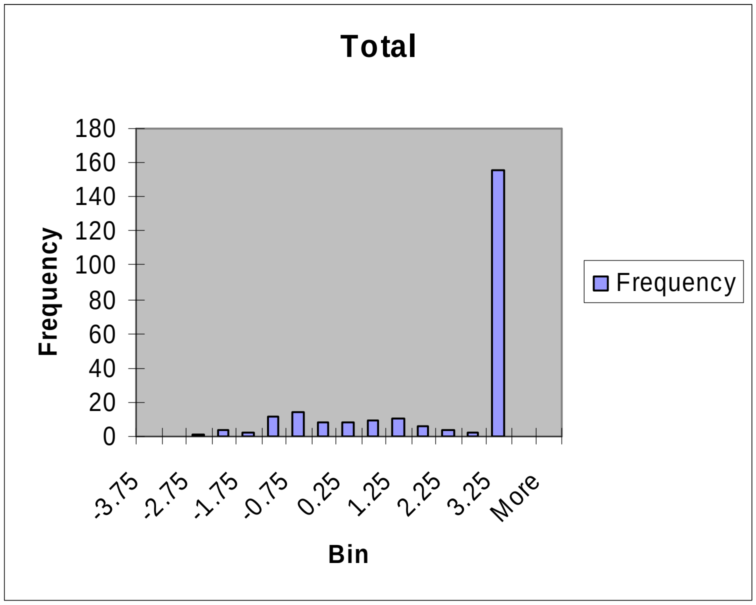


Figure 6-56. Scaled total stress migration

6.1.4.3 There are no expatriates

Figure 6-57 shows the anchors for the input variable (node number 62) "there are no expatriates." Analysis of data on expatriate numbers (from the CIA World Factbook) permits more exact calculations, based on the number of expatriates and the population of the country with expatriates added back in. (The World Factbook directly lists refugees in each country. To find expatriates for a given country, all countries have to be searched to find refugees hosted there from the desired country.)

Several factors in the External Model are listed as reversible and variable factors. Changes in this input variable may affect several of these factors. The standard presumption is that an improvement in the expatriates variable implies an increase in "changes in population composition improve outlook"; however, this need not always be the case. For example, if the number of expatriates decreases because they come back to participate in a rebellion, the implication would be reversed. Similarly, the standard presumption is that returning expatriates implies an improvement in the commercial sector's contribution to the natural welfare, an improvement in government legitimacy, a reduction in paramilitary forces, a reduction in forced population movement, and improvement in the perception of a safe and secure environment. Depending on the situation, one or more of these implications may be reversed.

-3	-2	-1	0	1	2	3
there are many important (wealth, intellectual, etc.) forced expatriates or a very large group who are guest workers elsewhere because of lack of opportunity at home		there are important (wealth, intellectual, etc.) forced expatriates or a large group who are guest workers elsewhere because of lack of opportunity at home		most expatriates are voluntary		expatriates are purely voluntary

Figure 6-57. There are no expatriates

The equations for converting the percentage of expatriates (1% = 1, not 0.01) are given below. If ExpatPct < 0.01% then set ScaledExpat = 2.99.

$$ExpatPct = 100 * Expats / (Population + Expats) \tag{25}$$

$$ScaledExpat = 3 * (-\log 10(ExpatPct) - 0.3547) / 1.85 \tag{26}$$

The distribution for this statistic is given in Figure 6-58.

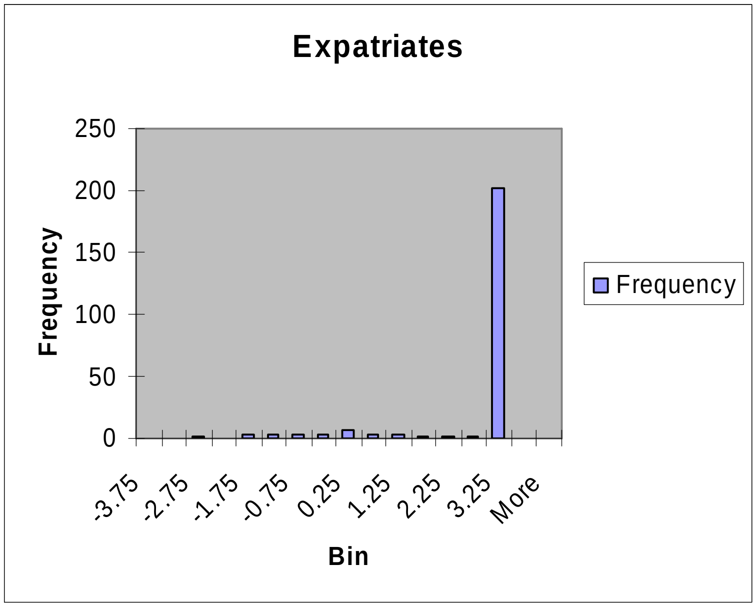


Figure 6-58. Scaled expatriates

6.1.4.4 There are no migrants

Figure 6-59 shows the anchors for the input variable (node number 64) "there are no migrants." Analysis of data on expatriate numbers (from the CIA World Factbook) permits more exact calculations, based on the number of refugees and the population of the country (with any expatriates added back in). (The World Factbook directly lists refugees [migrants] in each country. To find expatriates for a given country, all countries have to be searched to find refugees hosted there from the desired country.)

Several factors in the External Model are listed as reversible and variable factors. Changes in this input variable may affect one of these factors. The standard presumption is that an improvement in the migrants variable implies an increase in "changes in population composition improve outlook"; however, this need not always be the case. For example, if the number of migrants decreases because they die or are killed, the implication would be reversed.

-3	-2	-1	0	1	2	3
migrants are a major problem		migrants are a moderate problem		migrants are a minor problem		no appreciable migrants from outside or population who have migrated out

Figure 6-59. There are no migrants

The equations for converting the percentage of refugees (1% = 1, not 0.01) are given below. If refugeePct < 0.01% then set Scaledrefugees = 2.99.

$$refugeePct = 100 * refugees / (Population + Expats) \qquad 27$$

$$Scaledrefugees = 3 * (-\log 10(refugeePct) - 0.3547) / 1.85 \qquad 28$$

The distribution for this statistic is given in Figure 6-60.

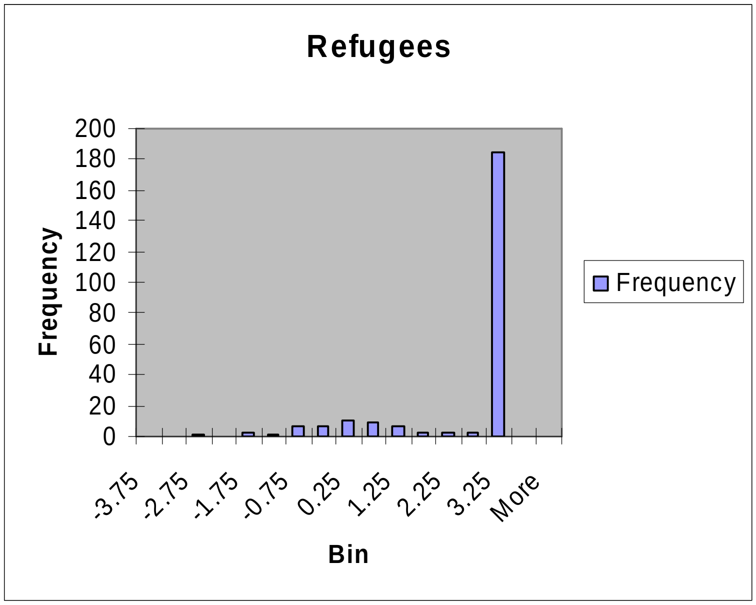


Figure 6-60. Scaled refugees

6.1.4.5 There is no displaced population

Figure 6-61 shows the anchors for the input variable (node number 63) "there is no displaced population." Analysis of data on displaced persons numbers (from the CIA World Factbook) permits more exact calculations, based on the number of displaced persons and the population of the country (with any expatriates added back in). (The World Factbook directly lists refugees and displaced persons in each country. To find expatriates for a given country, all countries have to be searched to find refugees hosted there from the desired country.)

Several factors in the External Model are listed as reversible and variable factors. Changes in this input variable may affect one of these factors. The standard presumption is that an improvement in the displaced population variable implies an increase in "changes in population composition improve outlook"; however, this need not always be the case. For example, if the number of displaced persons decreases because they die or are killed, the implication would be reversed.

-3	-2	-1	0	1	2	3
displaced population is a major problem		displaced population is a moderate problem		displaced population is a minor problem		no appreciable displaced population

Figure 6-61. There is no displaced population

The equations for converting the percentage of displaced persons (1% = 1, not 0.01) are given below. If DisplacedPct < 0.01% then set ScaledDisplaced = 2.99.

$$DisplacedPct = 100 * Displaced / (Population + Expats) \qquad 29$$

$$ScaledDisplaced = 3 * (-\log 10(DisplacedPct) - 0.3547) / 1.85 \qquad 30$$

The distribution for this statistic is given in Figure 6-62.

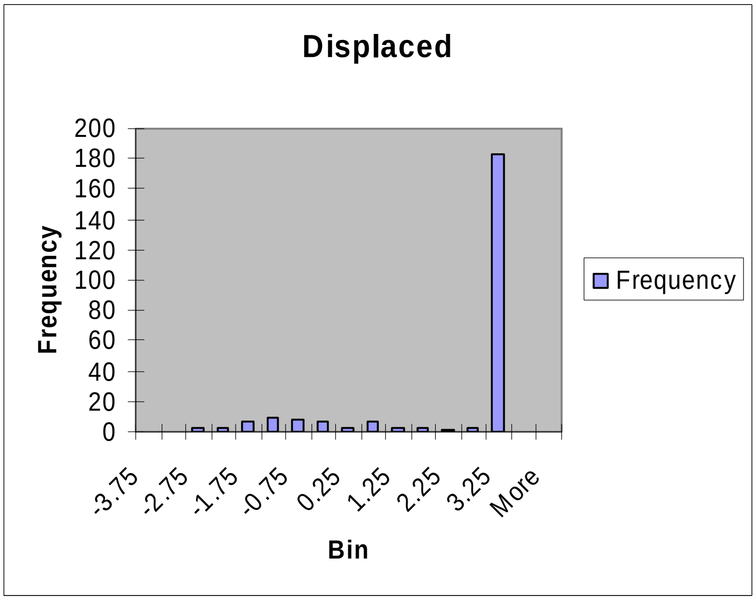


Figure 6-62. Scaled displaced persons

6.1.5 Economy Sector Model

The economy sector has two inputs (and five possible future inputs) that relate to the status of the economy.

6.1.5.1 Financial system is solid

Figure 6-63 shows the anchor points for the input variable (node number 71) "financial system is solid." This variable includes components for strength of the currency, strength of the banking system, and the inverse of the strength of the underground economy.

-3	-2	-1	0	1	2	3
there is no recognized financial system, barter is the rule			financial system is defined, curency recognized, banks exist, but underground economy may also be strong			currency has world value, banks are strong, etc.

Figure 6-63. Financial system is solid

For a non-economist, valuing this variable does not appear to be simple. The NationMaster.com website contains statistics on a large number of topics. One statistic is labeled Macroeconomic Environment Index (MEI), sourced from the World Economic Forum Global Competitiveness Report (http://www.weforum.org). From its title, this statistic might serve as a good data source; however, its definition is not clear. The equation below shows how the MEI is scaled to fit between -3.0 and +3.0. Figure 6-64 shows the distribution for the scaled MEI for 100 countries.

$$ScaledMEI = 3*(MEI - 4)/2 \tag{31}$$

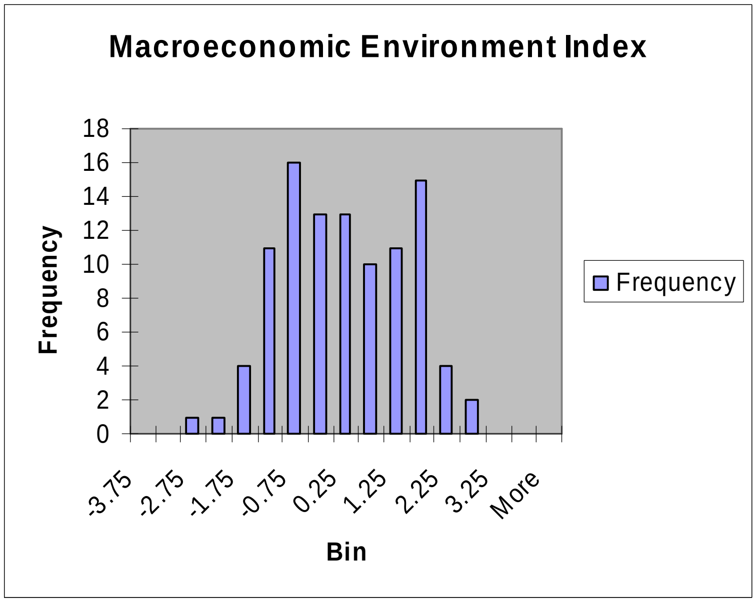


Figure 6-64. Macroeconomic environment index

NationMaster.com also includes a statistic for the percent of the total economy that the informal economy represents. This statistic may be a good indicator for the size of the underground economy. The equation below shows how the percentage value (1% = 1, not 0.01) is converted to a scaled value.

$$ScaledInformal = -6*(\log_{10}(Informal\%) - 0.477)/(2 - 0.477) + 3 \tag{32}$$

Figure 6-65 shows the distribution of this statistic for 100 countries.

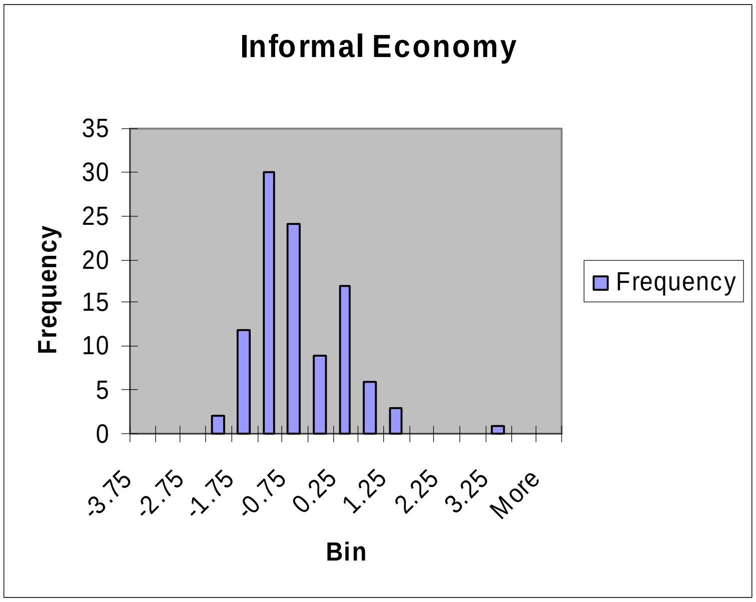


Figure 6-65. Informal economy

The user may have to perform additional research to obtain useful additional data sources for additional preprocessor variables for the "financial system is solid" variable.

The final variable is identical in meaning to the basic variable, but should be called "expert opinion …." This variable takes into account all of the relevant factors, but is produced entirely as an expert's opinion. The concept is that numerical data are useful, but are often inadequate, often irregularly available or untimely, and sometimes biased. Further, a decomposition of the basic variable may not capture all aspects of the problem. The expert opinion can balance inadequacies and bias effects and can smooth out irregular availability and approximate the most current situation.

These variables are most easily combined in the Preprocessor as a weighted average, with the weights defined by the user. The best advice is to always set the weight of the expert opinion variable to 1.0 and vary the weights of the other variables as appropriate. If there is some reason to vary the weights over time or if you wish to combine the variables with a non-linear equation, you will have to build the formulas to do so in the UserWorksheet of the Preprocessor, passing the final result to the basic variable.

6.1.5.2 Foreign investment is available

Figure 6-66 shows the anchor values for the input variable (node number 124) "foreign investment is available."

-3	-2	-1	0	1	2	3
no govt or private foreign investment is available	private investment is highly speculative, govt investment is minimal	private investment is minimal, govt investment is small	private investment is only average for size area, govt investment comes with strings	private investment is slightly above average, govt investment has only some strings	private investment is strong, govt investment involves hope of returns (e.g.,investment in local govt bonds, etc.)	there is vigorous public and private investment, vigorous being measured as appropriate to area's size

Figure 6-66. Foreign investment is available

If you have access to the total foreign investment being made, you may use the Preprocessor to convert it to the scaled input as follows. First, convert the investment to an annualized figure in U.S. dollars deflated to the year 2000. Second, convert to a per capita figure by dividing by the population. Use the equation below to scale the result.

$$ScaledFI = 2 * \log_{10}(FIpercapita) - 3.9 \qquad 33$$

The distribution for this statistic for 130 countries is shown in Figure 6-67.

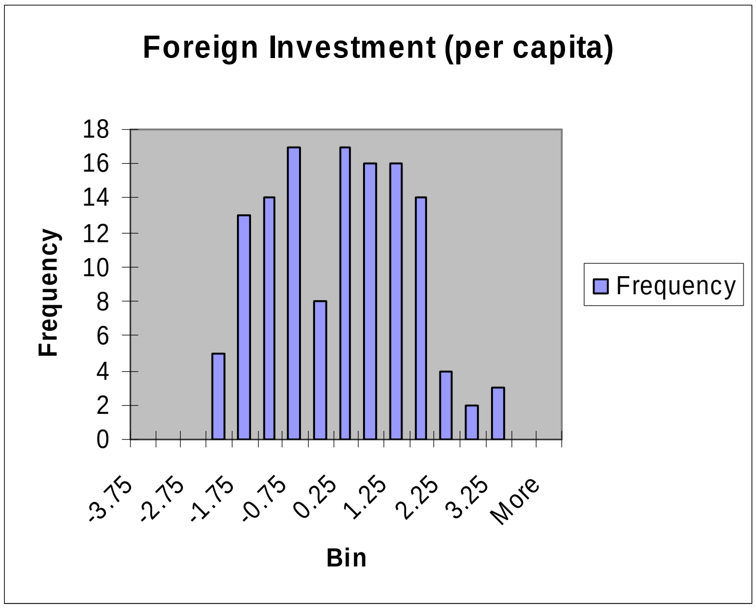


Figure 6-67. Foreign investment (per capita)

If you don't have access to the direct foreign investment data, you may use exports per capita as a proxy. Convert the exports per capita to U.S. dollars (2003) and use the equation below to obtain a scaled value.

$$ScaledExport = (\log_{10}(\max(Exportspercapita, 0.5)) - 2.888) / 0.3732 \qquad 34$$

Figure 6-68 shows the distribution for this statistic for 200 countries.

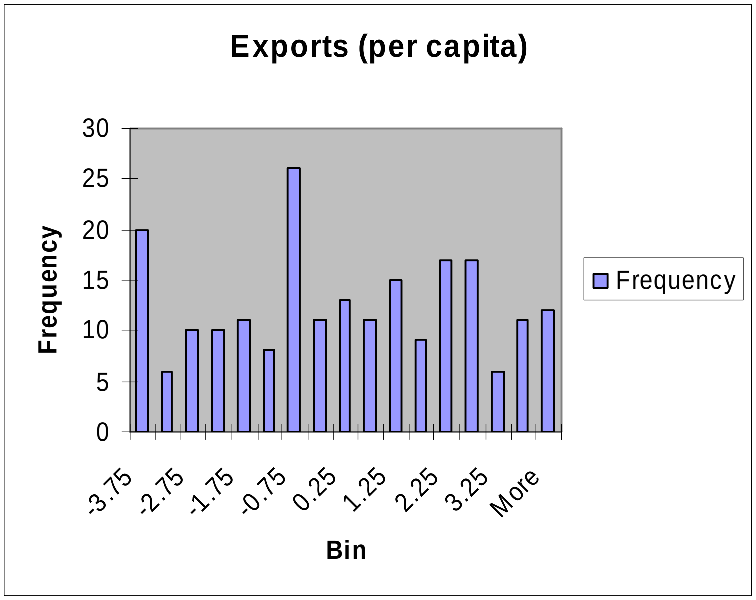


Figure 6-68. Exports (per capita)

The user may have to perform additional research to obtain useful additional data sources for additional preprocessor variables for the "foreign investment is available" variable.

The final variable is identical in meaning to the basic variable, but should be called "expert opinion …." This variable takes into account all of the relevant factors, but is produced entirely as an expert's opinion. The concept is that numerical data are useful, but are often inadequate, often irregularly available or untimely, and sometimes biased. Further, a decomposition of the basic variable may not capture all aspects of the problem. The expert opinion can balance inadequacies and bias effects and can smooth out irregular availability and approximate the most current situation.

These variables are most easily combined in the Preprocessor as a weighted average, with the weights defined by the user. The best advice is to always set the weight of the expert opinion variable to 1.0 and vary the weights of the other variables as appropriate. If there is some reason to vary the weights over time or if you wish to combine the variables with a non-linear equation, you will have to build the formulas to do so in the UserWorksheet of the Preprocessor, passing the final result to the basic variable.

6.1.5.3 Employment level is adequate (possible future input variable)

The ISSM currently has an intermediate variable, "acceptable jobs are available," which is calculated from other variables. This variable could be influenced by a new input variable "employment level is adequate." To value this variable, use the percentage unemployment (1% = 1, not 0.01) in the following equation. Values above +3.0 and below -3.0 are then capped at those levels to create the input values for the variable.

$$ScaledEmployment = -3.5 * \log_{10}(Unemployment\%) + 3 \qquad 35$$

The distribution for 200 countries of this statistic is shown in Figure 6-69.

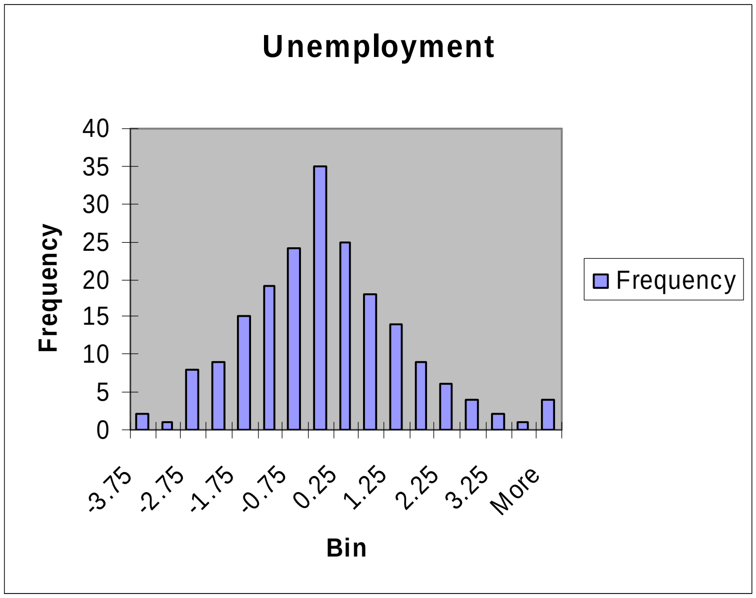


Figure 6-69. Unemployment

6.1.5.4 Telecom sector is strong (possible future input variable)

The ISSM currently has an intermediate variable, "telecom infrastructure is in place," which is calculated from other variables. This variable could be influenced by a new input variable "telecom sector is strong." To value this variable, use the equations below to calculate the number of lines in the country, lines per capita, and the scaled value. Values above +3.0 and below -3.0 are then capped at those levels to create the input values for the variable.

$$Lines = (MainPhoneLines + CellPhones + InternetHosts + InternetUsers) \tag{36}$$

$$Linespercapita = Lines / Population \tag{37}$$

$$ScaledTelecom = 6 * \log_{10}(Linespercapita) / 2.27 + 2 \tag{38}$$

Figure 6-70 shows the distribution of this statistic for 230 countries.

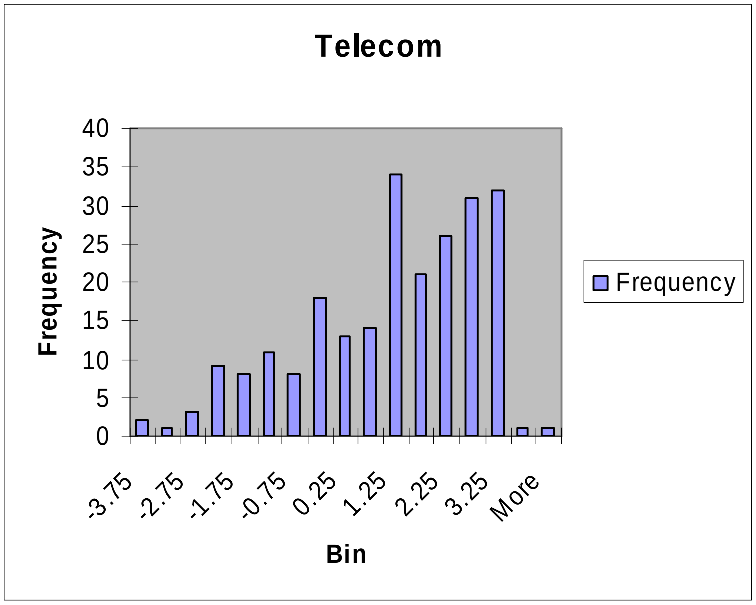


Figure 6-70. Telecom sector strength

6.1.5.5 Transport sector is strong (possible future input variable)

The ISSM currently has an intermediate variable, "transportation infrastructure is in place," which is calculated from other variables. This variable could be influenced by a new input variable "transport sector is strong." To value this variable, use the equations below to calculate the kilometers of transport network in the country, transport with weighted number of airports and merchant marine ships, transport per capita, and the scaled value. Values above +3.0 and below -3.0 are then capped at those levels to create the input values for the variable.

$$kmTransport = kmRoads + kmRails + kmWaterways \tag{39}$$

$$TransportQuant = kmTransport + 100 * Airports + 10 * MerchantMarine \tag{40}$$

$$Transportpercapita = TransportQuant / Population \tag{41}$$

$$ScaledTransport = 3.5 * \log_{10}(Transportpercapita) + 8 \tag{42}$$

Figure 6-71 shows the distribution of this statistic for 230 countries.

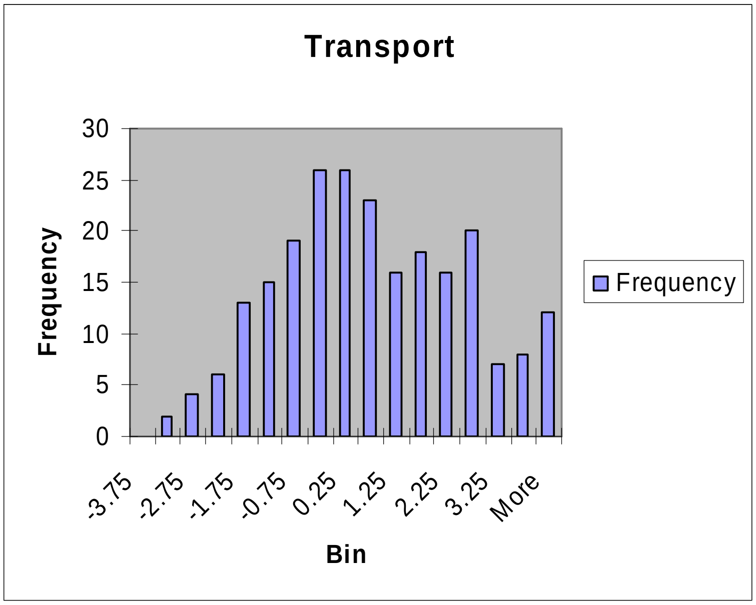


Figure 6-71. Transport sector strength

6.1.5.6 Energy sector is strong (possible future input variable)

The ISSM currently has an intermediate variable, "energy supply and distribution are sufficient," which is calculated from other variables. This variable could be influenced by a new input variable "energy sector is strong." To value this variable, several preprocessor variables would be useful.

Electricity production is an obvious input to "energy sector is strong." To calculate electricity production, use the equations below to calculate the kilowatt hours produced per capita and the scaled value. Values above +3.0 and below -3.0 are then capped at those levels to create the input values for the variable.

$$Eprodpercapita = kWhproduced / Population \tag{43}$$

$$ScaledEprod = 3 * (\log_{10}(Eprodpercapita) - 2.7) / 1.8 \tag{44}$$

Figure 6-72 shows the distribution for this statistic over 215 countries.

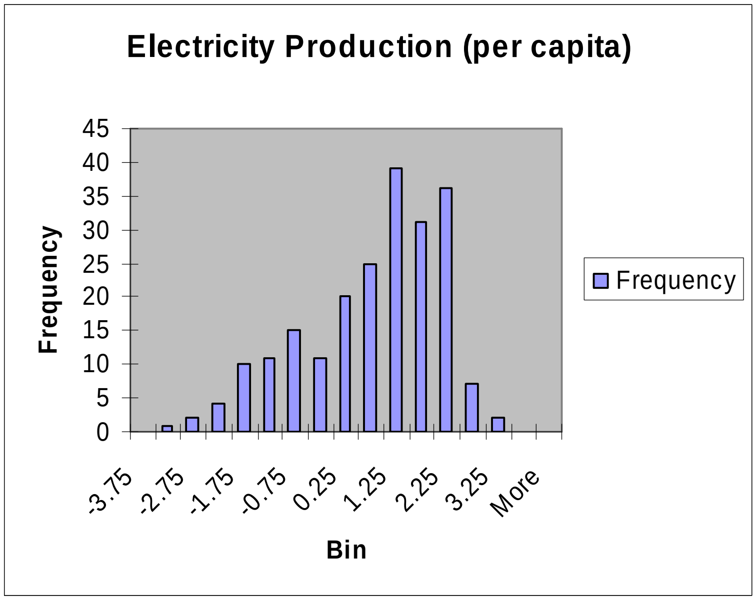


Figure 6-72. Electricity production (per capita)

Electricity consumption is another obvious input to "energy sector is strong." To calculate electricity consumption, use the equations below to calculate the kilowatt hours consumed per capita and the scaled value. Values above +3.0 and below -3.0 are then capped at those levels to create the input values for the variable.

$$Econspercapita = kWhconsumed / Population \quad (45)$$

$$ScaledEcons = 3*(\log_{10}(Econspercapita) - 2.7)/1.8 \quad (46)$$

Figure 6-73 shows the distribution for this statistic over 215 countries.

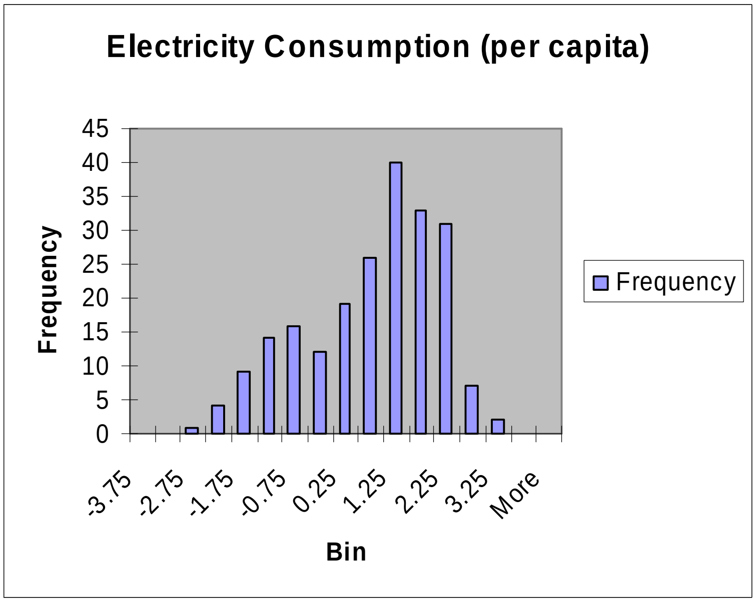


Figure 6-73. Electricity consumption (per capita)

Oil and natural gas production are also obvious inputs to "energy sector is strong." However, not all countries produce oil or natural gas and should not be penalized for that lack. Further, the quantity that should be produced varies with the availability in the country and will change over time. To calculate oil production, use the equation below to calculate the kilowatt hours produced per capita and the scaled value. Similar equations should be used for natural gas production.

$$FractionalOilprod = Oilproduced / ExpectedLevel \quad (47)$$

$$ScaledOilprod = 6 * FractionalOilprod - 3 \quad (48)$$

Oil consumption is another obvious input to "energy sector is strong." To calculate oil consumption, use the equations below to calculate the barrels per day consumed per capita and the scaled value. Values above +3.0 and below -3.0 are then capped at those levels to create the input values for the variable.

$$Oconspercapita = bbldayconsumed / Population \quad (49)$$

$$ScaledEcons = 3 * (\log_{10}(Oconspercapita) + 2) / 2 \quad (50)$$

Figure 6-74 shows the distribution for this statistic for 210 countries.

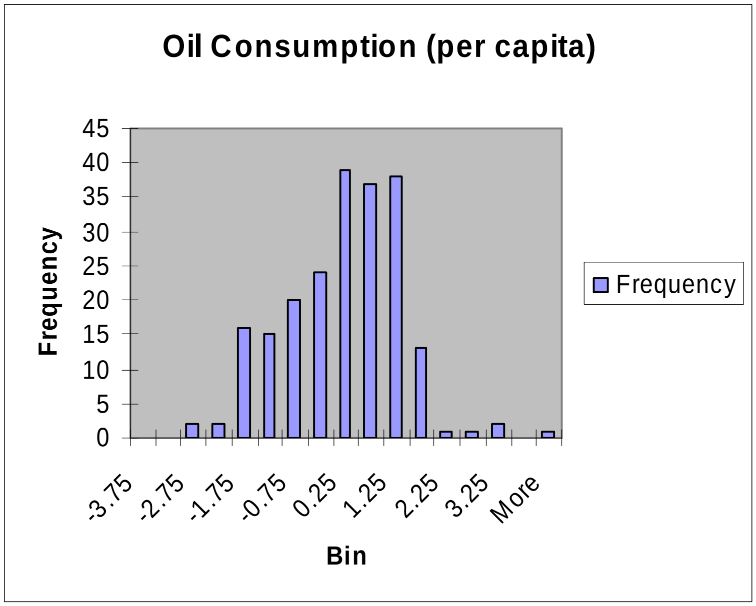


Figure 6-74. Oil consumption (per capita)

The final variable is identical in meaning to the basic variable, but should be called "expert opinion …." This variable takes into account all of the relevant factors, but is produced entirely as an expert's opinion. The concept is that numerical data are useful, but are often inadequate, often irregularly available or untimely, and sometimes biased. Further, a decomposition of the basic variable may not capture all aspects of the problem. The expert opinion can balance inadequacies and bias effects and can smooth out irregular availability and approximate the most current situation.

These variables are most easily combined in the Preprocessor as a weighted average, with the weights defined by the user. The best advice is to always set the weight of the expert opinion variable to 1.0 and vary the weights of the other variables as appropriate. If there is some reason to vary the weights over time or if you wish to combine the variables with a non-linear equation, you will have to build the formulas to do so in the UserWorksheet of the Preprocessor, passing the final result to the basic variable.

6.1.5.7 Agriculture sector is strong (possible future input variable)

The ISSM currently has an intermediate variable, "agricultural system is productive," which is calculated from other variables. This variable could be influenced by a new input variable "agriculture sector is strong." To value this variable, several preprocessor variables would be useful.

Crop production is an obvious input to "agricultural system is productive." To calculate crop production, use the equation below to the scaled value for hectares of permanent crops per 1000 people. Values above +3.0 and below -3.0 are then capped at those levels to create the input values for the variable.

$$ScaledCrops = 2 * (\log_{10}(hectaresperKpeople) - 1.1) \qquad 51$$

Figure 6-75 shows the distribution of this statistic over 175 countries.

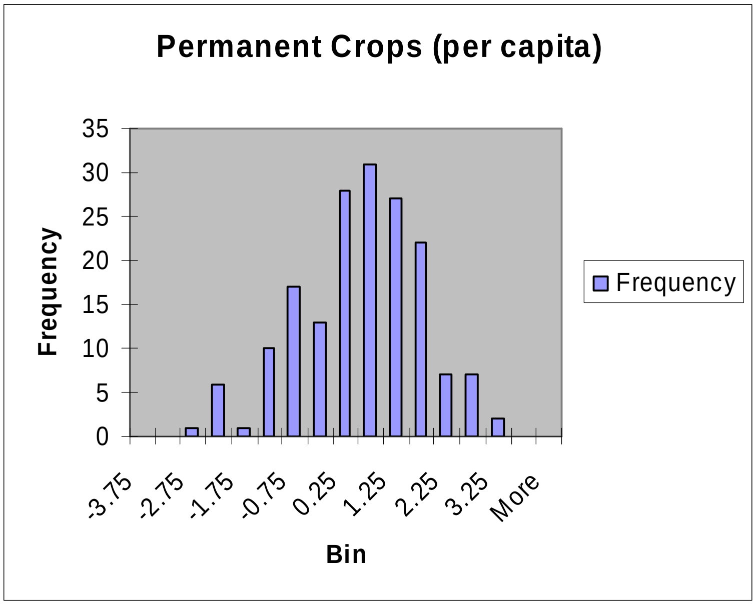


Figure 6-75. Permanent crops (per capita)

Meat production is another obvious input to "agricultural system is productive." To calculate meat production, use the equation below to the scaled value for annual metric tons of meat per person. Values above +3.0 and below -3.0 are then capped at those levels to create the input values for the variable. Figure 6-76 shows the distribution for 150 countries.

$$ScaledMeat = 2*(\log 10(MetTonspercapita)+1.9) \quad 52$$

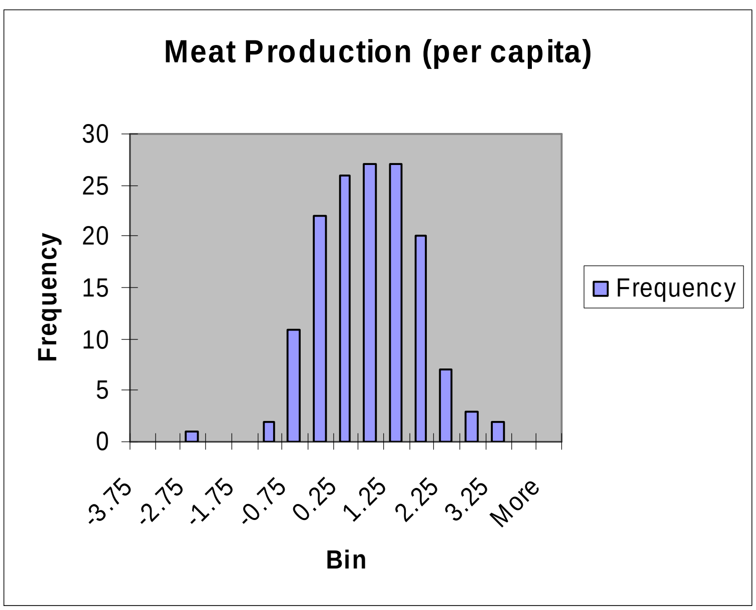


Figure 6-76. Meat production (per capita)

A simple average can be used to combine these two statistics. Figure 6-77 shows the resulting distribution.

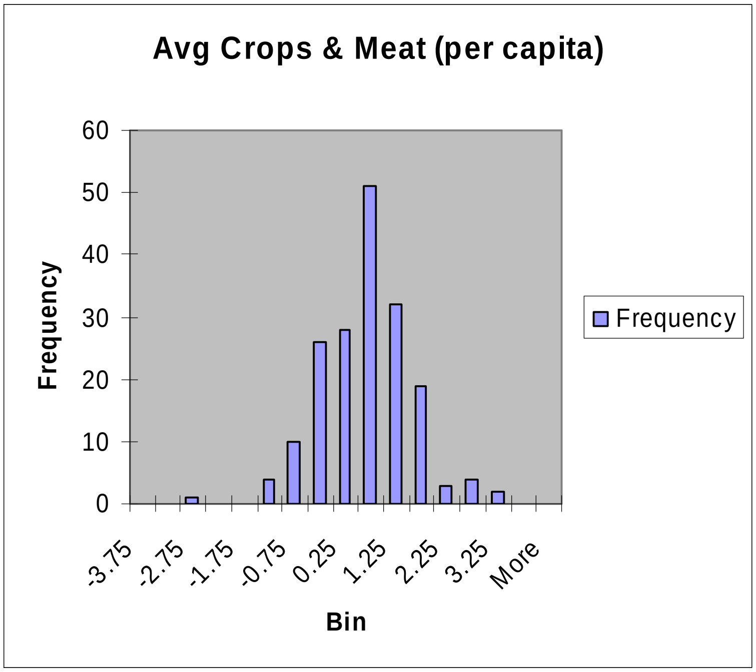


Figure 6-77. Average crops and meat production (per capita)

Once the base value has been set a simple equation based on percentage of past number (101%=101, not 1.01) yields the scaled change that should be applied.

$$ScaledChangeAg = \log_{10}(pctchange) - 2 \quad 53$$

Thus, if agricultural production increases by 4% from one reporting period (in the ISSM) to the next, then the new scaled value is the old scaled value plus $\log_{10}(104)$-2 = 0.02.

6.2 EXTERNAL MODEL

The external model includes normal factors (factors that participate in weighted averages) and special factors. The conceptual models for the special factors make sense; however, the conceptual model for the normal factors is problematic and probably should be improved.

6.2.1 Conceptual Model for Normal Factors

The conceptual model for the normal factors is based on thinking of these external factors as observables (internal model factors) that haven't happened yet. Thus, they participate in the (appropriate) weighted averages just as the observables do, but with time delays applied to the application of their scaled values.

6.2.1.1 Time delay representation problems

The first problem is relatively straight-forward and relatively easily corrected by programming changes. The time delays are described in terms of days, which are converted to time periods, defined by an input variable (e.g., 7 day periods, 28 day periods, 30 day periods). These periods are used to determine the number of columns that the values should be offset from their entry column. This methodology presupposes a constant time period between each column. This restriction on the data entry should be removed by making the column entry equal to the last value previous or equal to the set time delay. This would allow variable time periods between columns (e.g., 3 months for background data, 1 month for lead up time, 1 week for general data, occasional gaps for missing data).

6.2.1.2 Initial data value problems

The second problem involves the proper choices for the entry values. It is more difficult to resolve; however, with due diligence, it can be resolved.

- If destruction of some capability is complete and the intervention is set to restore the capability completely, the choice of inputs is clear. For a two entry variables, the denominator part is the value of the total capability and the numerator part is the current amount that has been restored, plus the amount that is under active restoration. Thus, the inputs start with zero divided by the total value. The input at the date of the start of the first increment of restoration is the value of that increment divided by the total value. The input at the date of the start of the next increment of restoration, no matter how soon or late, is the value of the previous increment(s), plus the value of the new increment, divided by the total value. For fractional variables, the values follow the same philosophy: the initial value is zero, followed by a non-decreasing sequence of fractions that represent the fraction restored or under restoration.

- Contemplating the conversion of the either of these types of variable to a scaled variable or the case of a direct scaled variable (only appears in the Preprocessor) adds a minor complication. The zero value should certainly be converted to a -3.0; however, achievement of 100% of the total capability may not represent a scaled value of +3.0. That is, if the total capability represents the status quo before the crisis and the country was impoverished or only marginally stable before the crisis, that capability might only deserve a scaled value of +1.0, for example. The Preprocessor allows variable scaling factors that can produce this result for the given denominator or fractional representation. This functionality is not available in the ISSM Main. Therefore the total capability should be chosen to represent the ultimately desirable value for a country of the given, area, population, or other appropriate measure. The ISSM Main makes the assumption that the fractional value of 1.0 should be converted to a scaled value of +3.0 and does so. It is the responsibility of the user to make sure this is a valid assumption.

- When the destruction of a capability is not complete, the temptation is to work from the starting point of what exists. The reports of the agencies performing the work often make this the easiest assumption. For example, the agency will state that 20 kilometers of road need to be repaired and it is beginning the work. Unmentioned is the fact that another 500 kilometers were damaged and 1500 kilometers are sub-par for what should be expected for the country. Also unmentioned is that 1000 kilometers of road are in fine condition. It will take work to discover these facts. The reason they are important is that the ISSM will convert 0/20 to a -3.0, which is too low for a country that has 1000 kilometers of good road and should have 3000 kilometers. The starting point should be 1000/3000 = 0.333, which converts to -1.0. On the other hand, once the project is finished, 20/20 converts to +3.0, which is too high for a country that now has 1020 kilometers of good road and should have 3000. This end point should be 1020/3000 = 0.34, which converts to -0.96, an improvement, but not a major one. Using the proper total capability for the denominator also avoids the problem of serial projectitis. Typically, once the agency completes the project (or gets more money), it starts another one, announcing it is beginning to repair another 30 kilometers of road. If the user has not done the research, he now has the problem of choosing the correct inputs. Starting with 0/30 is clearly wrong, because that means that despite having just achieved a +3.0 from repairing the first section of road, the input will send a -3.0 signal through the system. Similarly a 20/30 sends a negative signal. Further, once the 30 kilometers are finished, a numerator larger than the denominator gets capped at the denominator's value, so 50/30 gets converted to 30/30, with a +3.0 signal again being sent. A more reasonable choice would be to change the original denominator to 50, meaning that the revised history will show a 20/50 = 0.4 value will obtain once the first segment is completed, converting to a -0.6 scaled value, with the +3.0 not coming until the second segment is completed. On its face, this process looks rational; however, each new segment means a revision of history, which must be explained, and the values are not really correct anyway.

- Beginning an intervention can produce unwanted effects.
    - Assume that the user has been using the ISSM purely in an observation mode for a particular country. Assume, for simplicity of discussion, that all of the inputs have been in the neighborhood of -1.0 and and the overall result has been a steady -1.0. At the point where a decision is made to intervene and correct various problems, the user starts entering values for external variables. The most dramatic example can be imagined with a project to repair 20 kilometers of road in four segments, for which the user enters the following sequence of values: 0/20, 5/20, 5/20, 5/20, 10/20, 10/20, 10/20, 15/20, 15/20, 15/20, 20/20, … . To the user's great surprise, on the date that the 0/20 value takes effect (depending on the lag times for the interventions affected by the project) the overall result jogs negatively! The user thinks it unfair that beginning an intervention makes things look worse than if no one had tried to help. The reason for the jog is the introduction of a -3.0 value (conversion of 0/20 = 0) when all the other input values are about -1.0. Most likely, this is an artificial negative result due to entering improper values. If the road situation actually was as described in the previous paragraph, the sequence should have been as follows: 1000/3000, 1005/3000, 1005/3000, 1005/3000, 1010/3000, 1010/3000, 1010/3000, 1015/3000, 1015/3000, 1015/3000, 1020/3000, … . With those entries, the beginning of the intervention would yield a scaled value of -1.0, producing no significant jog.
    - It is possible for a jog to occur when proper values are entered. Assume that the road situation entries (1000/3000, …) are correct but that the previous observation input variables had had values around 0.0 and the final result was holding constant at 0.0. The sudden onset of a variable having a -1.0 value will cause a negative jog in this situation. Here the problem is not incorrect entries, but the existence of an observable situation that signals a different value (-1.0) than all of the standard input variables (0.0). Such a situation may be rare, but the level of disparity between an intervention variable and an input variable is not what is unusual, rather the unanimity of the input variables in this example is the unusual feature. If the introduction of values to the external variables does not cause any noticeable jogs in the output variables, the user may choose to ignore this problem. However, if there are noticeable jogs or if the user wants to make sure that introducing external variable values hasn't flattened out jogs that should have been visible, he may extend backward in time the initial values (in this case 1000/3000) of the external variables. This revises the history (after recalculation), but ensures comparability of values over time.
    - The last sentence of the previous paragraph is almost true; however, there is an exception. As long as the first date in the external variables is sufficiently earlier than the first date of the internal variables, the statement is true. For example, a variable with a lag time of seven days will pass its first value to a date seven days subsequent to its entry date. If the

first date in the internal variables is at least seven days after the first date in the external variables, then all values from the external variable that are used will come from that first external date value or later. However, if the first date in the internal variables equals the first date in the external variables, the internal values for a date seven days subsequent to the first date will use the value from the external variable's first entry. Internal values from the first date will not use any value from the external variable, causing a possible jog. Ideally then, the first date for the external variables should precede the first date for the internal variables by the amount of the largest delay time of any intervention variable. Unfortunately, some of the delay times are on the order of one year. Problem one (above) makes it impractical for a user to create such a difference in first dates. A reasonable compromise is to start the external variables a few months prior to the start of the internal variables, catching most of the delay times.

- The conversion from the two entry and fractional variables to scaled variables is linear. If this is not appropriate in some case, the user must take advantage of either the DiamondWorksheet or the UserWorksheet to pass values that can be converted linearly.

6.2.1.3 Negative effects subsequent to initial entry

The third problem involves accounting for setbacks in schedules and destructive acts that reduce capabilities. This is a hard problem because it involves time differently from that envisioned in the intervention delays.

- Destructive acts can be pinned to a certain date, just as the initiation of a project can be pinned to a certain date. However, the effects of destructive acts are immediate; whereas the effects of external intervention projects may be delayed. Consider the road example above. The planned sequence is as follows: 1000/3000, 1005/3000, 1005/3000, 1005/3000, 1010/3000, 1010/3000, 1010/3000, 1015/3000, 1015/3000, 1015/3000, 1020/3000, … .
  - This sequence is converted to fractions and shown in the "Plan" row of Table 6-2. Assume that each road segment will be finished in four weeks (unrealistically fast, but convenient for the example). The "PlnFin" row shows the values that will be passed to the Intervention Transportation variable to account for this delay. Now assume that ten kilometers of road (not involved in the construction) are destroyed in Week 6. This should affect the Intervention Transportation variable beginning in Week 6 and all subsequent weeks. The question is how the user is to adjust his entries to make this happen properly. First, it should be clear that this destruction does not affect the denominator variable, but the numerator variable, which shows the total available capacity. It also does not affect the growth of the numerator variable. The question is when the change should be implemented. Because the Intervention Transportation variable is not available for direct user modification, the user must modify the numerator variable, starting four weeks before the actual destruction (Week 2). This is shown in the "NewPln" row. The plan is set back by 10/3000 = 0.0033 (rounds to .003 or .004, depending on the week) each week and the finished amount ("NewFin" row) is also reduced by the same amount.
  - This process creates a satisfactory (if manually difficult) solution for the Intervention Transportation variable that is derived from the road construction. Unfortunately, two other intervention variables also derive values from road construction, Intervention Jobs and Intervention Investment. These two variables usually have zero delay values, as jobs are created immediately upon the start of the project, not at its completion. Intervention Investment also starts immediately, as materials have to be purchased and the workers

paid. (An argument could be made that this variable should have a one or two week delay to account for delay in actual payments. The user may make this choice.) The "PlnJob" row shows the values that will be passed to the Intervention Jobs variable before the road destruction and the "NwJob" row shows the values that will be passed after the destruction has been taken into account. Notice that the change caused by the destruction begins in Week 2, four weeks before the destruction takes place! Further, there is no reason for there to be a change in the jobs variable in the first place – the destruction took place on a road with no construction, so a reduction in jobs doesn't make sense. The logic for influencing the jobs variable appears flawed in any case. It would seem that once the road project is complete, the jobs should be reduced.

  - A similar examination of the Intervention Investment variable yields the same timing problem. However, it makes sense to reduce the investment because of destruction of capital assets and it makes sense not to reduce the investment once the road is complete as the capital assets inventory has been increased and the money invested is still in circulation.

- Project delays can be handled in one of three ways. If the user determines that he has underestimated the time to perform an entire category of projects, for example it takes eight weeks to complete five kilometers of road, not four weeks, he may simply change the appropriate delay factor (and recalculate). For a delay to a single project, it may be simplest just to move the start date forward so that it produces the revised expected finish date. This does shift any zero delay components, perhaps inappropriately. The third strategy is to break the project into segments (e.g., the four five kilometer road segments as opposed to a single 20 kilometer road segment). Shifting one or more of the segments has less impact than shifting the entire project and allows final completion on the revised schedule. This third strategy requires some care. A project that is all or nothing should not be divided, as it would be inappropriate to give credit for partial work that does not serve the desired purpose. For example, building a four lane bridge might be divided into three segments: a temporary pontoon crossing, the two northbound lanes (used temporarily as one lane each north and south bound), and the two southbound lanes. However, dividing the southbound lanes in two parts would be inappropriate, as no additional traffic could flow until the both "parts" are complete. The user must also be careful when subdividing projects that the delay makes sense for all parts and for any other projects of the same kind. For example, if eight weeks were a reasonable delay for building five kilometer segments of road, that does not mean it is a reasonable delay for projects sized at 100 kilometers.

Table 6-2. Road Construction Example

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11
Plan	.333	.335	.335	.335	.337	.337	.337	.338	.338	.338	.340
PlnFin	.333	.333	.333	.333	.333	.335	.335	.335	.337	.337	.337
NewPln	.333	.332	.332	.332	.333	.333	.333	.335	.335	.335	.337
NewFin	.333	.333	.333	.333	.333	.332	.332	.332	.333	.333	.333
PlnJob	.333	.335	.335	.335	.337	.337	.337	.338	.338	.338	.340
NwJob	.333	.332	.332	.332	.333	.333	.333	.335	.335	.335	.337

6.2.2 General Data Entry

As described in the Users' Guide, data for the external variables is entered in the ExternalInputs worksheet (or the UserWorksheet or DiamondWorksheet when preprocessing is needed). In the ExternalInputs sheet, most of the external variables require two nodes, one for the amount of effort in progress (numerator) and one for the total amount needed (denominator). A few of the variables use only one node, as the input is a fraction (or in a couple of cases a percentage). Where there are two nodes, the denominator's node number equals 0.1 added to the numerator's node number.

6.2.2.1 Two node variables

A value for the denominator should be entered either at the beginning of the operation or at such time that the situation devolves into one that newly requires the particular intervention. The result of entering a value later than the beginning of the operation will be a jog downward in the situation assessment, which is proper in the latter situation. Thus, the denominator's value will generally be constant.

The value for the numerator should represent the sum of previous values and any new intervention for the current date. Thus, it is (generally) a non-decreasing set of values throughout the duration of the assessment. Should the value of the numerator equal of exceed the value of the denominator, then the value of the denominator should be reassessed. It should be at least as large as the largest value of the numerator, maintaining its value as a constant from its first entry. If a change is needed, the workbook should be recalculated, using the Recalculate Data button on the Controls sheet.

In some cases the numerator will need to be reduced, as described in section 6.2.1.3 above. This may be handled manually, semi-automatically (as described in section 6.2.2.4 below), or by special logic in the User worksheet. For a particular intervention, an additional positive value would have been entered into the numerator at its beginning. When it has been determined that there will be no positive outcome from this intervention, a negative value of the same size can be entered in that same column in a different row and the user should recalculate the workbook. This procedure retains the record of the fact of the intervention, but negates its effect. If the intervention actually makes things worse, the user might record a larger negative value to reflect this effect. If the negotiation makes things worse before the time delay will have elapsed, the user can enter a negative value equal to the original positive value to counteract the intervention itself and enter the remaining part of the larger negative value at a time (time delay) days before the negative impact is to take effect. The complexity of keeping track of these issues is one reason for using multiple rows to keep records of what seems, on its face, to be a simple matter.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If the final numerator equals the denominator or is judged to be at an optimal value, then the current value and all future values of the denominator may be left blank, with no further entries placed in numerator. All previous values for the denominator should be reset to the last (maximum) value of the numerator (and ISSM should be recalculated). This will result in a smooth transition. If the final numerator is less than the optimal value, the proper value for the denominator should be reassessed and reset, if needed, (with workbook recalculation). This value and the final value for the numerator should be carried forward in all future monitoring of the situation.

6.2.2.2 Single node variables

A value for the variable should be entered either at the beginning of the operation or at such time that the situation devolves into one that newly requires the particular intervention. The result of entering a value later than the beginning of the operation will be a jog downward in the situation assessment, which is proper in the latter situation.

The value for the variable should represent the sum of previous values and any new intervention for the current date. Thus, it is (generally) a non-decreasing set of values throughout the duration of the assessment.

In some cases the value for the variable will need to be reduced, as described in section 6.2.1.3 above. This may be handled manually, semi-automatically (as described in section 6.2.2.4 below), or by special logic in the User worksheet. For a particular intervention, an additional positive value would have been entered into the variable at its beginning. When it has been determined that there will be no positive outcome from this intervention, a negative value equal to the original positive value can be entered in that same column in a different row and the user should recalculate the workbook. This procedure retains the record of the fact of the intervention, but negates its effect. If the intervention actually makes things worse, the user might record a larger negative value, to reflect this effect. If the intervention makes things worse before the time delay will have elapsed, the user can enter a negative value equal to the original positive value to counteract the negotiation itself and enter the remaining part of the larger negative value at a time (time delay) days before the negative impact is to take effect. The complexity of keeping track of these issues is one reason for using multiple rows to keep records of what seems, on its face, to be a simple matter.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If the final value is 1.0 (for fractional variables), then the current value and all future values may be left blank. This will result in a smooth transition. If the final value is less than 1.0 (for fractional variables), this value should be carried forward in all future monitoring of the situation. For percentage variables (values 0 – 100), the current value and all future values may be left blank.

6.2.2.3 Reversible & variable inflators

The Reversible & Variable Inflators variables require no entries; they are optional. If the user makes no entries the "Std Infl" values are used. The standard values yield positive results. For example, positive values for "People's spiritual needs are met" generate positive value for "People are tolerant of the status quo." It is possible to envision a scenario in which this is not the case. For example, consider the rise of the Taliban in Afghanistan: the spiritual needs of a large group of people drove them to be intolerant of the status quo and institute a change. A large negative value (such as -1.0 or -1.25) might have been substituted for the standard small positive value (0.25) until the change had been effected. The user may use abrupt changes or might use smaller changes for each entry, or both. For example, the user might have started with a -0.25, growing over time to -1.25, then abruptly shifting to 0.25 (by leaving further entries blank) after the Taliban gained power.

6.2.2.4 Data entry details

Except for the Reversible & Variable Inflators Special Factors, all of the variables have data entry rows that combine to produce either the numerator (two node variables) or variable value (single node variables). The standard labels for these rows are "Coalition Forces," "Other US Depts & Agencies," "UN Depts & Agencies," "NGOs & PVOs," and a fifth row that may read "Other," "From DiamondWorksheet," or "From UserWorksheet."

The first four labels may be changed by the user by changing the initial values at the top of the ExternalInputs worksheet. They have no meaning to the logic of the ISSM and are present only as a convenience for tracking past inputs for the user. Thus, the user could separate the contributions by various intervenors or, by changing the labels, separate the contribution by separate information sources. The user might also use this label changing ability to separate negative effects into a separate row, placing negative numbers there. Because the logic of the spreadsheet sums the values in each row for a particular column (and only uses the sum), the user can place the numbers in any way that is useful for his purposes.

The fifth row can be used by the user if neither the UserWorksheet or the DiamondWorksheet will be used in either the ISSM Main **or the Preprocessor**. Thus it is better to not use this row at all. The "Connect/Disconnect" button on the Controls sheet of the Controller governs the name and logic for this row. Connecting either of the User or Diamond Worksheets will erase the contents of this row for any variables contained in the corresponding worksheets and replace them with references to the contents of the appropriate row from lower section of that worksheet. **The user must then make sure that there are no manual entries for any column for these variables with data passed from the user worksheet, as this would result in double counting.**

6.2.3 Cross-Reference of Nodes

The external inputs are grouped into eight sectors: conflict, economy, government, miscellaneous, movement, needs, physical, and security. The similarities among the inputs in each sector make understanding them easier; however, there are also similarities (and connections) across the sectors. Table 6-3 provides a means of finding where an input is discussed, given its node number.

Following the sector groups is a section that covers the external inputs that control the reversible and variable factors that connect some of the nodes.

Table 6-3. Cross Reference of External Nodes and Sections Describing Them

Node Number	Section Number	Section Name
150	6.2.9.2	Medical treatment
151	6.2.9.3	Food importation
152	6.2.9.4	Food distribution
153	6.2.9.5	Water distribution
154	6.2.9.8	Negotiating bureaucracies to get relief
155	6.2.9.7	Resettlement processes
156	6.2.9.6	Providing temporary shelter/housing
157	6.2.5.1	Buy local produce
158	6.2.5.2	Support new planting
159	6.2.6.1	Education facilities
160	6.2.6.2	Education supplies
161	6.2.6.3	Train teachers
162	6.2.6.8	Create local governments
163	6.2.6.9	Educate local governments
164	6.2.6.10	Supply local governments
165	6.2.6.5	Train police forces
166	6.2.6.24	Train military forces
167	6.2.10.9	Electricity production plants
168	6.2.10.10	Electricity distribution
169	6.2.10.3	Rebuild roads
170	6.2.10.4	Rebuild bridges
171	6.2.10.6	Rebuild airports
172	6.2.10.7	Rebuild seaports
173	6.2.10.11	Rebuild oil production

Node Number	Section Number	Section Name
174	6.2.10.12	Rebuild oil pipelines
175	6.2.10.1	Rebuild water lines
176	6.2.10.2	Rebuild water & sewage treatment facilities
177	6.2.10.8	Rebuild telecommunications
178	6.2.5.7	New currency
179	6.2.5.8	Interbanks payment system
180	6.2.5.10	Targeted privatization
181	6.2.5.9	Development of microfinance systems
182	6.2.5.5	Commercial law to improve investment
183	6.2.5.3	Public works programs to generate jobs
184	6.2.5.12	Insurance system
185	6.2.4.1	Mediating & negotiating w/ conflicting parties
186	6.2.4.2	Establishing demilitarized zones, sanctions, and arms embargoes
187	6.2.4.3	Maintaining compliance with peace accord milestones & conditions
188	6.2.4.4	Implementing weapons control regimes
189	6.2.4.5	Demobilizing, reducing, or reintegrating military & paramilitary units
190	6.2.4.6	Providing job training and employment for discharged military personnel
191	6.2.4.7	Establishing observer missions & interposing forces
192	6.2.5.4	Reforming government economic policy
193	6.2.5.6	Assisting in economic integration & cooperation
194	6.2.5.13	Managing natural resources
195	6.2.5.11	Seeking investment capital
196	6.2.5.14	Energy importation
197	6.2.6.19	Conducting war crimes investigations, tribunals, etc.
198	6.2.6.4	Conducting constabulary operations
199	6.2.6.11	Establishing, staffing & funding effective transition national government
200	6.2.6.14	Establishing a mechanism for constitutional reform
201	6.2.6.15	Conducting nationwide elections
202	6.2.6.16	Training newly elected national political leaders
203	6.2.6.12	Providing advisors to national government officials
204	6.2.6.13	Monitoring and reporting on corruption by government officials
205	6.2.6.17	Transferring control of government functions to host nation officials
206	6.2.6.18	Monitoring government powersharing arrangements
207	6.2.6.6	(Re)building & monitoring new police force
208	6.2.6.7	Providing advisors to police & criminal justice organizations & supporting establishment of operations
209	6.2.6.23	Creating or reforming & monitoring military
210	6.2.6.21	Assisting in establishing humane penal systems
211	6.2.6.20	Assisting in establishing/reforming legitimate legal system
212	6.2.6.22	Monitoring human rights practices
213	6.2.7.3	Conducting benign public information operations
214	6.2.7.1	Promoting civic education
215	6.2.7.2	Sponsoring journalist training & professionalization
216	6.2.8.1	Reducing likelihood of population movements
217	6.2.9.9	Coordinating NGO activities
218	6.2.9.1	Prepositioning humanitarian relief stocks
219	6.2.11.1	Establishing confidence-building and security measures
220	6.2.11.2	Providing security assistance to the host nation

Node Number	Section Number	Section Name
221	6.2.11.3	Safeguarding institutions of governance and key officials
222	6.2.7.4	Negative impact of intervention (rapes, etc.)
232	6.2.11.4	Providing security for HA activities
233	6.2.11.5	Providing security for PO activities
234	6.2.11.6	Providing security for Stability activities
235	6.2.11.7	Providing force security
237	6.2.9.10	Health infrastructure repair
239	6.2.10.5	Rebuild railroads

6.2.4 Conflict Sector Model

The conflict sector contains seven input variables. The conflict sector contains combat-related variables, but it also contains variables reflecting a broader definition of conflict that includes disagreement and its resolution.

6.2.4.1 Mediating & negotiating w/ conflicting parties

This variable requires two inputs, nodes 185 and 185.1. The first node contains the number of mediation missions and the second node contains the total number required. This variable affects node 230, Intervention Peace Operations, with a standard delay of 84 days. If there are no parties in conflict, this variable is not needed. However, it should be understood that "conflict" is a broad term that includes much more than combat. Only pure Humanitarian Assistance (HA) and Disaster Relief (DR) Operations are likely to be without conflict and many HA/DR operations include or devolve into operations with conflict.

If the total number required is left blank, no values are passed for this variable. Ideally, the second node should represent the total number of missions that will be needed to bring the country to its optimal state. This is a difficult quantity to guess at the beginning of an intervention and, thus, may require revisions (with accompanying historical revisions) over the course of the intervention. The user might use the following formula to create a rational guess.

$$MediatNum = Fudge * NumFact * (2 * NumYears) \qquad 54$$

The variable NumYears is the expected duration of the intervention in years (from the beginning of negotiations); the variable NumFact is the number of factions with whom negotiations may be necessary; and the variable Fudge is a fudge factor. The factor "2" indicates an assumption that two negotiation missions will be required for each faction per year. This factor may be linked to the delay factor as follows: an 84 day (12 week) delay presumes a long period of negotiations, followed by a shorter period of implementation, followed by a positive impact, with a similar 84 day period before another round of negotiations, hence two rounds per year. The variable Fudge probably has a minimum value of 2, because nothing ever works as planned.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If the final set of negotiations was concluded favorably and no future negotiations are seen as being needed, then the current value and all future values of node 185.1 may be left blank, with no entries placed in node 185. All previous values for node 185.1 should be reset to the last (maximum) value of node 185 (and ISSM should be recalculated). This will result in a smooth transition. If the final negotiations were not concluded favorably or if it is judged that further negotiations should be performed (despite the fact that they are not currently envisioned), the proper value for node 185.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 185 should be carried forward in all future monitoring of the situation.

Because this variable only affects one intervention variable, bad outcomes can be represented easily. For a particular negotiation mission, an additional value of +1 would have been entered into the numerator at its beginning. When it has been determined that there will be no positive outcome from this negotiation, a value of -1 can be entered in that same column in a different row and the user should recalculate the workbook. This procedure retains the record of the fact of the negotiation, but negates its effect. If the negotiation actually makes things worse, the user might record a -2, rather than a -1, to reflect this effect. If the negotiation makes things worse before the 84 days will have elapsed, the user can enter a -1 to counteract the negotiation itself and enter the other -1 at a time 84 days before the negative impact is to take effect. The complexity of keeping track of these issues is one reason for using multiple rows to keep records of what seems, on its face, to be a simple matter.

6.2.4.2 Establishing demilitarized zones, sanctions, and arms embargoes

This variable requires two inputs, nodes 186 and 186.1. The first node contains the number of missions and the second node contains the total number required. This variable affects node 230, Intervention Peace Operations, with a standard delay of 14 days. If there are no parties in conflict, this variable is not needed.

If the total number required is left blank, no values are passed for this variable. Ideally, the second node should represent the total number of missions that will be needed to bring the country to its optimal state. This is a difficult quantity to guess at the beginning of an intervention and, thus, may require revisions (with accompanying historical revisions) over the course of the intervention.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no future demilitarized zones, sanctions or arms embargoes are seen as being needed, then the current value and all future values of node 186.1 may be left blank, with no entries placed in node 186. All previous values for node 186.1 should be reset to the last (maximum) value of node 186 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further missions should be performed (despite the fact that they are not currently envisioned), the proper value for node 186.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 186 should be carried forward in all future monitoring of the situation.

Because this variable only affects one intervention variable, bad outcomes can be represented easily. For a particular mission, an additional value of +1 would have been entered into the numerator at its beginning. When it has been determined that there will be no positive outcome from this mission, a value of -1 can be entered in that same column in a different row and the user should recalculate the workbook. This procedure retains the record of the fact of the mission, but negates its effect. If the mission actually makes things worse, the user might record a -2, rather than a -1, to reflect this effect. If the mission makes things worse before the 14 days will have elapsed, the user can enter a -1 to counteract the mission itself and enter the other -1 at a time 14 days before the negative impact is to take effect. The complexity of keeping track of these issues is one reason for using multiple rows to keep records of what seems, on its face, to be a simple matter.

6.2.4.3 Maintaining compliance with peace accord milestones & conditions

This variable requires two inputs, nodes 187 and 187.1. The first node contains the number of missions and the second node contains the total number required. Judgment is required in determining how to define the missions. In the simplest case, only one mission is required. However, if it is judged that some of the milestones or conditions may have problems with compliance, it might be better to define a mission for each milestone and condition. In some cases it might be wise to further subdivide by time intervals to permit cumulative scoring, so that a better value is achieved by maintaining compliance for a long time. This variable affects node 230, Intervention Peace Operations, with a standard delay of 28 days. If there are no parties in conflict, this variable is not needed.

If the total number required is left blank, no values are passed for this variable. Ideally, the second node should represent the total number of missions that will be needed to bring the country to its optimal state. This is a difficult quantity to guess at the beginning of an intervention and, thus, may require revisions (with accompanying historical revisions) over the course of the intervention.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no future compliance maintenance is seen as being needed, then the current value and all future values of node 187.1 may be left blank, with no entries placed in node 187. All previous values for node 187.1 should be reset to the last (maximum) value of node 187 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further missions should be performed (despite the fact that they are not currently envisioned), the proper value for node 187.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 187 should be carried forward in all future monitoring of the situation.

Because this variable only affects one intervention variable, bad outcomes can be represented easily. For a particular mission, an additional value of +1 would have been entered into the numerator at its beginning. When it has been determined that there will be no positive outcome from this mission, a value of -1 can be entered in that same column in a different row and the user should recalculate the workbook. This procedure retains the record of the fact of the mission, but negates its effect. If the mission actually makes things worse, the user might record a -2, rather than a -1, to reflect this effect. If the mission makes things worse before the 28 days will have elapsed, the user can enter a -1 to counteract the mission itself and enter the other -1 at a time 28 days before the negative impact is to take effect. The complexity of keeping track of these issues is one reason for using multiple rows to keep records of what seems, on its face, to be a simple matter.

6.2.4.4 Implementing weapons control regimes

This variable requires two inputs, nodes 188 and 188.1. The first node contains the number of missions and the second node contains the total number required. Judgment is required in determining how to define the missions. In the simplest case, only one mission is required. However, if there will be several different weapons cantonment locations or weapons of mass destruction sites, it might be better to define a mission for location. In some cases it might be wise to further subdivide by time intervals to permit cumulative scoring, so that a better value is achieved by maintaining compliance for a long time. This variable affects node 230, Intervention Peace Operations, with a standard delay of 28 days. Even if there are no parties in conflict, this variable may be needed (e.g., the country has agreed to monitoring of nuclear sites).

If the total number required is left blank, no values are passed for this variable. Ideally, the second node should represent the total number of missions that will be needed to bring the country to its optimal state. This is a difficult quantity to guess at the beginning of an intervention and, thus, may require revisions (with accompanying historical revisions) over the course of the intervention.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no future compliance maintenance is seen as being needed, then the current value and all future values of node 188.1 may be left blank, with no entries placed in node 188. All previous values for node 188.1 should be reset to the last (maximum) value of node 188 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further missions should be performed (despite the fact that they are not currently envisioned), the proper value for node 188.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 188 should be carried forward in all future monitoring of the situation.

Because this variable only affects one intervention variable, bad outcomes can be represented easily. For a particular mission, an additional value of +1 would have been entered into the numerator at its beginning. When it has been determined that there will be no positive outcome from this mission, a value of -1 can be entered in that same column in a different row and the user should recalculate the workbook. This procedure retains the record of the fact of the mission, but negates its effect. If the mission actually makes things worse, the user might record a -2, rather than a -1, to reflect this effect. If the mission makes things worse before the 28 days will have elapsed, the user can enter a -1 to counteract the mission itself and enter the other -1 at a time 28 days before the negative impact is to take effect. The complexity of keeping track of these issues is one reason for using multiple rows to keep records of what seems, on its face, to be a simple matter.

6.2.4.5 Demobilizing, reducing, or reintegrating military & paramilitary units

This variable requires two inputs, nodes 189 and 189.1. The first node contains the number affected and the second node contains the total number to be affected. The number might represent military units or number of troops (or thousands of troops [KPeople]). The user should take advantage of his ability to record his choice of units to avoid later confusion. This variable affects node 228, Intervention demobilization, with a standard delay of 84 days. This delay reflects a delay in the social effects of demobilization activities. If there are no parties in conflict, this variable is probably not needed.

If the total number required is left blank, no values are passed for this variable. The total to be affected should equal the sum of all units that are not under government control plus any excess units under government control. Where there are paramilitary units to be demobilized and an excess of government military units, there might be legitimate reasons for incorporating a unit into the government military, even before the totals for the government military have reached desired levels. If the user disregards the row labels and uses one row for paramilitary reductions and another for government military reductions, they would be scored with an increase (indicating successful decrease) in the paramilitary row and an identical decrease (indicating an increase in military size) in the government military row. This accounting does not create a net positive demobilization score; however, it does maintain the record of what is happening.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no future demobilization is seen as being needed, then the current value and all future values of node 189.1 may be left blank, with no entries placed in node 189. All previous values for node 189.1 should be reset to the last (maximum) value of node 189 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further demobilization should be performed (despite the fact that they are not currently envisioned), the proper value for node 189.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 189 should be carried forward in all future monitoring of the situation.

Because this variable only affects one intervention variable, bad outcomes can be represented easily. The user may want to award partial scores. For example, if 1000 troops are demobilized, but not disarmed, the user might score this as 500 in node 189; if 1000 troops in a paramilitary unit are brought directly under legitimate military control, the user could score this as 1000; however, if the user had suspicions that the latter reintegration was not complete, he might score it as 750. If the demobilization actually makes things worse, the user might record a negative number.

6.2.4.6 Providing job training and employment for discharged military personnel

This variable requires two inputs, nodes 190 and 190.1. The first node contains the number affected and the second node contains the total number to be affected. The number might represent military units or number of troops (or thousands of troops [KPeople]). The user should take advantage of his ability to record his choice of units to avoid later confusion. This variable affects node 229, Intervention military retraining, with a standard delay of 84 days. This delay reflects a delay needed to complete retraining. If there are no parties in conflict, this variable is probably not needed.

If the total number required is left blank, no values are passed for this variable. As with the demobilization variables (189), the total to be affected should equal the sum of all units that are not under government control plus any excess units under government control. This variable includes two tasks, retraining and employment. The user could account for this by doubling the total to be affected to allow for actual numbers retrained and actual numbers employed or the user might use half values for the numbers actually retrained, adding in the other half when they are employed.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no future retraining and employment is seen as being needed, then the current value and all future values of node 190.1 may be left blank, with no entries placed in node 190. All previous values for node 190.1 should be reset to the last (maximum) value of node 190 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further retraining and employment should be performed (despite the fact that they are not currently envisioned), the proper value for node 190.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 190 should be carried forward in all future monitoring of the situation.

Because this variable only affects one intervention variable, bad outcomes can be represented easily. The user may want to award partial scores to separate retraining and employment. If the retraining and employment actually makes things worse, the user might record a negative number.

6.2.4.7 Establishing observer missions & interposing forces

This variable requires two inputs, nodes 191 and 191.1. The first node contains the number of troops (or missions, at the user's discretion) and the second node contains the total number required (in the same units). This variable affects node 230, Intervention Peace Operations, with a standard delay of 7 days. If there are no parties in conflict, this variable is not needed.

If the total number required is left blank, no values are passed for this variable. Ideally, the second node should represent the total number of troops (or missions) that will be needed to bring the country to its optimal state. This is a difficult quantity to guess at the beginning of an intervention and, thus, may require revisions (with accompanying historical revisions) over the course of the intervention.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no future observer missions or interpositions of troops are seen as being needed, then the current value and all future values of node 191.1 may be left blank, with no entries placed in node 191. All previous values for node 191.1 should be reset to the last (maximum) value of node 191 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further missions should be performed (despite the fact that they are not currently envisioned), the proper value for node 191.1

should be reassessed and reset (with workbook recalculation). This value and the final value for node 191 should be carried forward in all future monitoring of the situation.

Because this variable only affects one intervention variable, bad outcomes can be represented easily. The logic described for nodes 186 and 186.1 can be used here. (If the values represent numbers of troops, rather than numbers of missions, the +/- 1 values would be replaced with the mission size in troops.)

6.2.5 Economy Sector Model

The economy sector has 14 inputs that relate to improving the economy. Many of these also relate to governmental actions; however, their connection to the economy is stronger.

6.2.5.1 Buy local produce

This variable requires two inputs, nodes 157 and 157.1. In the simplest case, the first node contains the amount purchased to date and the second node contains the total amount to be purchased. The units will be in tons or thousands of tons [Ktons], or a similar metric value. The user should take advantage of his ability to record his choice of units to avoid later confusion. This variable affects node 128, Intervention agriculture, with a standard delay of 0 days, and node 147 Intervention jobs, also with a standard delay of 0 days. These delays reflect the almost immediate impact of the variable. If food is not a problem, this variable will not be needed. However, if the scenario represents a subsistence economy and the intervention force buys local produce for its own use, a large force might thus create negative effects, rather than positive effects.

If the total number required is left blank, no values are passed for this variable.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no future produce purchasing is seen as being needed, then the current value and all future values of node 157.1 may be left blank, with no entries placed in node 157. Unless rates are used (see below), all previous values for node 157.1 should be reset to the last (maximum) value of node 157 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further produce purchasing should be performed (despite the fact that it is not currently envisioned), the proper value for node 157.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 157 should be carried forward in all future monitoring of the situation.

Because this variable affects two intervention variables, representing bad outcomes can be difficult. However, as long as both intervention variables have the same delay value, the problem is simplified. If the produce purchasing actually makes things worse, the user must decide how to represent it.

Consider a situation in which there is sufficient local food and distribution capability, but no excess, and in which the intervention force buys an amount of local produce for its own consumption. If the purpose is to increase demand for produce gradually to induce an increase in production and is done carefully (and successfully), there is no negative effect. The concept is that the production per unit of time is now X and should become X + Y. Thus the value for node 157.1 should be X + Y. The initial value for node 157 is the current consumption (per the same unit of time), which is by definition of the situation also X. The purchase of local produce is represented as an incremental addition to X, in units of purchases per unit of time. Thus, both nodes represent rates (consumption and production), not cumulative values, as in many other variables. The user should modify the units to reflect this case. As long as the production rate grows to match the total consumption rate (with caveats for local shortages), no negative effects are produced. Suppose this holds true up to a consumption rate of $X + Y_1$, but that production doesn't grow beyond this rate. At the point of consumption equal to $X + Y_1$, the model yields a value of $(X + Y_1)/(X + Y)$, less than 1.0, but greater than the initial value of $X/(X + Y)$. Consumption above $X + Y_1$, should yield a lower value than $(X + Y_1)/(X + Y)$, in fact, perhaps it should be lower than $X/(X + Y)$, if the local populace no longer has sufficient produce for its own use. If the intervention force is on top of the situation, it will stop its increase of purchases to maintain the situation at $(X + Y_1)/(X + Y)$, until production increases resume. If it overshoots, however, the value of node 157, the numerator should be set at X minus the excess consumption, until the situation is corrected. Note that continuing to purchase the excess amount, but returning the excess as free food or even selling it at market value will cause disruptions in the economy, by introducing competition to the indigenous produce sellers. These disruptions would require a more complex economic model to handle than is present in the ISSM; however, maintaining the numerator at X minus the excess consumption does at least indicate that all is not well.

The second situation is perhaps a more standard one. In this situation, there is a need for food in one area of the country. Part of this need will be supplied by importation from external sources (nodes 151 and 151.1 and 152 and 152.1), but part can be supplied by purchasing in areas of the country that have an excess of food, but no existing mechanism for delivering it to the needy areas. The concept is to deliver X tons of food to the needy areas over the duration of the intervention. The total quantity of food that will be available locally (in the needy areas) over the duration is Y. The proper value for node 157.1 is $X + Y$ and the initial value for node 157 is X. Thus the initial fraction would be $X/(X + Y)$ if there were no areas with excess food in the country. (In that situation, nodes 157 and 157.1 would not be used.) Given that there are areas with excess food, Y is the amount of excess food that will be available over the duration and let Z be the amount of food needed locally in the areas with excess food (over the duration). By supposition, without purchase of W by the intervention forces, it would not be available in the needy areas, hence the values are as follow. The total needed food is $Z + X + Y$, the value to be used for node 157.1. The initial value for node 157 is $Z + X$, yielding the fraction $(Z + X)/(Z + X + Y)$. This fraction represents the national food deficit (given lack of delivery). As the cumulative purchase of produce (and assumed delivery) takes place, the fraction approaches 1.0.

There is a problem in this latter case. The total food deficit is probably larger than expressed by the initial fraction because of the separation of imported food from purchases of local produce. The additional needs could be added to the denominator; however, without additions to the numerator, the fraction would never reach 1.0. By judicious use of the UserWorksheet, the user could extend the concept described above to combine the two sources of food in the worksheet and create a combined total need, each piece being passed to the appropriate node. However, this can only be done where the units are of the same type (e.g., cumulative totals). In many situations, this additional work is not required for two reasons. First, the importation quantity is likely to be much larger than the local purchase quantity. Second, the focus of this variable is on agriculture and jobs, not food needs. Thus, the fraction described in the paragraph above, is actually more accurate in its effect on agriculture and on jobs than one that includes imported food.

6.2.5.2 Support new planting

This variable requires two inputs, nodes 158 and 158.1. The first node contains the area planted and the second node contains the total amount to be planted. The units will be in acreage, or a similar metric value. The user should take advantage of his ability to record his choice of units to avoid later confusion. This variable affects node 128, Intervention agriculture, with a standard delay of 168 days, and node 147 Intervention jobs, with a standard delay of 0 days. These delays reflect the growing/harvest cycle and the almost immediate impact of jobs creation. If food is not a problem, this variable will not be needed.

If the total number required is left blank, no values are passed for this variable. The values for the inputs should reflect both the intervention and the planting that would be performed without intervention. Thus, node 158.1 should contain the target planting, based on the country's population, import/export potential, arable land, and water resources. Thus, the target, in general, would be for self-sufficiency. In some cases, self-sufficiency is not practicable; however, that target will give an indication of the potential for agricultural needs to be a driver toward instability. In some cases, the target could include planting for export. Such an increased target would be justified in consideration of the impacts of loss of income from such exports. Node 158 should include the base amount planted, plus the new planting supported by the intervention.

Because different crops are actually planted at different times, defining the proper values to use is difficult. The most accurate method would be a seasonal variation of the target value in node 158.1, coupled with the actual numbers planted against that target in node 158. However, an annual total, with an expected annual actual planting may be sufficiently accurate. The effect of this variable is to create a scaled representation of the adequacy of agricultural planting. Therefore, a cumulative intervention is inappropriate. If the intervention supports additional planting in one season, but not the next, do not continue the increase to the next season (year). If the intervention was successful, the next indigenous planting will continue the total achieved previously.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no future produce planting support is seen as being needed, then the current value and all future values of node 158.1 may be left blank, with no entries placed in node 158. All previous values for node 158.1 should be reset to the last (maximum) value of node 158 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further produce planting support should be performed (despite the fact that it is not currently envisioned), the proper value for node 158.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 158 should be carried forward in all future monitoring of the situation.

Because this variable affects two intervention variables with different delays, representing bad outcomes can be difficult. The most likely bad outcome is a crop failure. When this occurs, reduce the "planted" amount by the amount of the failure at the time it occurs, carried forward to the next planting cycle. The agricultural component will represent lower availability, although perhaps later than it should, and the jobs component will represent lower jobs for harvesting, although perhaps earlier than it should.

6.2.5.3 Public works programs to generate jobs

This variable requires two inputs, nodes 183 and 183.1. The first node contains the number of jobs available and the second node contains the total jobs target. This variable affects node 147 Intervention jobs, with a standard delay of 0 days. This delay reflects the almost immediate impact of jobs creation.

If the total number required is left blank, no values are passed for this variable. The values for the inputs should reflect both the intervention and the public works jobs that would be performed without intervention. Thus, node 183.1 should contain the target public works jobs, based on the country's population and infrastructure size. It may also include a temporary increase because of infrastructure improvement needs and as a purely economic boost. In case of temporary increases, the values for node 183.1 will not be constant and should be periodically reassessed to determine when they should be reduced toward the standard target value. Node 183 should include the base amount of jobs, plus the new jobs supported by the intervention.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no future jobs support is seen as being needed, then the current value and all future values of node 183.1 may be left blank, with no entries placed in node 183. All previous values for node 183.1 should be reset to the last value of node 183 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further jobs support should be performed (despite the fact that it is not currently envisioned), the proper value for node 183.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 183 should be carried forward in all future monitoring of the situation.

Because this variable affects only one intervention variable and it has zero delay, representing bad outcomes is easy. Simply reduce the value of node 183 accordingly.

6.2.5.4 Reforming government economic policy

This variable requires a single input, node 192, which contains a value between 0.0 and 1.0. This variable affects node 135 Intervention financial, with a delay of 168 days, and node 137 Intervention investment, with a delay of 84 days. These delays represent a common delay in implementing policy changes (perhaps optimistically short) and separate delays in the impact on investment decisions and the general financial structure.

If the input is left blank, no values are passed for this variable. Because economic policy is complex and not easily dissected into components, the input value represents a fraction of what should be done. An economist is required to give a general estimate of the current policy to use as a starting value (e.g., the policy is miserable and needs an almost complete overhaul: value 0.1, or the policy is not too bad and only needs minor tweaking: value 0.8). Incremental changes are represented by increases in the value over time until the policy represents basic free market status (moderate to no tariffs, reasonable taxation, etc.).

Negative changes are simply represented as regressions in the value toward 0.0.

6.2.5.5 Commercial law to improve investment

This variable requires a single input, node 182, which contains a value between 0.0 and 1.0. This variable affects node 137 Intervention investment, with a delay of 364 days. This delay represents a delay in implementing legal changes (perhaps optimistically short) and a delay in the impact on investment decisions.

If the input is left blank, no values are passed for this variable. Because commercial law is complex and not easily dissected into components, the input value represents a fraction of what should be done. An economist is required to give a general estimate of the current law to use as a starting value (e.g., the commercial law is miserable and needs an almost complete overhaul: value 0.1, or it is not too bad and only needs minor tweaking: value 0.8). Incremental changes are represented by increases in the value over time until the law supports business practices and capital formation and retention (property rights, ownership laws, etc.).

Negative changes are simply represented as regressions in the value toward 0.0.

6.2.5.6 Assisting in economic integration & cooperation

This variable requires a single input, node 193, which contains a value between 0.0 and 1.0. This variable affects node 135 Intervention financial, with a delay of 364 days, and node 137 Intervention investment, with a delay of 84 days. These delays represent a common delay in creating changes (perhaps optimistically short) and separate delays in the impact on investment decisions and the general financial structure.

If the input is left blank, no values are passed for this variable. Because the potential issues are complex and not foreseeable in detail, the input value represents a fraction of what should be done. The issues may involve a change from a command economy to a free market economy or from government ownership of some segments of the economy to private ownership or of creating or restarting missing parts of the economy (e.g., tourism, manufacturing, or public works) or a combination of these. An economist is required to give a general estimate of the situation to use as a starting value. Incremental changes are represented by increases in the value over time until the situation is improved.

Negative changes are simply represented as regressions in the value toward 0.0.

6.2.5.7 New currency

This variable requires a single input, node 178, which contains a value between 0.0 and 1.0. This variable affects node 135 Intervention financial, with a delay of 84 days. This delay represents a delay in creating and distributing the currency and a delay in the impact on the general financial structure. If new currency is not required, this intervention is left blank.

If the input is left blank, no values are passed for this variable. An economist is required to determine how bad the current currency is. If the currency is valueless, the starting point will be 0.0. Probably several stages will be required, perhaps starting with temporary "fiat" currency. Decisions on the basis for a new currency, conversion targets for other currencies, "float" practices, currency designs, units of currency, printing, distribution, etc.

Negative changes are simply represented as regressions in the value toward 0.0.

6.2.5.8 Interbanks payment system

This variable requires a single input, node 179, which contains a value between 0.0 and 1.0. This variable affects node 135 Intervention financial, with a delay of 7 days. This delay represents a delay in implementing the system once it has been planned, built, installed, and tested. If new currency is not required, this intervention is left blank.

If the input is left blank, no values are passed for this variable. The value could be the fraction of banks on the system. However, it is probably better to use the values from 0.0 to 0.5 for the implementation phases and spread the fraction of banks on the system between 0.5 and 1.0.

Negative changes are simply represented as regressions in the value toward 0.0.

6.2.5.9 Development of microfinance systems

This variable requires two inputs, nodes 181 and 181.1. The best practice is to use either dollar value or numbers of loans outstanding for the first node and target loan capacity in dollar value or numbers of loans for the second node. This variable affects node 135 Intervention financial, with a standard delay of 0 days. This delay reflects the immediate impact, as the loans have been made.

If the total number required is left blank, no values are passed for this variable. This variable can be denominated in a number of ways, monetary capital available for loans (dollars or other units), number of projects, or number of loans. The last measure is the most closely related to the goals of microfinance systems; however, it is the hardest to get data on. The number of projects is the most publicized; however, it yields the least usable information. The amount of money available is useful; however, it is indirect, as not all money will be loaned and certainly not immediately. Both the first and the last measures present the problem of using cumulative numbers or number per year. The target loan capacity will depend on the economic situation and requires an economist to set its value.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no microfinance support is seen as being needed, then the current value and all future values of node 181.1 may be left blank, with no entries placed in node 181. All previous values for node 181.1 should be reset to the last value of node 181 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further microfinance support should be performed (despite the fact that it is not currently envisioned), the proper value for node 181.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 181 should be carried forward in all future monitoring of the situation.

Because this variable affects only one intervention variable and it has zero delay, representing bad loans is easy. Simply reduce the value of node 181 accordingly.

6.2.5.10 Targeted privatization

This variable requires two inputs, nodes 180 and 180.1. The best practice is to use either dollar value or numbers of industries set for privatization for the first node and target privatization in dollar value or numbers of industries for the second node. This variable affects node 131 Intervention critical industries, with a standard delay of 168 days. This delay reflects the delay in accomplishing privatization, once a decision has been made.

If the total number required is left blank, no values are passed for this variable. The target privatization will depend on the economic situation and requires an economist to set its value. The best practice is to include in the target value those industries that are already private and to also include this value as a constant part of node 180. This allows distinguishing situations that start with no private industries from those with a private industry base.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no further privatization is seen as being needed, then the current value and all future values of node 180.1 may be left blank, with no entries placed in node 180. All previous values for node 180.1 should be reset to the last value of node 180 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further privatization should be performed (despite the fact that it is not currently envisioned), the proper value for node 180.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 180 should be carried forward in all future monitoring of the situation.

Because this variable affects only one intervention variable, representing bad results is relatively easy. If a privatization project will not take place, remove its contribution from when it was first entered onward. If a privatization project is later seen to have made things worse, the representation is more difficult. The best course is to use a separate row to include a negative contribution to node 180 that doubles the planned contribution but has a negative sign.

6.2.5.11 Seeking investment capital

This variable requires two inputs, nodes 195 and 195.1. The first node represents the cumulative investment capital that has been captured and the second node represents the total investment capital that is needed. This variable affects node 137 Intervention investment, with a standard delay of 84 days. This delay reflects the delay in using the investments.

If the total number required is left blank, no values are passed for this variable. The target investment capital will depend on the economic situation and requires an economist to set its value. The best practice is to include in the target value the amount that is already available and to also include this value as a constant part of node 195. This allows distinguishing situations that start with no investment capital available from those with an existing base.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no further investment (increase) is seen as being needed, then the current value and all future values of node 195.1 may be left blank, with no entries placed in node 195. All previous values for node 195.1 should be reset to the last value of node 195 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further investment increase is required (despite the fact that it is not currently envisioned), the proper value for node 195.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 195 should be carried forward in all future monitoring of the situation.

Because this variable affects only one intervention variable, representing bad results is relatively easy. If an investment project will not take place, remove its contribution from when it was first entered onward. If an investment project is later seen to have made things worse, the representation is more difficult. The best course is to use a separate row to include a negative contribution to node 195 that doubles the planned contribution but has a negative sign.

6.2.5.12 Insurance system

This variable requires a single input, node 184, which contains a value between 0.0 and 1.0. This variable affects node 135 Intervention financial, with a delay of 168 days. This delay represents a delay in implementing the system once it has been planned, built, installed, and tested. If new currency is not required, this intervention is left blank.

If the input is left blank, no values are passed for this variable. The value could be the fraction of coverage of the system. However, it is probably better to use the values from 0.0 to 0.5 for the implementation phases and spread the fraction of coverage of the system between 0.5 and 1.0.

Negative changes are simply represented as regressions in the value toward 0.0.

6.2.5.13 Managing natural resources

This variable requires two inputs, nodes 194 and 194.1. The first node represents the cumulative amount managed and the second node represents the total amount that needs managing. This variable affects node 231 Intervention natural resources, with a standard delay of 28 days. This delay reflects the delay in effects of management.

If the total number required is left blank, no values are passed for this variable. The target natural resources will depend on the country. The best practice is to include in the target value the amount that is already under management and to also include this value as a constant part of node 194. This allows distinguishing situations that start with no natural resource management from those with an existing base. The appropriate units will depend on the situation. In a country with a single (or single very dominant) resource, the obvious unit will be the one appropriate for that resource, acreage for agriculture, barrels (or some variant) for oil, etc. For most countries, monetary value may be the only common unit. "Management" need not mean government management, rather it means "competent" management, whether government, corporate, or individual. However, it probably requires some government involvement for coordination.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no further management increase is seen as being needed, then the current value and all future values of node 194.1 may be left blank, with no entries placed in node 194. All previous values for node 194.1 should be reset to the last value of node 194 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further management increase is required (despite the fact that it is not currently envisioned), the proper value for node 194.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 194 should be carried forward in all future monitoring of the situation.

Because this variable affects only one intervention variable, representing bad results is relatively easy. If a management project will not take place, remove its contribution from the date it was first entered onward. If a management project is later seen to have made things worse, the representation is more difficult. The best course is to use a separate row to include a negative contribution to node 194 that doubles the planned contribution but has a negative sign.

6.2.5.14 Energy importation

This variable requires two inputs, nodes 196 and 196.1. In the simplest case, the first node contains the amount imported to date and the second node contains the total amount to be imported. The units will be in Mwatts, barrels, or similar values, or monetary value (dollars). The user should take advantage of his ability to record his choice of units to avoid later confusion. This variable affects node 134, Intervention energy, with a standard delay of 28 days. This delay reflects the time from importation to delivery to customers. If the energy is imported as electricity, the user may want to change the delay to zero days. If energy is not a problem, this variable will not be needed.

If the total number required is left blank, no values are passed for this variable.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no future energy importation is seen as being needed, then the current value and all future values of node 196.1 may be left blank, with no entries placed in node 196. Unless rates are used (see below), all previous values for node 196.1 should be reset to the last (maximum) value of node 196 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further energy importation should be performed (despite the fact that it is not currently envisioned), the proper value for node 196.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 196 should be carried forward in all future monitoring of the situation.

Because this variable affects a single intervention variables, representing bad outcomes is relatively simple. For example, if the energy is imported in the form of petroleum products and the supply is destroyed before it can be used, simply remove that quantity in node 196 at its initiation and subsequently.

The simple case described above applies for a one time need for energy. Many situations are more complex. Two cases are described. The simpler is one in which virtually all energy is imported. The more complex case involves both domestic production and importation of energy.

In the simpler case, the primary difference with the case above is that the denominator, node 196.1, should represent an amount of energy needed per unit time (week, month, year), a rate, and the denominator, node 196, should represent the importation rate in those same units, for the input date in question.

The more complex case also requires the use of rates. Its additional complexity derives from accounting for domestic production of energy. Nodes 167 and 167.1, Electricity production plants, 168 and 168.1, Electricity distribution, 173 and 173.1, Rebuild oil production, and 174 and 174.1, Rebuild oil pipelines, all feed node 134, Intervention energy, also. The question is what is the proper denominator value for each of these and for 196.1.

If the imported energy is of the other kind from the domestically produced kind, the problem is simplified because the two types can be separated and each kind can have its own denominator, which is equal to the total need rate for that kind of energy.

If the imported energy is of one kind and no rebuilding is needed for that kind, then the denominator for the other kind is its total need rate and the denominator for the imported energy and its production/transport type should be its total need rate. The numerator for the importation and for the production should be the production rate + the import rate. The numerator for the transport (of the import type) depends on the available transport and its repairs. The numerators for production and transport of the non-import type energy depend on their own internals.

If the imported energy is of both kinds or rebuilding is needed for its kind, the only logical combination is through dollar value over both energy types. However, doing that yields a common denominator for all five variables and the same numerators for all but the two transport variables, which disguises the sources of any problems. In this case, it is best to ignore the complexities and treat each variable separately. This means that excessively pessimistic values will show up for some variables, to be partially balanced against excessively optimistic values for others.

6.2.6 Government Sector Model

The government sector contains 24 inputs that relate to government issues.

6.2.6.1 Education facilities

This variable requires two inputs, nodes 159 and 159.1. The first node represents the number of usable education facilities and the second node represents the total number needed. This variable affects node 133 Intervention education, with a standard delay of 42 days. This delay reflects the average time to build/refurbish a facility.

If the total number required is left blank, no values are passed for this variable. The target number of schools will depend on the population size. The best practice is to include in the target value the number of currently usable facilities and to also include this value as a constant part of node 159. This allows distinguishing situations that start with no education facilities from those with an existing base.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional facilities are seen as being needed, then the current value and all future values of node 159.1 may be left blank, with no entries placed in node 159. All previous values for node 159.1 should be reset to the last value of node 159 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional facilities are required (despite the fact that an increase is not currently envisioned), the proper value for node 159.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 159 should be carried forward in all future monitoring of the situation.

Because this variable affects only one intervention variable, representing bad results is relatively easy. If a project will not take place, remove its contribution from the date it was first entered onward.

6.2.6.2 Education supplies

This variable requires two inputs, nodes 160 and 160.1. The first node represents the quantity of education supplies available and the second node represents the total quantity needed. This variable affects node 133 Intervention education, with a standard delay of 42 days. This delay reflects the time acquire and distribute the supplies.

If the total number required is left blank, no values are passed for this variable. The target quantity will depend on the population size. The best practice is to include in the target value the quantity of currently usable supplies and to also include this value as a constant part of node 160. This allows distinguishing situations that start with no supplies from those with an existing base. Recent literature has included the unit type “sets” in describing quantities of school supplies.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional supplies are seen as being needed, then the current value and all future values of node 160.1 may be left blank, with no entries placed in node 160. All previous values for node 160.1 should be reset to the last value of node 160 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional supplies are required (despite the fact that an increase is not currently envisioned), the proper value for node 160.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 160 should be carried forward in all future monitoring of the situation.

Because this variable affects only one intervention variable, representing bad results is relatively easy. If a project will not take place, remove its contribution from the date it was first entered onward.

6.2.6.3 Train teachers

This variable requires two inputs, nodes 161 and 161.1. The first node represents the number of teachers available and in training and the second node represents the total number needed. This variable affects node 133 Intervention education, with a standard delay of 42 days, and node 147 Intervention jobs, with a delay of zero. These delays reflect the time to train the teachers and the immediate jobs.

If the total number required is left blank, no values are passed for this variable. The target quantity will depend on the population size. The best practice is to include in the target value the quantity of currently available teachers and to also include this value as a constant part of node 161. This allows distinguishing situations that start with no teachers from those with an existing base.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional teachers are seen as being needed, then the current value and all future values of node 161.1 may be left blank, with no entries placed in node 161. All previous values for node 161.1 should be reset to the last value of node 161 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional teachers are required (despite the fact that an increase is not currently envisioned), the proper value for node 161.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 161 should be carried forward in all future monitoring of the situation.

Because this variable affects two intervention variables with different delays, representing bad results is difficult. If a training project will not take place, remove its contribution from the date it was first entered onward. If the project stops before completion, remove its contribution from the date it stops onward.

6.2.6.4 Conducting constabulary operations

This variable requires two inputs, nodes 198 and 198.1. The first node represents the number of constables available and the second node represents the total number needed. This variable affects node 226 Intervention policing, with a standard delay of 14 days. This delay reflects the time until impact is expected.

If the total number required is left blank, no values are passed for this variable. The target quantity will depend on the population size, urbanization, and crime level. The best practice is to include in the target value the quantity of currently available constables and to also include this value as a semi-constant part of node 198, with intervention supplied constables as the basic variable. This allows distinguishing situations that start with no police from those with an existing base. This variable should be coordinated with the Train police forces variable. As police forces are trained and enter duty, the semi-constant part should be increased. The target quantity for this variable may not be constant as the crime level may increase or decrease over time.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional police are seen as being needed, then the current value and all future values of node 198.1 may be left blank, with no entries placed in node 198. All previous values for node 198.1 should be reset to the last value of node 198 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional police are required (despite the fact that an increase is not currently envisioned), the proper value for node 198.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 198 should be carried forward in all future monitoring of the situation.

Because this variable affects only one intervention variable, representing bad results is easy. If a training project will not take place, remove its contribution from the date it was first entered onward. If the project stops before completion, remove its contribution from the date it stops onward.

6.2.6.5 Train police forces

This variable requires two inputs, nodes 165 and 165.1. The first node represents the number of constables available and the second node represents the total number needed. This variable affects node 139 Intervention police (different from 226 Intervention policing), with a standard delay of 28 days, node 130 Intervention LE corruption, with a standard delay of 28 days, and node 147 Intervention jobs, with a standard delay of zero. These delays reflect the time until impact is expected for training, reduced law enforcement corruption, and jobs.

If the total number required is left blank, no values are passed for this variable. The target quantity will depend on the population size, urbanization, and crime level. It should be the same as the target value in node 198.1. The best practice is to include in the target value the quantity of currently available constables and to also include this value as a constant part of node 165, with intervention trained constables as the basic variable. This allows distinguishing situations that start with no police from those with an existing base. This variable should be coordinated with the Conducting constabulary operations variable. As police forces are trained and enter duty, the semi-constant part of the latter variable should be increased. The target quantity for this variable (i.e., node 165.1) may not be constant as the crime level may increase or decrease over time.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional police are seen as being needed, then the current value and all future values of node 165.1 may be left blank, with no entries placed in node 165. All previous values for node 165.1 should be reset to the last value of node 165 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional police are required (despite the fact that an increase is not currently envisioned), the proper value for node 165.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 165 should be carried forward in all future monitoring of the situation.

Because this variable affects three intervention variables, representing bad results is difficult. If a training project will not take place, remove its contribution from the date it was first entered onward. If the project stops before completion, remove its contribution from the date it stops onward. If problems are noted with the training or recruitment process, it is possible that the new police are making the situation worse. In that case, a separate row should be used to hold negative values representing a decrease in effectiveness. The timing of these entries should be back-dated by the amount of the largest delay so that the effect appears at the proper time.

6.2.6.6 (Re)building & monitoring new police force

This variable requires two inputs, nodes 207 and 207.1. The first node represents the number of organizational units (e.g., precincts, companies, etc.) available and the second node represents the total number needed. This variable affects node 139 Intervention police (different from 226 Intervention policing), with a standard delay of 42 days. This delay reflects the time until impact is expected.

If the total number required is left blank, no values are passed for this variable. The target quantity will depend on the population size, urbanization, and crime level. It should be related to the target value in node 198.1; however, this variable relates to the organizational structure and quality of the police force. The best practice is to include in the target value the quantity of currently available units and to also include this value as a constant part of node 207, with intervention built units as the basic variable. This allows distinguishing situations that start with no police from those with an existing base. The target quantity for this variable (i.e., node 207.1) may not be constant as the crime level may increase or decrease over time; however, it is likely to be more stable than node 165.1.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional police units are seen as being needed, then the current value and all future values of node 207.1 may be left blank, with no entries placed in node 207. All previous values for node 207.1 should be reset to the last value of node 207 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional police units are required (despite the fact that an increase is not currently envisioned), the proper value for node 207.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 207 should be carried forward in all future monitoring of the situation.

Because this variable affects one intervention variables, representing bad results is relatively easy. If a new unit will not be created, remove its contribution from the date it was first entered onward. Use a separate row to hold negative values, representing monitoring that detects problems. The timing of these entries should be back-dated by the amount of the delay so that the effect appears at the proper time.

6.2.6.7 Providing advisors to police & criminal justice organizations & supporting establishment of operations

This variable requires two inputs, nodes 208 and 208.1. The first node represents the number of advisors available and the second node represents the total number needed. This variable affects node 139 Intervention police (different from 226 Intervention policing), with a standard delay of 28 days. This delay reflects the time until impact is expected.

If the total number required is left blank, no values are passed for this variable. The target quantity will depend on the numbers of organizations and their sizes. The target quantity for this variable may not be constant over time.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional advisors are seen as being needed, then the current value and all future values of node 208.1 may be left blank, with no entries placed in node 208. All previous values for node 208.1 should be reset to the last value of node 208 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional advisors are required (despite the fact that an increase is not currently envisioned), the proper value for node 208.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 208 should be carried forward in all future monitoring of the situation.

Because this variable affects one intervention variable, representing bad results is easy. If new advisors will not be supplied, remove their numbers from the date they were first entered onward.

6.2.6.8 Create local governments

This variable requires two inputs, nodes 162 and 162.1. The first node represents the number of villages, towns, counties, and cities with local governments and the second node represents the total number needed. This variable affects node 127 Intervention justice, with a standard delay of 28 days, node 129 Intervention central authority, with a standard delay of 42 days, and node 144 Intervention social services, with a standard delay of 84 days. These delays reflect the time until impact is expected in the areas of justice delivery, perception of central authority, and provision of social services, respectively.

If the total number required is left blank, no values are passed for this variable. If the situation does not require that intervention personnel provide local government services initially, the target quantity is a count of the total number of locations requiring a local government. The value of node 162 should equal the number of governments in place and being created. If some of the locations require interim governments provided by intervention personnel, then the target quantity is twice the count of locations. The value of node 162 is similar to the first case; however the counting method is different. A government consisting of intervention personnel counts as one and a government consisting of local personnel counts as two. This permits interim situations that are better than no local governments, but not as good as 100% indigenous local governments.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional governments are seen as being needed, then the current value and all future values of node 162.1 may be left blank, with no entries placed in node 162. All previous values for node 162.1 should be reset to the last value of node 162 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional governments are required (despite the fact that an increase is not currently envisioned), the proper value for node 162.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 162 should be carried forward in all future monitoring of the situation. If some local governments are staffed by intervention forces that will be withdrawn, the final value for node 162 should be adjusted accordingly.

Because this variable affects three intervention variables, representing bad results is difficult. If new governments will not be created, remove their numbers from the dates they were first entered onward. If an indigenous government fails and has to be replaced by an intervention staffed government, subtract one from node 162 at the date of failure minus the central authority delay.

6.2.6.9 Educate local governments

This variable requires two inputs, nodes 163 and 163.1. The first node represents the number of villages, towns, counties, and cities with local governments and the second node represents the total number needed. This variable affects node 127 Intervention justice, with a standard delay of 0 days, node 129 Intervention central authority, with a standard delay of 14 days, and node 144 Intervention social services, with a standard delay of 84 days. These delays reflect the time until impact is expected in the areas of justice delivery, perception of central authority, and provision of social services, respectively.

If the total number required is left blank, no values are passed for this variable. The target quantity is a count of the total number of local governments. The value of node 163 should equal the number of governments having sufficient education and being educated.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional governments are seen as needing education, then the current value and all future values of node 163.1 may be left blank, with no entries placed in node 163. All previous values for node 163.1 should be reset to the last value of node 163 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional governments require education (despite the fact that an increase is not currently envisioned), the proper value for node 163.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 163 should be carried forward in all future monitoring of the situation.

Because this variable affects three intervention variables, representing bad results is difficult. If new governments will not be educated, remove their numbers from the dates they were first entered onward. If a government needs reeducation, subtract one from node 163 at the date of failure minus the central authority delay.

6.2.6.10 Supply local governments

This variable requires two inputs, nodes 164 and 164.1. The first node represents the number of villages, towns, counties, and cities with local governments and the second node represents the total number needed. This variable affects node 127 Intervention justice, with a standard delay of 0 days, node 129 Intervention central authority, with a standard delay of 0 days, and node 144 Intervention social services, with a standard delay of 0 days. These delays reflect the immediate impact in all areas.

If the total number required is left blank, no values are passed for this variable. The target quantity is a count of the total number of local governments. The value of node 164 should equal the number of governments having sufficient supplies and being supplied.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional governments are seen as needing supplies, then the current value and all future values of node 164.1 may be left blank, with no entries placed in node 164. All previous values for node 164.1 should be reset to the last value of node 164 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional governments require supplies (despite the fact that an increase is not currently envisioned), the proper value for node 164.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 164 should be carried forward in all future monitoring of the situation.

Because this variable affects three intervention variables, all with the same zero delay, representing bad results is relatively easy. If new governments will not be supplied, remove their numbers. If a government needs resupply, subtract one from node 164.

6.2.6.11 Establishing, staffing & funding effective transition national government

This variable requires a single input, node 199, which contains a value between 0.0 and 1.0. This variable affects node 129 Intervention central authority, with a delay of 28 days, and node 224 Intervention transition, with a delay of 28 days. These delays represent delays in impact once the work is complete. If a transition national government is not required, this intervention is left blank.

If the input is left blank, no values are passed for this variable. The user could leave this value at 0.0 until the transition national government is in place; however, a better practice would be to increase the value in stages as progress is made toward the goal. Incremental increases better model the public's reaction to progress than does a single dramatic increase. However, the staging should leave a large increase (0.3 - 0.5) for the final increment.

Negative changes are simply represented as regressions in the value toward 0.0.

6.2.6.12 Providing advisors to national government officials

This variable requires two inputs, nodes 203 and 203.1. The first node represents the number of advisors available and the second node represents the total number needed. This variable affects node 129 Intervention central authority, with a standard delay of 0 days, and node 224 Intervention transition, with a standard delay of 0 days. These delays reflect the time until impact is expected.

If the total number required is left blank, no values are passed for this variable. The target quantity will depend on the numbers of organizations and their sizes. The target quantity for this variable may not be constant over time.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional advisors are seen as being needed, then the current value and all future values of node 203.1 may be left blank, with no entries placed in node 203. All previous values for node 203.1 should be reset to the last value of node 203 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional advisors are required (despite the fact that an increase is not currently envisioned), the proper value for node 203.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 203 should be carried forward in all future monitoring of the situation.

Because this variable affects two intervention variables with the same delay, representing bad results is relatively easy. If new advisors will not be supplied, remove their numbers from the date they were first entered onward.

6.2.6.13 Monitoring and reporting on corruption by government officials

This variable requires two inputs, nodes 204 and 204.1. The first node represents the number of monitors available and the second node represents the total number needed. This variable affects node 130 Intervention LE corruption, with a standard delay of 28 days, node 227 Intervention govt corruption, with a standard delay of 168 days, and node 225 Intervention social services corruption, with a standard delay of 168 days. These delays reflect the time until impact is expected. Note the pessimistic view on effects of reporting government and social services corruption.

If the total number required is left blank, no values are passed for this variable. The target quantity will depend on the numbers of organizations and their sizes. The target quantity for this variable may not be constant over time.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional monitors are seen as being needed, then the current value and all future values of node 204.1 may be left blank, with no entries placed in node 204. All previous values for node 204.1 should be reset to the last value of node 204 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional monitors are required (despite the fact that an increase is not currently envisioned), the proper value for node 204.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 204 should be carried forward in all future monitoring of the situation.

Because this variable affects three intervention variables with different delays, representing bad results is difficult. If new monitors will not be supplied, remove their numbers from the date they were first entered onward. The desired process is for the number of required monitors to decrease over time and the number of actual monitors follow; however, it is possible that successful monitors will be made unwelcome and leave. The impact of this reduction is not likely to be delayed as would be the impact of an increase. Therefore, it is probably wise to backdate the reduction by at least the smallest delay value.

6.2.6.14 Establishing a mechanism for constitutional reform

This variable requires a single input, node 200, which contains a value between 0.0 and 1.0. This variable affects node 129 Intervention central authority, with a delay of 28 days, and node 224 Intervention transition, with a delay of 28 days. These delays represent delays in impact once the work is complete. If constitutional reform is not required, this intervention is left blank.

If the input is left blank, no values are passed for this variable. The user could leave this value at 0.0 until the constitution is reformed; however, a better practice would be to increase the value in stages as progress is made toward the goal. Incremental increases better model the public's reaction to progress than does a single dramatic increase. However, the staging should leave a large increase (0.3 - 0.5) for the final increment.

Negative changes are simply represented as regressions in the value toward 0.0.

6.2.6.15 Conducting nationwide elections

This variable requires two inputs, nodes 201 and 201.1. The first node represents the number of elections completed or under way and the second node represents the total number needed. This variable affects node 129 Intervention central authority, with a delay of 42 days, and node 224 Intervention transition, with a delay of 42 days. These delays reflect the time until impact is expected.

If the total number required is left blank, no values are passed for this variable. The target quantity will depend on the legal situation. For example, elections might be required for a transition government, constitutional reform, and for a final government. The user could use integer values for node 201, increasing as each election is held; however, a better practice would be to increase the value in fractions. For example, an information campaign supporting the election may be required; candidates for office have to be chosen in some process; a period of time for campaigning or discussing is needed; and the elections have to be held. A sequence of {0.1, 0.3, 0.5, 1.0} added to the previous value of node 201 might be used to indicate the start of each these phases. Incremental increases better model the public's reaction to progress than does a single dramatic increase.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional elections are seen as being needed, then the current value and all future values of node 201.1 may be left blank, with no entries placed in node 201. All previous values for node 201.1 should be reset to the last value of node 201 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional elections are required (despite the fact that an increase is not currently envisioned), the proper value for node 201.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 201 should be carried forward in all future monitoring of the situation.

Because this variable affects two intervention variables with the same delays, representing bad results is relatively easy. If the election process is delayed, the last increment that was entered should be moved forward in time to its new beginning. If a delay is excessive, there will be negative repercussions and the size of the last increment should be reduced or a perhaps made into a negative increment. If an election is cancelled, a negative increment should definitely be entered (unless the current value for node 201 is zero, in which case a negative increment will have no effect). The user will have to determine at a later time whether a particular election has created a situation that entirely makes up for previous negative increments or whether that will have to wait for the final election.

6.2.6.16 Training newly elected national political leaders

This variable requires two inputs, nodes 202 and 202.1. The first node represents the number of leaders who are trained or are in training and the second node represents the total number of leaders. This variable affects node 129 Intervention central authority, with a delay of 14 days, and node 224 Intervention transition, with a delay of 14 days. These delays reflect the time until impact is expected.

If the total number required is left blank, no values are passed for this variable. The target quantity is a count of the total number of national political leaders. The value of node 202 should equal the number of leaders having sufficient training and being trained.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional leaders are seen as needing training, then the current value and all future values of node 202.1 may be left blank, with no entries placed in node 202. All previous values for node 202.1 should be reset to the last value of node 202 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional leaders require training (despite the fact that an increase is not currently envisioned), the proper value for node 202.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 202 should be carried forward in all future monitoring of the situation.

Because this variable affects two intervention variables with the same delays, representing bad results is relatively easy. If new leaders will not be trained, remove their numbers from the dates they were first entered onward.

6.2.6.17 Transferring control of government functions to host nation officials

This variable requires a single input, node 205, which contains a value between 0.0 and 1.0. This variable affects node 129 Intervention central authority, with a delay of 0 days, and node 224 Intervention transition, with a delay of 0 days. These delays represent delays in impact once the work is complete. If transfer of control is not required, this intervention is left blank.

If the input is left blank, no values are passed for this variable. The user could leave this value at 0.0 until control is transferred; however, a better practice would be to increase the value in stages as progress is made toward the goal. Incremental increases better model the public's reaction to progress than does a single dramatic increase. Stages might correspond to individual government functions, such as control of penal functions, police functions, government ministries, and the military. However, the staging should leave a large increase (0.3 - 0.5) for the final increment.

Negative changes are simply represented as regressions in the value toward 0.0.

6.2.6.18 Monitoring government powersharing arrangements

This variable requires two inputs, nodes 206 and 206.1. The first node represents the number of monitors available and the second node represents the total number needed. This variable affects node 129 Intervention central authority, with a standard delay of 0 days and node 224 Intervention transition, with a standard delay of 0 days. If there are no powersharing arrangements, this variable is not needed.

If the total number required is left blank, no values are passed for this variable. The target quantity will depend on the situation. The target quantity for this variable may not be constant over time.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional monitors are seen as being needed, then the current value and all future values of node 206.1 may be left blank, with no entries placed in node 206. All previous values for node 206.1 should be reset to the last value of node 206 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional monitors are required (despite the fact that an increase is not currently envisioned), the proper value for node 206.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 206 should be carried forward in all future monitoring of the situation.

Because this variable affects two intervention variables with no delays, representing bad results is easy. If new monitors will not be supplied, remove their numbers. The desired process is for the number of required monitors to decrease over time and the number of actual monitors follow; however, it is possible that successful monitors will be made unwelcome and leave. Therefore, it is possible that the user will reduce the quantity in node 206 without reducing the quantity in node 206.1.

6.2.6.19 Conducting war crimes investigations, tribunals, etc.

This variable requires two inputs, nodes 197 and 197.1. The first node represents the number of completed and ongoing investigations and trials and the second node represents the total number needed. This variable affects node 140 Intervention govt military, with a standard delay of 728 days and node 168 Intervention govt corruption, with a standard delay of 168 days. These delays represent the extremely slow process, beginning with discussions that such trials are necessary, with the earlier impact on government corruption caused by increasing belief that something will be done. If there are no war crimes, this variable is not needed.

If the total number required is left blank, no values are passed for this variable. The target quantity will depend on the situation. The user should probably use fractional values to indicate stages in the process: 0.1 when the prospect of investigations is first seriously discussed; 0.2 when the process is defined (venue, rules of evidence, etc.); 0.3 when the formal investigation begins; 0.5 when the trial begins; 0.9 when a verdict is reached; 1.0 when the sentence (if any) is carried out. However, in this case, the delays should be reduced to allow for earlier impact of the partial results. With the suggested fractional values or any finer breakdown, the delays can be reduced to a week or two.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional investigations are seen as being needed, then the current value and all future values of node 197.1 may be left blank, with no entries placed in node 197. All previous values for node 197.1 should be reset to the last value of node 197 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional investigations are required (despite the fact that an increase is not currently envisioned), the proper value for node 197.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 197 should be carried forward in all future monitoring of the situation.

Because this variable affects two intervention variables with large and different delays, representing bad results is difficult. If a particular investigation is delayed and fractional numbers are not being used, the initial entry time should be moved forward to reflect the delay. The use of fractional values and shorter delays means that no particular action is required to reflect a delay. The delay in entering the next fractional increment adequately reflects the delay in the process. If a particular investigation concludes early (e.g., a decision is made not to proceed to trial) and this is widely perceived as a fair and just result, then the increment should be immediately increased to 1.0. (In the case of not using fractional values, the only option is to move the entry for this investigation back in time.) If an investigation concludes early or has a result that is widely perceived as grossly unjust, the user may consider using a negative increment.

6.2.6.20 Assisting in establishing/reforming legitimate legal system

This variable requires a single input, node 211, which contains a value between 0.0 and 1.0. This variable affects node 127 Intervention justice, with a delay of 364 days. This delay represents delays in impact once the work is complete. If no reform is required, this intervention is left blank.

If the input is left blank, no values are passed for this variable. The user could leave this value at 0.0 until legal reform is complete; however, a better practice would be to increase the value in stages as progress is made toward the goal. Incremental increases better model the public's reaction to progress than does a single dramatic increase. Stages might correspond to visible steps, such as convening a panel or completion of deliberations, or that might simply represent estimates of progress with the passage of time. However, the staging should leave a large increase (0.3 - 0.5) for the final increment.

Negative changes are simply represented as regressions in the value toward 0.0.

6.2.6.21 Assisting in establishing humane penal systems

This variable requires two inputs, nodes 210 and 210.1. The first node represents a measure of the effort under way and accomplished and the second node represents the target value. This variable affects node 127 Intervention justice, with a standard delay of 168 days.

If the total number required is left blank, no values are passed for this variable. The target quantity and its unit of measure will depend on the situation. In a simple situation, this may be the number of prisons that are needed in the country, with node 210 containing the number that are in adequate condition or are in the process of being refurbished. In more complex situations, prison guards and management may need retraining in humane standards along with facility improvements. The user may need to devise a combination measure that results in a simple fraction as a value for node 210 and 1.0 as the target value in node 210.1.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional improvements are seen as being needed, then the current value and all future values of node 210.1 may be left blank, with no entries placed in node 210. All previous values for node 210.1 should be reset to the last value of node 210 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional improvements are required (despite the fact that an increase is not currently envisioned), the proper value for node 210.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 210 should be carried forward in all future monitoring of the situation.

Because this variable affects one intervention variable, representing bad results is relatively. However, the details will depend on the measure being used.

6.2.6.22 Monitoring human rights practices

This variable requires two inputs, nodes 212 and 212.1. The first node represents the number of monitors available and the second node represents the total number needed. This variable affects node 127 Intervention justice, with a standard delay of 28 days.

If the total number required is left blank, no values are passed for this variable. The target quantity will depend on the situation. The target quantity for this variable may not be constant over time.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional monitors are seen as being needed, then the current value and all future values of node 212.1 may be left blank, with no entries placed in node 212. All previous values for node 212.1 should be reset to the last value of node 212 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional monitors are required (despite the fact that an increase is not currently envisioned), the proper value for node 212.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 212 should be carried forward in all future monitoring of the situation.

Because this variable affects one intervention variables, representing bad results is easy. If new monitors will not be supplied, remove their numbers. The desired process is for the number of required monitors to decrease over time and the number of actual monitors follow; however, it is possible that successful monitors will be made unwelcome and leave. Therefore, it is possible that the user will reduce the quantity in node 212 without reducing the quantity in node 212.1.

6.2.6.23 Creating or reforming & monitoring military

This variable requires two inputs, nodes 209 and 209.1. The first node represents the number of organizational units (e.g., precincts, companies, etc.) available and the second node represents the total number needed. This variable affects node 140 Intervention govt military, with a standard delay of 42 days. This delay reflects the time until impact is expected.

If the total number required is left blank, no values are passed for this variable. The target quantity will depend on the country's size, population and geopolitical threats. It should be related to the target value in node 166.1; however, this variable relates to the organizational structure and quality of the military force. The best practice is to include in the target value the quantity of currently available units and to also include this value as a constant part of node 209, with intervention built units as the basic variable. This allows distinguishing situations that start with no military from those with an existing base.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional military units are seen as being needed, then the current value and all future values of node 209.1 may be left blank, with no entries placed in node 209. All previous values for node 209.1 should be reset to the last value of node 209 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional military units are required (despite the fact that an increase is not currently envisioned), the proper value for node 209.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 209 should be carried forward in all future monitoring of the situation.

Because this variable affects one intervention variables, representing bad results is relatively easy. If a new unit will not be created, remove its contribution from the date it was first entered onward. Use a separate row to hold negative values, representing monitoring that detects problems. The timing of these entries should be back-dated by the amount of the delay so that the effect appears at the proper time.

6.2.6.24 Train military forces

This variable requires two inputs, nodes 166 and 166.1. The first node represents the number of troops available and the second node represents the total number needed. This variable affects node 140 Intervention govt military, with a standard delay of 28 days and node 147 Intervention jobs, with a standard delay of zero. These delays reflect the time until impact is expected for training and jobs.

If the total number required is left blank, no values are passed for this variable. The target quantity will depend on the country's size, population and geopolitical threats. The best practice is to include in the target value the quantity of currently available troops and to also include this value as a constant part of node 166, with intervention trained troops as the basic variable. This allows distinguishing situations that start with no military from those with an existing base.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional troops are seen as being needed, then the current value and all future values of node 166.1 may be left blank, with no entries placed in node 166. All previous values for node 166.1 should be reset to the last value of node 166 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional troops are required (despite the fact that an increase is not currently envisioned), the proper value for node 166.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 166 should be carried forward in all future monitoring of the situation.

Because this variable affects two intervention variables, representing bad results is difficult. If a training project will not take place, remove its contribution from the date it was first entered onward. If the project stops before completion, remove its contribution from the date it stops onward. If problems are noted with the training or recruitment process, it is possible that the new troops are making the situation worse. In that case, a separate row should be used to hold negative values representing a decrease in effectiveness. The timing of these entries should be back-dated by the amount of the largest delay so that the effect appears at the proper time.

6.2.7 Miscellaneous Sector Model

The miscellaneous sector contains four inputs that relate to information flows.

6.2.7.1 Promoting civic education

This variable requires two inputs, nodes 214 and 214.1. The first node represents the number of civic education projects completed and under way and the second node represents the total number needed. This variable affects node 138 Intervention media, with a standard delay of 28 days. These delays reflect the time until impact is expected. If no civic education is undertaken, this variable can be left blank.

If the total number required is left blank, no values are passed for this variable. Civic education projects include get out the vote campaigns, as well as education on the rights and responsibilities of citizens and on particular issues. The target quantity will depend on the situation. Because the total number of projects is hard to estimate, especially when the length of the intervention is uncertain, the user may want to use rates, rather than cumulative numbers. For example, during one phase of an intervention, 30 projects per month might be an appropriate number, whereas during another phase, 10 projects per month might be right. Thus if the intervention could only mount 10 projects per month, the effect would vary depending on the phase of the intervention.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional education projects are seen as being needed, then the current value and all future values of node 214.1 may be left blank, with no entries placed in node 214. Unless rates are being used, all previous values for node 214.1 should be reset to the last value of node 214 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional education projects are required (despite the fact that an increase is not currently envisioned), the proper value for node 214.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 214 should be carried forward in all future monitoring of the situation (if rates are not being used). If rates are used, set the value of 214.1 as above and leave the values of 214 as zero.

Because this variable affects one intervention variable, representing bad results is relatively easy. If an education project will not take place, remove its contribution from the date it was first entered onward. If the project stops before completion, remove its contribution from the date it stops onward. If a project is making the situation worse, a separate row should be used to hold negative values representing a decrease in effectiveness. The timing of these entries should be back-dated by the amount of the delay so that the effect appears at the proper time.

6.2.7.2 Sponsoring journalist training & professionalization

This variable requires two inputs, nodes 215 and 215.1. The first node represents the number of civic education projects completed and under way and the second node represents the total number needed. This variable affects node 138 Intervention media, with a standard delay of 14 days. This delay reflects the time until impact is expected. If no journalist training is undertaken, this variable can be left blank.

If the total number required is left blank, no values are passed for this variable. The target quantity of journalists will depend on the size of the population. The values for node 215 should include the number of journalists judged not to need training, those who have completed training, and those being trained. The user will note that this assumes a constant pool of reporters, with none leaving or entering the pool. Naturally, over the long haul this assumption is incorrect; however, it may be adequate for the duration of most interventions.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional journalists are seen as needing training, then the current value and all future values of node 215.1 may be left blank, with no entries placed in node 215. All previous values for node 215.1 should be reset to the last value of node 215 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional journalists need training (despite the fact that an increase is not currently envisioned), the proper value for node 215.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 215 should be carried forward in all future monitoring of the situation.

Because this variable affects one intervention variable, representing bad results is relatively easy. If a number of journalists will not be trained, remove their contribution from the date they were first entered onward. If some journalists are making the situation worse, a separate row should be used to hold negative values representing a decrease in effectiveness. The timing of these entries should be back-dated by the amount of the delay so that the effect appears at the proper time.

6.2.7.3 Conducting benign public information operations

This variable requires a single input, node 213, which contains a value between 0 (%) and 100 (%). This variable affects node 223 Intervention PR, with a delay of 7 days. This delay represents a delay in popular awareness of the operation. This variable may be used intermittently.

If the input is left blank, no values are passed for this variable. This variable is one of two special factors that pass weights, rather than values. The value that is assumed for this variable is +3.0, because, by definition, this variable carries favorable value. The value of the weight that is passed represents the percentage of the populace that is aware of the message. Thus for some event that is universally known (such as a successful national election) that carries a favorable message, the user would enter 100 into the date of its occurrence. A local occurrence, might be known to 100% of a town; however, on the national level, that might only be a 5% weight, depending on the relative size of the town. Two such local occurrences would be scored as 10 unless there were a valid reason to reduce the weight because of overlap. A benign operation that reaches 40% of the population would be scored as 40.

Events that are meant to be positive events, but that are viewed negatively, are not entered in this variable, but in node 222.

6.2.7.4 Negative impact of intervention (rapes, etc.)

This variable requires a single input, node 222, which contains a value between 0 (%) and 100 (%). This variable affects node 223 Intervention PR, with a delay of 0 days. This delay represents a delay in popular awareness of the operation. Note that it is less than that of node 213, as bad news generally travels faster than good news. This variable may be used intermittently.

If the input is left blank, no values are passed for this variable. This variable is one of two special factors that pass weights, rather than values. The value that is assumed for this variable is -3.0, because, by definition, this variable carries unfavorable value. The value of the weight that is passed represents the percentage of the populace that is aware of the message. Thus for some event that is universally known (such as the Abu Grabh prison scandal in Iraq) that carries an unfavorable message, the user would enter 100 into the date of its occurrence. A local occurrence, might be known to 100% of a town; however, on the national level, that might only be a 5% weight, depending on the relative size of the town. Two such local occurrences would be scored as 10 unless there were a valid reason to reduce the weight because of overlap. A terrorist operation, news of which reaches 40% of the population, would be scored as 40.

Events that are meant to be negative events, but that have positive results, are not entered in this variable, but in node 222. It might be possible to have a single event cause entries in both variables. For example, if a terrorist strike caused universal revulsion, leading to loss of popular support for the terrorists, the user could enter a weight in node 222 and a weight in node 213. This would model the negative and positive aspects of the event.

6.2.8 Movement Sector Model

The movement sector contains one input for reducing undesirable population movement.

6.2.8.1 Reducing likelihood of population movements

This variable requires a single input, node 216, which contains a value between 0.0 and 1.0. This variable affects node 132 Intervention displaced pop, with a delay of 7 days. This delay represents delays in impact. If no danger of population movements exists, this intervention is left blank.

If the input is left blank, no values are passed for this variable. The actions that might be taken in this intervention are so various (including armed forces preventing movement and armed forces ensuring security for returning refugees) that this variable simply represents an estimate of success.

Negative changes are simply represented as regressions in the value toward 0.0.

6.2.9 Needs Sector Model

The needs sector contains 10 inputs that relate to improving the situation with respect to the physical needs of the population.

6.2.9.1 Prepositioning humanitarian relief stocks

This variable requires two inputs, nodes 218 and 218.1. The first node represents the number of civic education projects completed and under way and the second node represents the total number needed. This variable affects node 141 Intervention health, with a standard delay of 0 days, node 143 Intervention water, with a standard delay of 0 days, node 136 Intervention food, with a standard delay of 0 days, and node 142 Intervention housing, with a standard delay of 0 days. These delays reflect the time until impact is expected. If no prepositioning is undertaken, this variable can be left blank.

If the total number required is left blank, no values are passed for this variable. The target quantity will depend on the size of the disaster. If at some later time, additional prepositioning is needed, the user has to decide whether this represents a quantity that should have been included in the original total requirement or represents a new need. In the first case, the previous values for node 218.1 should be revised upward and the ISSM recalculated. In the second case, new values for node 218.1 should have an increased value and the old values for node 218 should be carried forward, incremented by the actual new prepositioning. In this case, the result will be a decline in value until the prepositioning is completed, which will accurately represent the situation. The values for node 218 should be cumulative.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional prepositioning is needed, then the current value and all future values of node 218.1 may be left blank, with no entries placed in node 218. All previous values for node 218.1 should be reset to the last value of node 218 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional prepositioning is needed (despite the fact that this is not currently envisioned), the proper value for node 218.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 218 should be carried forward in all future monitoring of the situation.

Because this variable affects four intervention variables, all with zero delays, representing bad results is easy. If prepositioned stocks are stolen, destroyed or spoiled, reduce the number in node 218 by the proper amount at the time of occurrence.

6.2.9.2 Medical treatment

This variable requires two inputs, nodes 150 and 150.1. The first node represents the quantity treated and the second node represents the total number needing treatment. This variable affects node 141 Intervention health, with a standard delay of 0 days. This delay reflects the time until impact is expected. If no medical treatment is undertaken, this variable can be left blank.

If the total number required is left blank, no values are passed for this variable. The target quantity will depend on the size of the disaster. If at some later time, additional medical treatment is needed, the user has to decide whether this represents a quantity that should have been included in the original total requirement (e.g., a decision to add inoculations to previous treatment of symptoms) or represents a new need (e.g., a new epidemic strikes). In the first case, the previous values for node 150.1 should be revised upward and the ISSM recalculated. In the second case, new values for node 150.1 should have an increased value and the old values for node 150 should be carried forward, incremented by the actual new medical treatment. In this case, the result will be a decline in value until the medical treatment is completed, which will accurately represent the situation. The values for node 150 should be cumulative.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional treatment is needed, then the current value and all future values of node 150.1 may be left blank, with no entries placed in node 150. All previous values for node 150.1 should be reset to the last value of node 150 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional treatment is needed (despite the fact that this is not currently envisioned), the proper value for node 150.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 150 should be carried forward in all future monitoring of the situation.

Because this variable affects one intervention variable with zero delay, representing bad results is easy. If treatments make the situation worse, use a separate row to include negative increments to node 150 by the proper amount at the time of occurrence.

6.2.9.3 Food importation

This variable requires two inputs, nodes 151 and 151.1. In the simplest case, the first node contains the amount imported to date and the second node contains the total amount to be imported. The units will be in tons or thousands of tons [Ktons], or a similar metric value. The user should take advantage of his ability to record his choice of units to avoid later confusion. This variable affects node 136, Intervention food, with a standard delay of 7 days. This delay reflects the requirement to distribute the food after it is imported. If food is not a problem, this variable will not be needed.

If the total number required is left blank, no values are passed for this variable.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no future food importation is seen as being needed, then the current value and all future values of node 151.1 may be left blank, with no entries placed in node 151. Unless rates are used (see below), all previous values for node 151.1 should be reset to the last (maximum) value of node 151 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further food importation should be performed (despite the fact that it is not currently envisioned), the proper value for node 151.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 151 should be carried forward in all future monitoring of the situation.

Because this variable affects one intervention variable, representing bad outcomes is easy. If the imported food is stolen, destroyed or spoiled, reduce the value in node 151 by the proper amount at the time that food was entered into the node. If food importation causes other problems, such as displacement of food merchants, the remedy is uncertain.

In complex interventions, the simple case above is not appropriate. The target quantity should not be the amount imported, but the total food needs. The value of node 151 should include the amount imported and the amount on hand from domestic sources. Thus the ratio represents the overall food situation, not just the importation gap.

In interventions of longer duration, the values of nodes 151 and 151.1 should be rates, rather than absolute quantities. For example, in a 10 year intervention, the total food needs for the entire intervention should not be the target quantity. If all daily food needs were met, at the end of the first year 10% of the target quantity would have been met, which would score as a bad result instead of the 100% that would be proper. Calculating rates as a function of imports is more difficult and would require the use of separate rows. In general, if Z is the total weekly (monthly) food need and X is the weekly (monthly) domestically available food supply, then $Z - X$ is the weekly (monthly) importation requirement. If Y is the actual amount imported in a given week (month), the $(X + Y)/Z$ represents the fraction of the food need that is being met. Using one row for the X values and one row for the Y values to produce values for node 151 and using the Z values for node 151.1 will yield the desired result.

6.2.9.4 Food distribution

This variable requires two inputs, nodes 152 and 152.1. In the simplest case, the first node contains the amount distributed to date and the second node contains the total amount to be distributed. The units will be in tons or thousands of tons [Ktons], or a similar metric value. The user should take advantage of his ability to record his choice of units to avoid later confusion. This variable affects node 136, Intervention food, with a standard delay of 0 days. This delay reflects the immediate impact. If food distribution is not a problem, this variable will not be needed.

If the total number required is left blank, no values are passed for this variable. Note that the amount requiring distribution may equal the amount imported (see above). It may also be less than the amount imported if the local distribution chain is not impaired. Or it may be more than the amount imported, if the local distribution chain is inadequate for handling some of the locally produced food (e.g., a distribution intervention may be required even if food is produced in sufficient quantities within the country).

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no future food distribution is seen as being needed, then the current value and all future values of node 152.1 may be left blank, with no entries placed in node 152. Unless rates are used (see below), all previous values for node 152.1 should be reset to the last (maximum) value of node 152 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further food distribution should be performed (despite the fact that it is not currently envisioned), the proper value for node 152.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 152 should be carried forward in all future monitoring of the situation.

Because this variable affects one intervention variable, representing bad outcomes is easy. If the distributed food is stolen, destroyed or spoiled, reduce the value in node 152 by the proper amount. If food distribution causes other problems, such as displacement of food merchants, the remedy is uncertain.

In complex interventions, the simple case above is not appropriate. The target quantity should not be the amount distributed, but the total food needs. The value of node 152 should include the amount distributed and the amount on hand from domestic sources not requiring distribution. Thus the ratio represents the overall food situation, not just the distribution gap.

In interventions of longer duration, the values of nodes 152 and 152.1 should be rates, rather than absolute quantities (see the importation discussion above). Calculating rates as a function of distribution is more difficult and would require the use of separate rows. In general, if Z is the total weekly (monthly) food need and X is the weekly (monthly) domestically available food supply that doesn't require distribution, then $Z - X$ is the weekly (monthly) distribution requirement. If Y is the actual amount distributed in a given week (month), the $(X + Y)/Z$ represents the fraction of the food need that is being met. Using one row for the X values and one row for the Y values to produce values for node 152 and using the Z values for node 152.1 will yield the desired result.

6.2.9.5 Water distribution

This variable requires two inputs, nodes 153 and 153.1. In the simplest case, the first node contains the amount distributed to date and the second node contains the total amount to be distributed. The units will be in tons or thousands of tons [Ktons], or a similar metric value. The user should take advantage of his ability to record his choice of units to avoid later confusion. This variable affects node 153, Intervention water, with a standard delay of 0 days. This delay reflects the immediate impact. If water distribution is not a problem, this variable will not be needed.

If the total number required is left blank, no values are passed for this variable. There is not a separate variable for production/purification or importation of water.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no future water distribution is seen as being needed, then the current value and all future values of node 153.1 may be left blank, with no entries placed in node 153. Unless rates are used (see below), all previous values for node 153.1 should be reset to the last (maximum) value of node 153 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further water distribution should be performed (despite the fact that it is not currently envisioned), the proper value for node 153.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 153 should be carried forward in all future monitoring of the situation.

In complex interventions, the simple case above is not appropriate. The target quantity should not be the amount distributed, but the total water needs. The value of node 153 should include the amount distributed and the amount on hand from domestic sources not requiring distribution. Thus the ratio represents the overall water situation, not just the distribution gap.

In interventions of longer duration, the values of nodes 153 and 153.1 should be rates, rather than absolute quantities (see the food importation discussion above). Calculating rates as a function of distribution is more difficult and would require the use of separate rows. In general, if Z is the total weekly (monthly) water need and X is the weekly (monthly) domestically available water supply that doesn't require distribution, then Z – X is the weekly (monthly) distribution requirement. If Y is the actual amount distributed in a given week (month), the (X + Y)/Z represents the fraction of the water need that is being met. Using one row for the X values and one row for the Y values to produce values for node 153 and using the Z values for node 153.1 will yield the desired result.

6.2.9.6 Providing temporary shelter/housing

This variable requires two inputs, nodes 156 and 156.1. The first node represents the number of people housed and the second node represents the total number needing shelter. This variable affects node 142 Intervention housing, with a standard delay of 0 days. This delay reflects the time until impact is expected. If no shelter/housing projects are needed, this variable can be left blank.

If the total number required is left blank, no values are passed for this variable. The minimal target quantity is the number of people needing shelter. A better target is the entire population. With this interpretation, the values for node 156 should include the number people with permanent housing and those who are being provided temporary shelter. This interpretation allows comparisons between situations with massive displacements and those with smaller problems. A further refinement is possible by counting those with temporary shelter as half their actual numbers. Thus, even if all those needing shelter have temporary shelter, moving them to permanent shelter will improve the fraction.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional shelter is seen as needed, then the current value and all future values of node 156.1 may be left blank, with no entries placed in node 156. All previous values for node 156.1 should be reset to the last value of node 156 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional shelter is needed (despite the fact that an increase is not currently envisioned), the proper value for node 156.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 156 should be carried forward in all future monitoring of the situation.

6.2.9.7 Resettlement processes

This variable requires two inputs, nodes 155 and 155.1. The first node represents the number of people resettled and the second node represents the total number needing resettlement. This variable affects node 132 Intervention displaced pop, with a standard delay of 84 days. This delay reflects the time for the resettlement to be accomplished. If there are no displaced people, this variable can be left blank.

If the total number required is left blank, no values are passed for this variable. The minimal target quantity is the number of people needing resettlement. A better target is the entire population. With this interpretation, the values for node 155 should include the number people living in their own towns and those who are being permitted/induced to return to their own towns. This interpretation allows comparisons between situations with massive displacements and those with smaller problems.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional resettlement is seen as needed, then the current value and all future values of node 155.1 may be left blank, with no entries placed in node 155. All previous values for node 155.1 should be reset to the last value of node 155 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional resettlement is needed (despite the fact that an increase is not currently envisioned), the proper value for node 155.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 155 should be carried forward in all future monitoring of the situation.

Because this variable affects one intervention variable with a large delay, representing bad results is relatively easy. If a particular resettlement project is delayed, move its entry forward in time to synchronize with its new expected completion. If it is cancelled, remove its contribution from its entry date forward. If resettlements make the situation worse, there may be no easy way to account for that.

6.2.9.8 Negotiating bureaucracies to get relief

This variable requires two inputs, nodes 154 and 154.1. The first node represents the number of people served and the second node represents the total number needing service. This variable affects node 144 Intervention social services, with a standard delay of 0 days. This delay reflects the time for impact.

If the total number required is left blank, no values are passed for this variable. The target quantity is the number of people needing service in the given time period. The value for node 154 is the number served in that time period. Ideally, the value in node 154.1 will decline to zero by the end of the intervention.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional negotiation is seen as needed, then the current value and all future values of node 154.1 may be left blank, with no entries placed in node 154. If it is judged that additional resettlement is needed (despite the fact that an increase is not currently envisioned), the proper value for node 154.1 should be reassessed and reset (with workbook recalculation). This value and a value of zero for node 154 should be carried forward in all future monitoring of the situation.

Because this variable affects one intervention variable, representing bad results is easy. If negotiations make the situation worse, use an extra row to include negative numbers to counteract some of the positive contribution.

6.2.9.9 Coordinating NGO activities

This variable requires a single input, node 217, which contains a value between 0.0 and 1.25. This variable affects node 136 Intervention food, node 141 Intervention health, node 238 Intervention health infrastructure, node 142 Intervention housing, and node 143 Intervention water.

If the input is left blank, a value of 1.0 is passed for this variable. This variable is one of five special factors that act as multipliers, rather than supplying values to a weighted average. Each of the nodes that this node affects has a value that it receives from other inputs. That value is then multiplied by the node 217 value (actually the arithmetic is slightly more complex, but the multiplication concept is approximately correct). Thus if the intervention actively expends resources to coordinate NGO activities, the scores for those activities are improved.

6.2.9.10 Health infrastructure repair

This variable requires two inputs, nodes 237 and 237.1. The first node represents the number of health care facilities in good condition and under repair and the second node represents the total number of health care facilities needed. This variable affects node 238 Intervention health infrastructure, with a standard delay of 56 days, node 141 Intervention health, with a standard delay of 56 days, node 147 Intervention jobs, with a standard delay of 0 days, and node 137 Intervention investment, with a standard delay of 0 days. These delays reflect the time to complete the repair for the first two nodes and the immediate impact on the last two nodes.

If the total number required is left blank, no values are passed for this variable. The target quantity is the total number of health care facilities needed in the country and depends on the size and distribution of the population. The value for node 237 is the number in good condition and under repair.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional repair is seen as needed, then the current value and all future values of node 237.1 may be left blank, with no entries placed in node 237. All previous values for node 237.1 should be reset to the last value of node 237 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional repair is needed (despite the fact that an increase is not currently envisioned), the proper value for node 237.1 should be reassessed and reset (with workbook recalculation). This value and a value of zero for node 237 should be carried forward in all future monitoring of the situation.

Because this variable affects several intervention variables with different delays, representing bad results is not easy. If a project is delayed, moving the start date forward yields the correct finish date, but may result in incorrect job and investment timing. Instead, the value for the project should be removed from node 237 at the time of delay forward and re-entered at a date that yields the new completion. If facilities are destroyed during the intervention, the value of the facilities should be removed from the actuals node (not the target node) at a date preceding the actual destruction date by the amount of the largest delay value.

6.2.10 Physical Sector Model

The physical sector contains 12 inputs that relate to rebuilding or repairing the physical infrastructure.

6.2.10.1 Rebuild water lines

This variable requires two inputs, nodes 175 and 175.1. The first node represents the water lines in good condition and under repair and the second node represents the total water lines needed. This variable affects node 143 Intervention water, with a standard delay of 84 days, node 128 Intervention agriculture, with a standard delay of 84 days, node 147 Intervention jobs, with a standard delay of 0 days, and node 137 Intervention investment, with a standard delay of 0 days. These delays reflect the time to complete the repair for the first two nodes and the immediate impact on the last two nodes.

If the total number required is left blank, no values are passed for this variable. The target quantity is either the total number of miles of water lines or the total water flow through the lines needed in the country and depends on the size and distribution of the population. The value for node 175 is the miles or flow volume in good condition and under repair. The user should record the units used.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional repair is seen as needed, then the current value and all future values of node 175.1 may be left blank, with no entries placed in node 175. All previous values for node 175.1 should be reset to the last value of node 175 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional repair is needed (despite the fact that an increase is not currently envisioned), the proper value for node 175.1 should be reassessed and reset (with workbook recalculation). This value and a value of zero for node 175 should be carried forward in all future monitoring of the situation.

Because this variable affects several intervention variables with different delays, representing bad results is not easy. If a project is delayed, moving the start date forward yields the correct finish date, but may result in incorrect job and investment timing. Instead, the value for the project should be removed from node 175 at the time of delay forward and re-entered at a date that yields the new completion. If facilities are destroyed during the intervention, the value of the facilities should be removed from the actuals node (not the target node) at a date preceding the actual destruction date by the amount of the largest delay value.

6.2.10.2 Rebuild water & sewage treatment facilities

This variable requires two inputs, nodes 176 and 176.1. The first node represents the water facilities in good condition and under repair and the second node represents the total water facilities needed. This variable affects node 143 Intervention water, with a standard delay of 84 days, node 141 Intervention health, with a standard delay of 84 days, node 147 Intervention jobs, with a standard delay of 0 days, and node 137 Intervention investment, with a standard delay of 0 days. These delays reflect the time to complete the repair for the first two nodes and the immediate impact on the last two nodes.

If the total number required is left blank, no values are passed for this variable. The target quantity is either the total number of facilities or the total water flow through the facilities needed in the country and depends on the size and distribution of the population. The value for node 176 is the facilities or flow volume in good condition and under repair. The user should record the units used.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional repair is seen as needed, then the current value and all future values of node 176.1 may be left blank, with no entries placed in node 176. All previous values for node 176.1 should be reset to the last value of node 176 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional repair is needed (despite the fact that an increase is not currently envisioned), the proper value for node 176.1 should be reassessed and reset (with workbook recalculation). This value and a value of zero for node 176 should be carried forward in all future monitoring of the situation.

Because this variable affects several intervention variables with different delays, representing bad results is not easy. If a project is delayed, moving the start date forward yields the correct finish date, but may result in incorrect job and investment timing. Instead, the value for the project should be removed from node 176 at the time of delay forward and re-entered at a date that yields the new completion. If facilities are destroyed during the intervention, the value of the facilities should be removed from the actuals node (not the target node) at a date preceding the actual destruction date by the amount of the largest delay value.

6.2.10.3 Rebuild roads

This variable requires two inputs, nodes 169 and 169.1. The first node represents the roads in good condition and under repair and the second node represents the total roads needed. This variable affects node 146 Intervention transportation, with a standard delay of 42 days, node 147 Intervention jobs, with a standard delay of 0 days, and node 137 Intervention investment, with a standard delay of 0 days. These delays reflect the time to complete the repair for the first node and the immediate impact on the last two nodes.

If the total number required is left blank, no values are passed for this variable. The target quantity is the length of roads (miles or kilometers) needed in the country and depends on the size of the country and distribution of the population. The value for node 169 is the road length in good condition and under repair. The user should record the units used. Care should be taken in defining increments of additional repair. The user could define a single increment containing the entire amount of road needing repair (assuming the intervention plans to repair it all). However, it is unlikely that that size project could be completed in the standard delay of 42 days. The user could change the delay to fit this enormous project; however, there would be no intermediate improvements. It is better to define the increments in smaller pieces (which is how actual road projects are handled). In any case, the average project size should be used in determining the delay to use.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional repair is seen as needed, then the current value and all future values of node 169.1 may be left blank, with no entries placed in node 169. All previous values for node 169.1 should be reset to the last value of node 169 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional repair is needed (despite the fact that an increase is not currently envisioned), the proper value for node 169.1 should be reassessed and reset (with workbook recalculation). This value and a value of zero for node 169 should be carried forward in all future monitoring of the situation.

Because this variable affects several intervention variables with different delays, representing bad results is not easy. If a project is delayed, moving the start date forward yields the correct finish date, but may result in incorrect job and investment timing. Instead, the value for the project should be removed from node 169 at the time of delay forward and re-entered at a date that yields the new completion. If facilities are destroyed during the intervention, either by enemy action or through the deterioration of the road network caused by the use of heavy vehicles by the intervention forces, the value of the facilities should be removed from the actuals node (not the target node) at a date preceding the actual destruction date by the amount of the largest delay value.

6.2.10.4 Rebuild bridges

This variable requires two inputs, nodes 170 and 170.1. The first node represents the bridges in good condition and under repair and the second node represents the total bridges needed. This variable affects node 146 Intervention transportation, with a standard delay of 42 days, node 147 Intervention jobs, with a standard delay of 0 days, and node 137 Intervention investment, with a standard delay of 0 days. These delays reflect the time to complete the repair for the first node and the immediate impact on the last two nodes.

If the total number required is left blank, no values are passed for this variable. The target quantity is the number of bridges needed in the country and depends on the size of the country, its physical features, and the distribution of the population. The value for node 170 is the number of bridge lanes in good condition and under repair. The user should record the units used. Care should be taken in defining increments of additional repair. The user could define a single increment containing the entire amount of bridges needing repair (assuming the intervention plans to repair it all). However, it is unlikely that that size project could be completed in the standard delay of 42 days. The user could change the delay to fit this enormous project; however, there would be no intermediate improvements. It is better to define the increments in smaller pieces (which is how actual bridge projects are handled). In any case, the average project size should be used in determining the delay to use.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional repair is seen as needed, then the current value and all future values of node 170.1 may be left blank, with no entries placed in node 170. All previous values for node 170.1 should be reset to the last value of node 170 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional repair is needed (despite the fact that an increase is not currently envisioned), the proper value for node 170.1 should be reassessed and reset (with workbook recalculation). This value and a value of zero for node 170 should be carried forward in all future monitoring of the situation.

Because this variable affects several intervention variables with different delays, representing bad results is not easy. If a project is delayed, moving the start date forward yields the correct finish date, but may result in incorrect job and investment timing. Instead, the value for the project should be removed from node 170 at the time of delay forward and re-entered at a date that yields the new completion. If facilities are destroyed during the intervention, the value of the facilities should be removed from the actuals node (not the target node) at a date preceding the actual destruction date by the amount of the largest delay value.

6.2.10.5 Rebuild railroads

This variable requires two inputs, nodes 239 and 239.1. The first node represents the railroads in good condition and under repair and the second node represents the total railroads needed. This variable affects node 146 Intervention transportation, with a standard delay of 392 days, node 147 Intervention jobs, with a standard delay of 0 days, and node 137 Intervention investment, with a standard delay of 0 days. These delays reflect the time to complete the repair for the first node and the immediate impact on the last two nodes.

If the total number required is left blank, no values are passed for this variable. The target quantity is the rail miles needed in the country and depends on the size of the country, and the distribution of the population. The value for node 239 is the number of rail miles in good condition and under repair. The user should record the units used. Care should be taken in defining increments of additional repair. The user could define a single increment containing the entire amount of rails needing repair (assuming the intervention plans to repair it all). However, it is unlikely that that size project could be completed in the standard delay of 392 days. The user could change the delay to fit this enormous project; however, there would be no intermediate improvements. It is better to define the increments in smaller pieces (which is how actual rail projects are handled). In any case, the average project size should be used in determining the delay to use.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional repair is seen as needed, then the current value and all future values of node 239.1 may be left blank, with no entries placed in node 239. All previous values for node 239.1 should be reset to the last value of node 239 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional repair is needed (despite the fact that an increase is not currently envisioned), the proper value for node 239.1 should be reassessed and reset (with workbook recalculation). This value and a value of zero for node 239 should be carried forward in all future monitoring of the situation.

Because this variable affects several intervention variables with different delays, representing bad results is not easy. If a project is delayed, moving the start date forward yields the correct finish date, but may result in incorrect job and investment timing. Instead, the value for the project should be removed from node 239 at the time of delay forward and re-entered at a date that yields the new completion. If facilities are destroyed during the intervention, the value of the facilities should be removed from the actuals node (not the target node) at a date preceding the actual destruction date by the amount of the largest delay value.

6.2.10.6 Rebuild airports

This variable requires two inputs, nodes 171 and 171.1. The first node represents the airports in good condition and under repair and the second node represents the total airports needed. This variable affects node 146 Intervention transportation, with a standard delay of 49 days, node 147 Intervention jobs, with a standard delay of 0 days, and node 137 Intervention investment, with a standard delay of 0 days. These delays reflect the time to complete the repair for the first node and the immediate impact on the last two nodes.

If the total number required is left blank, no values are passed for this variable. The target quantity is the airports needed in the country and depends on the size of the country and the population. The value for node 171 is the number of airports in good condition and under repair. Care should be taken in defining increments of additional repair. The repair efforts on each airport should be reported as fractions of the airport repaired. In any case, the average project size should be used in determining the delay to use.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional repair is seen as needed, then the current value and all future values of node 171.1 may be left blank, with no entries placed in node 171. All previous values for node 171.1 should be reset to the last value of node 171 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional repair is needed (despite the fact that an increase is not currently envisioned), the proper value for node 171.1 should be reassessed and reset (with workbook recalculation). This value and a value of zero for node 171 should be carried forward in all future monitoring of the situation.

Because this variable affects several intervention variables with different delays, representing bad results is not easy. If a project is delayed, moving the start date forward yields the correct finish date, but may result in incorrect job and investment timing. Instead, the value for the project should be removed from node 171 at the time of delay forward and re-entered at a date that yields the new completion. If facilities are destroyed during the intervention, the value of the facilities should be removed from the actuals node (not the target node) at a date preceding the actual destruction date by the amount of the largest delay value.

6.2.10.7 Rebuild seaports

This variable requires two inputs, nodes 172 and 172.1. The first node represents the seaports in good condition and under repair and the second node represents the total seaports needed. This variable affects node 146 Intervention transportation, with a standard delay of 49 days, node 147 Intervention jobs, with a standard delay of 0 days, and node 137 Intervention investment, with a standard delay of 0 days. These delays reflect the time to complete the repair for the first node and the immediate impact on the last two nodes.

If the total number required is left blank, no values are passed for this variable. The target quantity is the seaports needed in the country and depends on the size of the country and its seacoast. The value for node 172 is the number of seaports in good condition and under repair. Care should be taken in defining increments of additional repair. The repair efforts on each seaport should be reported as fractions of the seaport repaired. In any case, the average project size should be used in determining the delay to use.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional repair is seen as needed, then the current value and all future values of node 172.1 may be left blank, with no entries placed in node 172. All previous values for node 172.1 should be reset to the last value of node 172 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional repair is needed (despite the fact that an increase is not currently envisioned), the proper value for node 172.1 should be reassessed and reset (with workbook recalculation). This value and a value of zero for node 172 should be carried forward in all future monitoring of the situation.

Because this variable affects several intervention variables with different delays, representing bad results is not easy. If a project is delayed, moving the start date forward yields the correct finish date, but may result in incorrect job and investment timing. Instead, the value for the project should be removed from node 172 at the time of delay forward and re-entered at a date that yields the new completion. If facilities are destroyed during the intervention, the value of the facilities should be removed from the actuals node (not the target node) at a date preceding the actual destruction date by the amount of the largest delay value.

6.2.10.8 Rebuild telecommunications

This variable requires two inputs, nodes 177 and 177.1. The first node represents the telecommunication facilities in good condition and under repair and the second node represents the total telecommunication facilities needed. This variable affects node 145 Intervention telecom, with a standard delay of 84 days, node 147 Intervention jobs, with a standard delay of 0 days, and node 138 Intervention media, with a standard delay of 14 days. These delays reflect the time to complete the repair for the first node, the immediate impact on jobs, and a slight delay in media impact. The media impact reflects the gradual increase in telecommunication lines to customers that is often a large part of this intervention.

If the total number required is left blank, no values are passed for this variable. The target quantity of telecommunication facilities includes radio and TV stations, telephone switchboards, cell towers, telephone land lines, cable lines, and business & home connections. The user may want to separate this into two components, large facilities and customers served, calculating each separately and then combining into a single value. The facilities could be combined as numbers of facilities, or perhaps more usefully, dollar values of the facilities. The target value for the customers served is the size of the population plus number of businesses (for telephone service). A reasonable combination would give half the weight to the facilities and half to the number of customers with service. The value for node 177 is the this weighted value for telecommunications in good condition and under repair. The equations below illustrate the concept. Care should be taken in defining increments of additional repair. The repair efforts on each project should be reported as units that correspond to the repair delay for used.

$$\begin{aligned} &TgtTelecomFacilities = \\ &\quad TgtNumRadioTV * CostRadioTV + \\ &\quad TgtNumSwitch * CostSwitch + \\ &\quad TgtNumTowers * CostTowers + \\ &\quad TgtMilesLandlines * CostLandlines + \\ &\quad TgtMilesCable * CostCable \end{aligned} \tag{55}$$

$$TgtTelecom = 1 \tag{56}$$

$$\begin{aligned} &ActTelecomFacilities = \\ &\quad ActNumRadioTV * CostRadioTV + \\ &\quad ActNumSwitch * CostSwitch + \\ &\quad ActNumTowers * CostTowers + \\ &\quad ActMilesLandlines * CostLandlines + \\ &\quad ActMilesCable * CostCable \end{aligned} \tag{57}$$

$$TgtCustomers = NumBus + NumPopulation \tag{58}$$

$$\begin{aligned} &ActTelecom = \\ &(ActTelecomFacilities / TgtTelecomFacilities + ActCustomers / TgtCustomers) / 2 \end{aligned} \tag{59}$$

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional repair is seen as needed, then the current value and all future values of node 177.1 may be left blank, with no entries placed in node 177. All previous values for node 177.1 should be reset to the last value of node 177 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional repair is needed (despite the fact that an increase is not currently envisioned), the proper value for node 177.1 should be reassessed and reset (with workbook recalculation). This value and a value of zero for node 177 should be carried forward in all future monitoring of the situation.

Because this variable affects several intervention variables with different delays, representing bad results is not easy. If a project is delayed, moving the start date forward yields the correct finish date, but may result in incorrect job and investment timing. Instead, the value for the project should be removed from node 177 at the time of delay forward and re-entered at a date that yields the new completion. If facilities are destroyed during the intervention, the value of the facilities should be removed from the actuals node (not the target node) at a date preceding the actual destruction date by the amount of the largest delay value.

6.2.10.9 Electricity production plants

This variable requires two inputs, nodes 167 and 167.1. The first node represents the electricity production facilities in good condition and under repair and the second node represents the total production facilities needed. This variable affects node 134 Intervention energy, with a standard delay of 28 days, node 147 Intervention jobs, with a standard delay of 0 days, and node 137 Intervention investment, with a standard delay of 0 days. These delays reflect the time to complete the repair for the first node and the immediate impact on the last two nodes.

If the total number required is left blank, no values are passed for this variable. The target quantity is either the total number of facilities or the total electricity production rate through the facilities needed in the country and depends on the size of the population and the country's economy. The value for node 167 is the facilities or production rate of facilities in good condition and under repair. The user should record the units used. Many electrical plant repairs take considerably more than 28 days. The user will have to determine whether to increase the delay or use partial repair quantities that are in accord with that delay.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional repair is seen as needed, then the current value and all future values of node 167.1 may be left blank, with no entries placed in node 167. All previous values for node 167.1 should be reset to the last value of node 167 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional repair is needed (despite the fact that an increase is not currently envisioned), the proper value for node 167.1 should be reassessed and reset (with workbook recalculation). This value and a value of zero for node 167 should be carried forward in all future monitoring of the situation.

Because this variable affects several intervention variables with different delays, representing bad results is not easy. If a project is delayed, moving the start date forward yields the correct finish date, but may result in incorrect job and investment timing. Instead, the value for the project should be removed from node 167 at the time of delay forward and re-entered at a date that yields the new completion. If facilities are destroyed during the intervention, the value of the facilities should be removed from the actuals node (not the target node) at a date preceding the actual destruction date by the amount of the largest delay value.

6.2.10.10 Electricity distribution

This variable requires two inputs, nodes 168 and 168.1. The first node represents the electricity distribution facilities in good condition and under repair and the second node represents the total distribution facilities needed. This variable affects node 134 Intervention energy, with a standard delay of 28 days, node 147 Intervention jobs, with a standard delay of 0 days, and node 137 Intervention investment, with a standard delay of 0 days. These delays reflect the time to complete the repair for the first node and the immediate impact on the last two nodes.

If the total number required is left blank, no values are passed for this variable. The target quantity is either the total electricity consumption rate needed in the country and depends on the size of the population and the country's economy. This should be the same as node 167.1, unless the country should be a net exporter of electrical power or plans to be a net importer of electrical power. The value for node 168 is actual consumption rate of delivered power. The user should record the units used. The user should change the delay for node 134 to zero to reflect recording actual consumption (with implied repairs or damage), rather than explicit repair activities.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional repair is seen as needed, then the current value and all future values of node 168.1 may be left blank, with no entries placed in node 168. All previous values for node 168.1 should be reset to the last value of node 168 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional repair is needed (despite the fact that an increase is not currently envisioned), the proper value for node 168.1 should be reassessed and reset (with workbook recalculation). This value and a value of zero for node 168 should be carried forward in all future monitoring of the situation.

Because this variable affects several intervention variables with different delays, representing bad results is not easy. If a project is delayed, moving the start date forward yields the correct finish date, but may result in incorrect job and investment timing. Instead, the value for the project should be removed from node 168 at the time of delay forward and re-entered at a date that yields the new completion. If facilities are destroyed during the intervention, the value of the facilities should be removed from the actuals node (not the target node) at a date preceding the actual destruction date by the amount of the largest delay value.

6.2.10.11 Rebuild oil production

This variable requires two inputs, nodes 173 and 173.1. The first node represents the oil production facilities in good condition and under repair and the second node represents the total production facilities needed. This variable affects node 134 Intervention energy, with a standard delay of 28 days, node 147 Intervention jobs, with a standard delay of 0 days, and node 137 Intervention investment, with a standard delay of 0 days. These delays reflect the time to complete the repair for the first node and the immediate impact on the last two nodes.

If the total number required is left blank, no values are passed for this variable. The target quantity is either the total number of facilities or the total oil production rate through the facilities needed in the country and depends on the size of the oil fields. The value for node 173 is the facilities or production rate of facilities in good condition and under repair. The user should record the units used. Many oil field repairs take considerably more than 28 days. The user will have to determine whether to increase the delay or use partial repair quantities that are in accord with that delay.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional repair is seen as needed, then the current value and all future values of node 173.1 may be left blank, with no entries placed in node 173. All previous values for node 173.1 should be reset to the last value of node 173 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional repair is needed (despite the fact that an increase is not currently envisioned), the proper value for node 173.1 should be reassessed and reset (with workbook recalculation). This value and a value of zero for node 173 should be carried forward in all future monitoring of the situation.

Because this variable affects several intervention variables with different delays, representing bad results is not easy. If a project is delayed, moving the start date forward yields the correct finish date, but may result in incorrect job and investment timing. Instead, the value for the project should be removed from node 173 at the time of delay forward and re-entered at a date that yields the new completion. If facilities are destroyed during the intervention, the value of the facilities should be removed from the actuals node (not the target node) at a date preceding the actual destruction date by the amount of the largest delay value.

6.2.10.12 Rebuild oil pipelines

This variable requires two inputs, nodes 174 and 174.1. The first node represents the oil pipelines in good condition and under repair and the second node represents the total pipelines needed. This variable affects node 134 Intervention energy, with a standard delay of 28 days, node 147 Intervention jobs, with a standard delay of 0 days, and node 137 Intervention investment, with a standard delay of 0 days. These delays reflect the time to complete the repair for the first node and the immediate impact on the last two nodes.

If the total number required is left blank, no values are passed for this variable. The target quantity is either the total miles of pipeline or the total oil flow rate through the pipelines needed in the country and depends on the country. The value for node 174 is the miles of pipeline or flow rate of pipelines in good condition and under repair. The user should record the units used. Some pipeline repairs take considerably more than 28 days. The user will have to determine whether to increase the delay or use partial repair quantities that are in accord with that delay.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no additional repair is seen as needed, then the current value and all future values of node 174.1 may be left blank, with no entries placed in node 174. All previous values for node 174.1 should be reset to the last value of node 174 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that additional repair is needed (despite the fact that an increase is not currently envisioned), the proper value for node 174.1 should be reassessed and reset (with workbook recalculation). This value and a value of zero for node 174 should be carried forward in all future monitoring of the situation.

Because this variable affects several intervention variables with different delays, representing bad results is not easy. If a project is delayed, moving the start date forward yields the correct finish date, but may result in incorrect job and investment timing. Instead, the value for the project should be removed from node 174 at the time of delay forward and re-entered at a date that yields the new completion. If facilities are destroyed during the intervention, the value of the facilities should be removed from the actuals node (not the target node) at a date preceding the actual destruction date by the amount of the largest delay value.

6.2.11 Security Sector Model

The security sector contains seven inputs that relate to improving security.

6.2.11.1 Establishing confidence-building and security measures

This variable requires two inputs, nodes 219 and 219.1. The first node contains the number of troops (or missions, at the user's discretion) and the second node contains the total number required (in the same units). This variable affects node 129, Intervention central authority, with a standard delay of 7 days, node 140, Intervention govt military, with a standard delay of 7 days, and node 129, Intervention Peace Operations, with a standard delay of 7 days. If this intervention is not a Peace Operation, this variable is not needed.

If the total number required is left blank, no values are passed for this variable. Ideally, the second node should represent the total number of troops (or missions) that will be needed to bring the country to its optimal state. This is a difficult quantity to guess at the beginning of an intervention and, thus, may require revisions (with accompanying historical revisions) over the course of the intervention.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no future missions are seen as being needed, then the current value and all future values of node 219.1 may be left blank, with no entries placed in node 219. All previous values for node 219.1 should be reset to the last (maximum) value of node 219 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further missions should be performed (despite the fact that they are not currently envisioned), the proper value for node 219.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 219 should be carried forward in all future monitoring of the situation.

Because this variable affects three intervention variables with the same delay, bad outcomes can be represented fairly easily. The logic described for nodes 186 and 186.1 can be used here. (If the values represent numbers of troops, rather than numbers of missions, the +/- 1 values would be replaced with the mission size in troops.)

6.2.11.2 Providing security assistance to the host nation

This variable requires two inputs, nodes 220 and 220.1. The first node contains the amount of security assistance provided and the second node contains the total number required (in the same units). This variable affects node 129, Intervention central authority, with a standard delay of 28 days, and node 140, Intervention govt military, with a standard delay of 28 days.

If the total number required is left blank, no values are passed for this variable. Ideally, the second node should represent the amount of security assistance that will be needed to bring the country to its optimal state. This is a difficult quantity to guess at the beginning of an intervention and, thus, may require revisions (with accompanying historical revisions) over the course of the intervention. The security assistance may take the form of foreign military sales, officer training at U.S. facilities, or other projects designed to enhance the security of the host nation. The diverse nature of the projects may make dollar value the most convenient unit of measure.

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no future missions are seen as being needed, then the current value and all future values of node 220.1 may be left blank, with no entries placed in node 220. All previous values for node 220.1 should be reset to the last (maximum) value of node 220 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further missions should be performed (despite the fact that they are not currently envisioned), the proper value for node 220.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 220 should be carried forward in all future monitoring of the situation.

Because this variable affects two intervention variables with the same delay, bad outcomes can be represented fairly easily. The logic described for nodes 186 and 186.1 can be used here. (If the values represent numbers of troops or dollars, rather than numbers of missions, the +/- 1 values would be replaced with the mission size in troops or project size in dollars.)

6.2.11.3 Safeguarding institutions of governance and key officials

This variable requires two inputs, nodes 221 and 221.1. The first node contains the number of troops (or missions, at the user's discretion) and the second node contains the total number required (in the same units). This variable affects node 129, Intervention central authority, with a standard delay of 0 days.

If the total number required is left blank, no values are passed for this variable. Ideally, the second node should represent the total number of troops (or missions) that will be needed to keep the institutions of governance and the key officials safe. This is a difficult quantity to guess at the beginning of an intervention and, thus, may require revisions (with accompanying historical revisions) over the course of the intervention. Nodes 221 and 221.1 should include indigenous troops and intervention troops (or missions) to permit comparisons between situations that require intervention forces to perform the entire mission and those that don't. Using one row for indigenous forces and one for intervention forces provides historical information on the division of labor and the changes as indigenous forces take up new duties, replacing intervention forces (or the opposite).

At such time as the intervention is concluded, a decision is needed for monitoring the situation from that time forward. If no future missions are seen as being needed, then the current value and all future values of node 221.1 may be left blank, with no entries placed in node 221. All previous values for node 221.1 should be reset to the last (maximum) value of node 221 (and ISSM should be recalculated). This will result in a smooth transition. If it is judged that further missions should be performed (despite the fact that they are not currently envisioned), the proper value for node 221.1 should be reassessed and reset (with workbook recalculation). This value and the final value for node 221 should be carried forward in all future monitoring of the situation.

Because this variable affects only one intervention variable with no delay, bad outcomes can be represented easily.

6.2.11.4 Providing security for HA activities

This variable requires a single input, node 232, which contains a value between 0.0 and 1.1. This variable affects the 14 Humanitarian Assistance (HA) nodes, 128 Intervention agriculture, 131 Intervention critical industries, 134 Intervention health energy, 145 Intervention telecom, 146 Intervention transportation, 147 Intervention jobs, 231 Intervention natural resources, 133 Intervention education, 132 Intervention displaced pop, 136 Intervention food, 141 Intervention health, 238 Intervention health infrastructure, 142 Intervention housing, and 143 Intervention water.

If the input is left blank, a value of 1.0 is passed for this variable. This variable is one of five special factors that act as multipliers, rather than supplying values to a weighted average. Each of the nodes that this node affects has a value that it receives from other inputs. That value is then multiplied by the node 232 value (actually the arithmetic is slightly more complex, but the multiplication concept is approximately correct). Thus, if the intervention actively expends resources to provide security for HA activities, the scores for those activities are improved.

6.2.11.5 Providing security for PO activities

This variable requires a single input, node 233, which contains a value between 0.0 and 1.1. This variable affects the four Peace Operations (PO) nodes, 14 Intervention govt military, 230 Intervention Peace Operations, 229 Intervention military retraining, and 228 Intervention demobilization.

If the input is left blank, a value of 1.0 is passed for this variable. This variable is one of five special factors that act as multipliers, rather than supplying values to a weighted average. Each of the nodes that this node affects has a value that it receives from other inputs. That value is then multiplied by the node 233 value (actually the arithmetic is slightly more complex, but the multiplication concept is approximately correct). Thus, if the intervention actively expends resources to provide security for PO activities, the scores for those activities are improved.

6.2.11.6 Providing security for Stability activities

This variable requires a single input, node 234, which contains a value between 0.0 and 1.1. This variable affects the 12 Stability nodes, 135 Intervention financial, 137 Intervention investment, 127 Intervention justice, 129 Intervention central authority, 130 Intervention LE corruption, 139 Intervention police, 144 Intervention social services, 225 Intervention social services corruption, 225 Intervention govt corruption, 226 Intervention policing, 224 Intervention transition, and 138 Intervention media.

If the input is left blank, a value of 1.0 is passed for this variable. This variable is one of five special factors that act as multipliers, rather than supplying values to a weighted average. Each of the nodes that this node affects has a value that it receives from other inputs. That value is then multiplied by the node 234 value (actually the arithmetic is slightly more complex, but the multiplication concept is approximately correct). Thus, if the intervention actively expends resources to provide security for Stability activities, the scores for those activities are improved.

6.2.11.7 Providing force security

This variable requires a single input, node 235, which contains a value between 0.0 and 1.0. This variable affects the three other providing security nodes, 232 Providing security for HA activities, 233 Providing security for PO activities, and 234 Providing security for Stability activities.

If the input is left blank, a value of 1.0 is passed for this variable. This variable is one of five special factors that act as multipliers, rather than supplying values to a weighted average. Each of the nodes that this node affects has a value that it receives from other inputs. That value is then multiplied by the node 233 value (actually the arithmetic is slightly more complex, but the multiplication concept is approximately correct). Thus, if the intervention actively expends resources to provide force security activities, the scores for those activities are improved. Inadequate provision for force security will reduce the security that is provided for other activities.

6.2.12 Variable and Reversible Connections Model

The equation below shows part of the computation for inferring the value of the "ToNode" from the value of the "Node." The Inflate and Center components of the equation are uniquely defined for each Node-ToNode connection. Although the most common values for Inflate and Center are 1.00 and 0.00, respectively, some of the connections require other values. Inflate values between 0.0 and 1.0 yield linear increases in the ToNodeValue with increases in the NodeValue; however, the rate of increase is slower. Negative Inflate values convert NodeValue increases into ToNodeValue decreases.

$$ToNodeValue = Inflate * NodeValue + Center \qquad 60$$

The Reversible & Variable Inflators variables are inputs that change the value of the inflate component of the formula. Each of these variables is referred to by its Node-ToNode pairing and has a standard inflate value (Std Infl) that is passed to the proper equation. If the user enters values for these variables, these values are passed to the equations (for the dates of the entries only) instead of the standard values. **The user should remember that these changes do not persist beyond the date of entry. Blank cells revert to the standard values.**

6.2.12.1 From node 18 to node 7

The connection from node 18 Displaced population decreases to node 7 Changes in population composition improve outlook has a standard inflation (Std Infl) value of 1.00. This value is standard because in most cases decreases in the displaced population is a good thing and it is valid to infer from this that changes in population composition do improve the outlook. However, there are historical examples (e.g., genocide) in which the inference should have been that population composition changes worsen the outlook. Changing the value to -1.00 will accomplish this inference reverse.

6.2.12.2 From node 24 to node 7

The connection from node 24 Expatriates return to country to node 7 Changes in population composition improve outlook has a Std Infl value of 0.80. This value is standard because in most cases expatriates return because the situation is getting safer and it is valid to infer from this that changes in population composition do improve the outlook. However, some expatriates may return to cause problems. The user may want to reduce the value to indicate a decrease in the proportion of benign expatriate return. If the balance shifts far enough, the user will want to reduce the value into the negative range.

6.2.12.3 From node 24 to node 10

The connection from node 24 Expatriates return to country to node 10 Commercial sector contributes to national welfare has a Std Infl value of 0.80. This value is standard because in most cases expatriates return because the situation is getting safer and it is valid to infer from this that the commercial sector will improve. However, some expatriates may return to cause problems. The user may want to reduce the value to indicate a decrease in the proportion of benign expatriate return. If the balance shifts far enough, the user will want to reduce the value into the negative range.

6.2.12.4 From node 24 to node 29

The connection from node 24 Expatriates return to country to node 29 Government has domestic legitimacy has a Std Infl value of 1.00. This value is standard because in most cases expatriates return because the situation is getting safer and it is valid to infer from this that the perceived legitimacy of the government is increasing. However, some expatriates may return to cause problems, perhaps because the perceived legitimacy is weakening. The user may want to reduce the value to indicate a decrease in the proportion of benign expatriate return. If the balance shifts far enough, the user will want to reduce the value into the negative range.

6.2.12.5 From node 24 to node 41

The connection from node 24 Expatriates return to country to node 41 Paramilitary forces are not present has a Std Infl value of 0.50. This value is standard because in most cases expatriates return because the situation is getting safer and it is valid to infer from this that the paramilitary forces are less of a problem. However, some expatriates may return to cause problems, joining the paramilitary forces and thus increasing them. The user may want to reduce the value to indicate a decrease in the proportion of benign expatriate return. If the balance shifts far enough, the user will want to reduce the value into the negative range.

6.2.12.6 From node 24 to node 46

The connection from node 24 Expatriates return to country to node 46 Population is not forced to move has a Std Infl value of 0.25. This value is standard because in most cases expatriates return because the situation is getting safer and it is valid to infer from this that the displace persons (or ethnic cleansing, etc.) situation is improving. However, some expatriates may return to cause problems. The user may want to reduce the value to indicate a decrease in the proportion of benign expatriate return. If the balance shifts far enough, the user will want to reduce the value into the negative range.

6.2.12.7 From node 24 to node 52

The connection from node 24 Expatriates return to country to node 52 Safe and secure environment is perceived has a Std Infl value of 0.50. This value is standard because in most cases expatriates return because the situation is getting safer. However, some expatriates may return to cause problems. The user may want to reduce the value to indicate a decrease in the proportion of benign expatriate return. If the balance shifts far enough, the user will want to reduce the value into the negative range.

6.2.12.8 From node 28 to node 8

The connection from node 28 Domestic media is free to node 8 Civil (internal) unrest is not present has a Std Infl value of 0.50. This value is standard because in most cases governments reduce freedom of the media as unrest increases and thus it is valid to infer a lack of unrest from observed free media. However, there have been occasions where increased freedom has led to increased unrest, such as in Iran in the last days of the Shah. If a similar case is observed, the user should shift to a negative value.

6.2.12.9 From node 39 to node 7

The connection from node 39 Migrants leave country to node 7 Changes in population composition improve outlook has a Std Infl value of 1.00. This value is standard because in most cases decreases in the migrants (refugees from other countries) is a good thing and it is valid to infer from this that changes in population composition do improve the outlook. However, there are historical examples (e.g., genocide) in which the inference should have been that population composition changes worsen the outlook. Changing the value to -1.00 will accomplish this inference reverse.

6.2.12.10 From node 44 to node 42

The connection from node 44 People's spiritual needs are met to node 42 People are tolerant of the status quo has a Std Infl value of 0.25. This variable was used as the example in section 6.2.2.3, the general discussion of variable and reversible inflators.

6.2.12.11 From node 50 to node 24

The connection from node 50 Property ownership issues are resolved to node 24 Expatriates return to country has a Std Infl value of 1.00. This value is standard because in many cases people are expatriates because of property ownership issues and as they are resolved the expatriates return. However, some resolutions of property ownership may produce expatriates. The user may want to reduce the value to indicate a decrease in the proportion of expatriate return to expatriate creation. If the balance shifts far enough, the user will want to reduce the value into the negative range.

6.3 DATA SOURCES

Table 6-4 lists information about sources for initial data on countries. Much of the data comes from a Systems-of-Systems Analysis (SoSA) Reference Library. The URLs are not always precise (and may change without warning); however, they do provide a starting point in searching for data. The description gives an idea of the data available on the site. The abbreviated headings that follow are for political, military, economic, social, information, infrastructure, terrorism, and a rating on the site's usefulness. Sites that were used in the discussions in this section are in bold face.

The information from these sources is basically static. Information on the progress of an operation must be obtained from the organizations involved, the United Nations (and its sub-organizations), NATO, the Department of Defense, the State Department, USAID, and the individual NGOs and International Organizations involved.

Table 6-4. Potential Data Sources

Site Name	URL	Description	Pol	Mil	Eco	Soc	Inf	Inf	Ter	Rat
Anti-Defamation League Terrorism	http://www.adl.org/terrorism/symbols/	Other Terrorisim site							x	5
CIA World Factbook	https://www.cia.gov/cia/publications/factbook/index.html	General reference on political, economic, social, cultural data by country	x	x	x	x	x	x	x	5
CIDCM	http://www.cidcm.umd.edu/	University of Maryland's Center for International Development and Conflict Management (CIDCM)	x		x	x				3
Council on Foreign Relations	http://www.cfr.org/publication/9237/	Other Terrorisim site							x	5
FAOSTAT	http://faostat.fao.org/	FAOSTAT is an on-line and multilingual database currently containing over 3 million time-series records covering international statistics in the areas of Food and Agriculture	x		x	x				4
Food and Agriculture Organization of the United Nations/ AQUASTAT data base	http://www.fao.org/waicent/faoinfo/agricult/agl/aglw/aquastat/dbase/index.stm	The Food and Agriculture Organization of the United Nations leads international efforts to defeat hunger. FAO is also a source of knowledge and information. AQUASTAT is FAO's global information system of water and agriculture developed by the Land and Water Development Division of FAO. The objective of AQUASTAT is to provide users with comprehensive information on the state of agricultural water management across the world, with emphasis on developing countries and countries in transition			x					5
Freedom House	http://www.freedomhouse.org/template.cfm?page=1	Freedom House, a non-profit, nonpartisan organization, is a clear voice for democracy and freedom around the world. Through a vast array of international programs and publications, Freedom House is working to advance the remarkable worldwide expansion of political and economic freedom	x		x					5
GeoAnalyzer (Encyclope	http://geoanalyzer.britannica.com/	Country Snapshots offer statistics on demography, vital statistics, national economy, transportation and communication, education and health, and military for	x	x	x	x	x	x	x	4

Site Name	URL	Description	Pol	Mil	Eco	Soc	Inf	Inf	Ter	Rat
dia Brittanica)		individual countries and tables of countries with the highest or lowest totals, rates, or percentages in several statistical categories, as well as tables covering the most remarkable features and attributes of different countries and the world								
Global Security	http://www.globalsecurity.org/index.html	A news portal on security issues	x		x	x				4
Global Terror Alert	http://www.globalterroralert.com/	A private web site purporting to offer terrorism reports							x	5
HIV/AIDS Surveillance data base	http://www.census.gov/ipc/www/hivaidsd.html	The HIV/AIDS Surveillance Data Base was developed and is maintained by the Health Studies Branch, International Programs Center (IPC), Population Division, U.S. Bureau of the Census, with funds from the U.S. Agency for International Development. It is a compilation of information from those studies appearing in the medical and scientific literature, presented at international conferences, and appearing in the press				x				4
Institute for Counter-Terrorism	http://www.ict.org.il/	Other Terrorisim site							x	5
International Crisis Group	http://www.crisisgroup.org/home/index.cfm	an independent, non-profit, non-governmental organization, with over 110 staff members on five continents, working through field-based analysis and high-level advocacy to prevent and resolve deadly conflict	x		x	x				3
International Crisis Group	http://www.crisisgroup.org/home/index.cfm	an independent, non-profit, non-governmental organization, with over 110 staff members on five continents, working through field-based analysis and high-level advocacy to prevent and resolve deadly conflict	x		x	x				3
Iraq Regime Change	http://fpc.state.gov/documents/organization/44914.pdf	A report (pdf) by the Congressional Research Service of the Library of Congress (April 2005)							x	5
MIPT Terrorism Knowledge Base	http://www.tkb.org/Home.jsp	Developed by the National Memorial Institute for the Prevention of Terrorism (MIPT), the Terrorism Knowledge Base offers in-depth information on terrorist incidents, groups, and trials							x	5
NationMaster	http://www.nationmaster.com/graph/gov_cor-government-corruption	statistics on numerous things	x	x	x	x	x	x	x	5
NATO and the fight against terrorism	http://www.nato.int/issues/terrorism/index.html	Explains NATO's contribution to the fight against terrorism through military operations in Afghanistan, the Balkans and the Mediterranean and by taking steps to protect its populations and territory against terrorist attacks. Includes key reports and studies							x	5
Northeast Intelligence Network	http://www.homelandsecurityus.com/terrorgroups.asp	Other Terrorisim site							x	5

Site Name	URL	Description	Pol	Mil	Eco	Soc	Inf	Inf	Ter	Rat
Office of the Coordinator for Reconstruction and Stabilization	http://www.state.gov/s/crs/rls/43327.htm	This office will lead, coordinate, and institutionalize U.S. Government civilian capacity to prevent or prepare for post-conflict situations, and to help stabilize and reconstruct societies in transition from conflict or civil strife so they can reach a sustainable path toward peace, democracy and a market economy	x	x	x					5
Overseas Private Investment Corporation (OPIC)	http://www.opic.gov/	OPIC helps U.S. businesses invest overseas, fosters economic development in new and emerging markets, complements the private sector in managing the risks associated with foreign direct investment, and supports U.S. foreign policy	x	x	x	x	x	x	x	3
Patriotic Union of Kurdistan	http://www.puk.org/	Other Terrorisim site							x	5
Political Rights Index	http://65.110.85.181/uploads/special_report/29.pdf	Measure of rights to participate meaningfully in the political process	x		x	x				5
Polity IV	http://www.cidcm.umd.edu/polity/	coded annual information on regime and authority characteristics for all independent states (with greater than 500,000 total population) in the global state system and covers the years 1800-2003	x		x	x				3
Population Pyramids	http://www.census.gov/ipc/www/idbpyr.html	US Government Census Bureau: Poplation statistics	x		x	x				3
Portals to the World	http://www.loc.gov/rr/international/portals.html	From the US Library of Congress; Links providing authoritative, in-depth information about the nations and other areas of the world. They are arranged by country or area with the links for each sorted into a wide range of broad categories. The links were selected by Area Specialists and other Library staff using Library of Congress selection criteria	x	x	x	x	x	x	x	5
Relief Web	http://www.reliefweb.int/rw/dbc.nsf/doc100?OpenForm	ReliefWeb is the world's leading on-line gateway to information (documents and maps) on humanitarian emergencies and disasters. An independent vehicle of information, designed specifically to assist the international humanitarian community in effective delivery of emergency assistance, it provides timely, reliable and relevant information as events unfold, while emphasizing the coverage of forgotten emergencies at the same time	x			x				5
SITE Institute	http://siteinstitute.org/index.html	Summaries of materials distributed to SITE Institute intel subscribers. Includes terrorism library and links to terrorist web sites							x	4
South Asia Terrorism Portal	http://www.satp.org/default.asp	A link to reports, studies, etc focusing on South Asia terrorism issues							x	4
Terrorism, WMD and Emergency Preparedness	http://cns.miis.edu/research/wtc01/terrwmd.htm	The Center for Nonproliferation Studies (CNS) strives to combat the spread of weapons of mass destruction (WMD) by training the next generation of nonproliferation specialists and disseminating timely information and analysis. CNS at the Monterey Institute of International Studies is the largest nongovernmental organization in the United States devoted exclusively to research and							x	3

Site Name	URL	Description	Pol	Mil	Eco	Soc	Inf	Inf	Ter	Rat
		training on nonproliferation issues								
Terrorist Group Profiles	http://library.nps.navy.mil/home/tgp/tgpndx.htm#2001	Index of Groups published in the Dudley Knox Library, Naval Post Graduate School. Material taken from Country Reports on Terrorism and Patterns of Global Terrorism, US Dept of State	x		x	x				5
The Association of Religion Data Archives (ARDA) / International Surveys and Data	http://www.thearda.com/Archive/Browse.asp	The Association of Religion Data Archives (ARDA) strives to democratize access to the best data on religion. Founded as the American Religion Data Archive in 1997 and going online in 1998, the initial archive was targeted at researchers interested in American religion. The targeted audience and the data collection have both greatly expanded since 1998, now including American and international collections and developing features for educators, journalists, religious congregations, and researchers				x				3
The DataWeb	http://www.thedataweb.org/index.html	TheDataWeb is network of online data libraries that the DataFerrett application access the data through. Data topics include, census data, economic data, health data, income and unemployment data, population data, labor data, cancer data, crime and transportation data, family dynamics, vital statistics data	x		x	x				4
The Jamestown Foundation	http://www.jamestown.org/	The Jamestown Foundation's mission is to inform and educate policy makers and the broader policy community about events and trends in those societies which are strategically or tactically important to the United States and which frequently restrict access to such information							x	3
The Pew Research Center	http://pewglobal.org/	The Pew Global Attitudes Project is a series of worldwide public opinion surveys. More than 90,000 interviews in 50 countries have been conducted as part of the project. Includes downloadable reports and data sets				x				5
TradeStats	http://tse.export.gov/ITAHome.aspx?UniqueURL=gbgwon55avf4xdmnlsojew45-2006-2-3-10-48-35	annual and quarterly trade data	x		x	x				5
Transparency International	http://www.transparency.org/	Transparency International is a global network including more than 90 locally established national chapters and chapters-in-formation. These bodies fight corruption in the national arena in a number of ways. They bring together relevant players from government, civil society, business and the media to promote transparency in elections, in public administration, in procurement and in business. TI's global network of chapters and contacts also use advocacy campaigns to lobby governments to implement anti-corruption reforms	x		x					5
UNESCO Institute for Statistics	http://www.uis.unesco.org/ev_en.php?ID=2867_201&ID2=DO_TOPIC	Global and internationally comparable statistics on education, science, technology, culture and communication				x				4

Site Name	URL	Description	Pol	Mil	Eco	Soc	Inf	Inf	Ter	Rat
US Census Bureau Data Center	http://www.census.gov/main/www/access.html	Access to US Census data and tools supporting research on population metrics	x		x	x				5
US Dept of State	http://www.state.gov/r/pa/ei/bgn/	Country Background Notes; Facts about the land, people, history, government, political conditions, economy, and foreign relations of independent states, some dependencies, and areas of special sovereignty. The Background Notes are updated/revised by the Office of Electronic Information and Publications of the Bureau of Public Affairs as they are received from the Department's regional bureaus	x	x	x					5
US Dept of Treasury	http://www.treasury.gov/offices/enforcement/	Terrorism and Financial Intelligence	x		x	x				4
US Institute for Peace	http://www.usip.org/	An independent, nonpartisan, national institution established and funded by Congress. Its goals are to help prevent and resolve violent international conflicts, promote post-conflict stability and democratic transformations, and increase peacebuilding capacity, tools, and intellectual capital worldwide	x			x			x	4
WorldBank Group	http://devdata.worldbank.org/data-query	population with access to potable water						x		4
World Economic Forum	http://www.weforum.org/en/initiatives/gcp/GlobalCompetitivences	Macroeconomic Environment Index			x					3
World Health Organization (WHO) Statistical Information System	http://www3.who.int/whosis/menu.cfm	The WHO Statistical Information System is the guide to health and health-related epidemiological and statistical information available from the World Health Organization. Most WHO technical programmes make statistical information available, and they will be linked from here. You also have the possibility to search by keywords within the WHOSIS or throughout the entire WHO site				x				5

7. CREATING ISSM MAIN V4.0 CUSTOM LOGIC

Creating custom logic is optional. If all of your external inputs can be handled in the ExternalInputs worksheet with little or no problems, then do so. If you need extra traceability, complicated computations, or non-linear computations to arrive at the external input values, then you should create the custom logic. If you are using the DIAMOND simulation to supply your data on the situation, then you will need to use the custom logic that has already been created and/or create new custom logic.

The choice must be the same one that is made for the Preprocessor. Note, that you need not have any data in the ISSM Main worksheet, despite having data in the Preprocessor worksheet (or vice versa). However, in this case, you must make sure that it is prepared properly so that no data is transferred inappropriately.

There are four steps that you will need to perform to set up your logic. The steps may be collected into three groups: preparation, logic node implementation, and checking. It is likely that you will find yourself iterating through these groups and their steps. It will probably be easiest to start with a single one of the required ISSM Main External inputs and create its entire logic before proceeding to another input's logic. You should pick one that you suspect will have no commonalities with any other output's logic. However, the most significant element of the choice may be the impact delay time. You do not want to create a large amount of logic and then discover that you need numerous columns of dates preceding your earliest date to account for some external input that has a very long impact delay. Once your are familiar with the process, you may find it easier to group the outputs that might have common elements, either in their inputs or in some intermediate results. **You should save your work regularly, using the Save control on the Controls sheet of the ISSM Controller.**

7.1 DESIGNING THE LOGIC

There are a fixed number of external inputs (roughly 90, listed in Table 7-1) and they are pre-numbered. Your logic need not involve each of these; however, you must consider whether each one will be used in your situation, where you will get the data for each one that is involved, what form the data will be in, what the impact delays are for each one, and how you need to transform the data (if at all).

Table 7-1. ISSM Main External Inputs

Node	Name	Type	Sector
150	Medical treatment	Intervention	Needs
150.1	Medical treatment	Intervention	Needs
151	Food importation	Intervention	Needs
151.1	Food importation	Intervention	Needs
152	Food distribution	Intervention	Needs
152.1	Food distribution	Intervention	Needs
153	Water distribution	Intervention	Needs
153.1	Water distribution	Intervention	Needs
154	Negotiating bureaucracies to get relief	Intervention	Needs
154.1	Negotiating bureaucracies to get relief	Intervention	Needs
155	Resettlement processes	Intervention	Needs
155.1	Resettlement processes	Intervention	Needs
156	Providing temporary shelter/housing	Intervention	Needs

Node	Name	Type	Sector
156.1	Providing temporary shelter/housing	Intervention	Needs
157	Buy local produce	Intervention	Economy
157.1	Buy local produce	Intervention	Economy
158	Support new planting	Intervention	Economy
158.1	Support new planting	Intervention	Economy
159	Education facilities	Intervention	Govt
159.1	Education facilities	Intervention	Govt
160	Education supplies	Intervention	Govt
160.1	Education supplies	Intervention	Govt
161	Train teachers	Intervention	Govt
161.1	Train teachers	Intervention	Govt
162	Create local governments	Intervention	Govt
162.1	Create local governments	Intervention	Govt
163	Educate local governments	Intervention	Govt
163.1	Educate local governments	Intervention	Govt
164	Supply local governments	Intervention	Govt
164.1	Supply local governments	Intervention	Govt
165	Train police forces	Intervention	Govt
165.1	Train police forces	Intervention	Govt
166	Train military forces	Intervention	Govt
166.1	Train military forces	Intervention	Govt
167	Electricity production plants	Intervention	Physical
167.1	Electricity production plants	Intervention	Physical
168	Electricity distribution	Intervention	Physical
168.1	Electricity distribution	Intervention	Physical
169	Rebuild roads	Intervention	Physical
169.1	Rebuild roads	Intervention	Physical
170	Rebuild bridges	Intervention	Physical
170.1	Rebuild bridges	Intervention	Physical
171	Rebuild airports	Intervention	Physical
171.1	Rebuild airports	Intervention	Physical
172	Rebuild seaports	Intervention	Physical
172.1	Rebuild seaports	Intervention	Physical
173	Rebuild oil production	Intervention	Physical
173.1	Rebuild oil production	Intervention	Physical
174	Rebuild oil pipelines	Intervention	Physical
174.1	Rebuild oil pipelines	Intervention	Physical
175	Rebuild water lines	Intervention	Physical
175.1	Rebuild water lines	Intervention	Physical
176	Rebuild water & sewage treatment facilities	Intervention	Physical
176.1	Rebuild water & sewage treatment facilities	Intervention	Physical
177	Rebuild telecommunications	Intervention	Physical
177.1	Rebuild telecommunications	Intervention	Physical
178	New currency	Intervention	Economy
179	Interbanks payment system	Intervention	Economy
180	Targeted privatization	Intervention	Economy
180.1	Targeted privatization	Intervention	Economy
181	Development of microfinance systems	Intervention	Economy
181.1	Development of microfinance systems	Intervention	Economy

Node	Name	Type	Sector
182	Commercial law to improve investment	Intervention	Economy
183	Public works programs to generate jobs	Intervention	Economy
183.1	Public works programs to generate jobs	Intervention	Economy
184	Insurance system	Intervention	Economy
185	Mediating & negotiating w/ conflicting parties	Intervention	Conflict
185.1	Mediating & negotiating w/ conflicting parties	Intervention	Conflict
186	Establishing demilitarized zones, sanctions, and arms embargoes	Intervention	Conflict
186.1	Establishing demilitarized zones, sanctions, and arms embargoes	Intervention	Conflict
187	Maintaining compliance with peace accord milestones & conditions	Intervention	Conflict
187.1	Maintaining compliance with peace accord milestones & conditions	Intervention	Conflict
188	Implementing weapons control regimes	Intervention	Conflict
188.1	Implementing weapons control regimes	Intervention	Conflict
189	Demobilizing, reducing, or reintegrating military & paramilitary units	Intervention	Conflict
189.1	Demobilizing, reducing, or reintegrating military & paramilitary units	Intervention	Conflict
190	Providing job training and employment for discharged military personnel	Intervention	Conflict
190.1	Providing job training and employment for discharged military personnel	Intervention	Conflict
191	Establishing observer missions & interposing forces	Intervention	Conflict
191.1	Establishing observer missions & interposing forces	Intervention	Conflict
192	Reforming government economic policy	Intervention	Economy
193	Assisting in economic integration & cooperation	Intervention	Economy
194	Managing natural resources	Intervention	Economy
194.1	Managing natural resources	Intervention	Economy
195	Seeking investment capital	Intervention	Economy
195.1	Seeking investment capital	Intervention	Economy
196	Energy importation	Intervention	Economy
196.1	Energy importation	Intervention	Economy
197	Conducting war crimes investigations, tribunals, etc.	Intervention	Govt
197.1	Conducting war crimes investigations, tribunals, etc.	Intervention	Govt
198	Conducting constabulary operations	Intervention	Govt
198.1	Conducting constabulary operations	Intervention	Govt
199	Establishing, staffing & funding effective transition national govt	Intervention	Govt
200	Establishing a mechanism for constitutional reform	Intervention	Govt
201	Conducting nationwide elections	Intervention	Govt
201.1	Conducting nationwide elections	Intervention	Govt
202	Training newly elected national political leaders	Intervention	Govt
202.1	Training newly elected national political leaders	Intervention	Govt
203	Providing advisors to national govt officials	Intervention	Govt
203.1	Providing advisors to national govt officials	Intervention	Govt
204	Monitoring and reporting on corruption by govt officials	Intervention	Govt
204.1	Monitoring and reporting on corruption by govt officials	Intervention	Govt
205	Transferring control of government functions to host nation officials	Intervention	Govt
206	Monitoring government powersharing arrangements	Intervention	Govt
206.1	Monitoring government powersharing arrangements	Intervention	Govt
207	(Re)building & monitoring new police force	Intervention	Govt
207.1	(Re)building & monitoring new police force	Intervention	Govt
208	Providing advisors to police & criminal justice organizations & supporting establishment of operations	Intervention	Govt
208.1	Providing advisors to police & criminal justice organizations & supporting establishment of operations	Intervention	Govt

Node	Name	Type	Sector
209	Creating or reforming & monitoring military	Intervention	Govt
209.1	Creating or reforming & monitoring military	Intervention	Govt
210	Assisting in establishing humane penal systems	Intervention	Govt
210.1	Assisting in establishing humane penal systems	Intervention	Govt
211	Assisting in establishing/reforming legitimate legal system	Intervention	Govt
212	Monitoring human rights practices	Intervention	Govt
212.1	Monitoring human rights practices	Intervention	Govt
213	Conducting benign public information operations	Intervention	Misc
214	Promoting civic education	Intervention	Misc
214.1	Promoting civic education	Intervention	Misc
215	Sponsoring journalist training & professionalization	Intervention	Misc
215.1	Sponsoring journalist training & professionalization	Intervention	Misc
216	Reducing likelihood of population movements	Intervention	Movement
217	Coordinating NGO activities	Intervention	Needs
218	Prepositioning humanitarian relief stocks	Intervention	Needs
218.1	Prepositioning humanitarian relief stocks	Intervention	Needs
219	Establishing confidence-building and security measures	Intervention	Security
219.1	Establishing confidence-building and security measures	Intervention	Security
220	Providing security assistance to the host nation	Intervention	Security
220.1	Providing security assistance to the host nation	Intervention	Security
221	Safeguarding institutions of governance and key officials	Intervention	Security
221.1	Safeguarding institutions of governance and key officials	Intervention	Security
222	Negative impact of intervention (rapes, etc.)	Intervention	Misc
232	Providing security for HA activities	Intervention	Security
233	Providing security for PO activities	Intervention	Security
234	Providing security for Stability activities	Intervention	Security
235	Providing force security	Intervention	Security
237	Health infrastructure repair	Intervention	Needs
237.1	Health infrastructure repair	Intervention	Needs
239	Rebuild railroads	Intervention	Physical
239.1	Rebuild railroads	Intervention	Physical

7.2 CREATING LOGIC ON THE USER- OR DIAMOND- WORKSHEET

If you are using one of these worksheets, you must first select which one it will be. Again, the selection must be the same, Diamond- or User- Worksheet, as you choose for the Preprocessor.

Figure 7-1 illustrates the concept. In the top half of the worksheet, the user builds in the worksheet a form that allows him to enter the data from available sources, then creates any needed computations (free-form logic) based on these data.

The first row must contain the dates for the interventions and these dates must be exactly the same as the dates in the ExternalInputs worksheet.

In this example, three airports need to be constructed from scratch. The projects are divided into eight sub-projects, with fractional values, representing their contribution to the total (here 0.125, each). The subprojects begin at different times with different rates of progress that will each eventually total to its contribution value. The progress for each airport is totaled. These progress totals are collected in the row labeled 171, representing the total airport construction progress. Note, that in this case each airport is equally valued. This is not a requirement. The row labeled 171.1 contains the desired total at the end of the project.

ISSM Main UserWorksheet			Use the area below for data input and calculations. Insert as many rows as desired Use the shaded area below the input and calculation area to copy final results for tr						
node				2/27/06	3/6/06	3/13/06	3/20/06	3/27/06	4/3/06
		Baghdad Airport							
	0.125	runways		0.050	0.050	0.050	0.100	0.100	0.100
	0.125	taxiways					0.050	0.050	0.050
	0.125	hangers		0.005	0.010	0.015	0.020	0.025	0.030
	0.125	control tower						0.025	0.050
	0.125	terminal buildings				0.005	0.010	0.015	0.020
	0.125	radars, etc.							
	0.125	electrical power, etc.							0.005
	0.125	finishings							
	1.00	Total		0.055	0.060	0.070	0.180	0.215	0.255
		Mosul Airport							
	0.125	runways						0.050	0.050
	0.125	taxiways							
	0.125	hangers						0.005	0.010
	0.125	control tower							
	0.125	terminal buildings							
	0.125	radars, etc.							
	0.125	electrical power, etc.							
	0.125	finishings							
	1.00	Total		0.000	0.000	0.000	0.000	0.055	0.060
		Basrah Airport							
	0.125	runways							
	0.125	taxiways							
	0.125	hangers							
	0.125	control tower							
	0.125	terminal buildings							
	0.125	radars, etc.							
	0.125	electrical power, etc.							
	0.125	finishings							
	1.00	Total		0.000	0.000	0.000	0.000	0.000	0.000
171		Airport Reconstruction	airports	**0.055**	**0.060**	**0.070**	**0.180**	**0.270**	**0.315**
171.1	3.00	Airport Reconstruction	airports	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**

Figure 7-1. UserWorksheet, upper part, with sample data

In the bottom half of the worksheet (Figure 7-2), the user collects all of the entries that will connect to the RawData worksheet.

The first step is to place formulas in the “dates” box to copy the dates from the top of the worksheet. Make sure that the resulting dates correspond exactly to the dates in RawData, including the number of dates, so that the last date in this worksheet corresponds with the last date in RawData.

The inputs should be in numerical order of the nodes that will be connected. If additional rows are needed, use the Excel “insert row” function to insert rows within the light orange section, which defines the area that will be connected. The user should start the first row of data below the double lines separating the instructions and dates, leaving at least one blank row in case nodes with smaller numerical values need to be inserted later.

ISSM Main UserWorksheet			Use the area below for data input and calculations. Insert as many rows as desirec Use the shaded area below the input and calculation area to copy final results for tr						
node				2/27/06	3/6/06	3/13/06	3/20/06	3/27/06	4/3/06
Use this block for memo items, such as date offset. No links allowed.	You must identify the Node #		Insert as many rows as desired in the shaded area below the double line and above Put dates in box below - Column positions **MUST CORRESPOND** with						
			Units	02/27/06	03/06/06	03/13/06	03/20/06	03/27/06	04/03/06
		171	airports	0.055	0.060	0.070	0.180	0.270	0.315
		171.1	airports	3.00	3.00	3.00	3.00	3.00	3.00

Figure 7-2. UserWorksheet, lower part, with sample data

In the "Node #" column, place a formula that copies the node number from the top half of the worksheet. If you used a constant goal, use a formula that adds 0.1 to the value for the node number. If you defined the units in the top half, place a formula that copies its value, otherwise, type the definition into the "Units" column.

Within the body of the section, place formulas that copy the values of the proper row, beginning at the desired date. The column identification of the formula will be the same as the column into which the formula is being placed.

If you discover that you have made a mistake in the column references, **do not use the Excel "cut" control to move the column of data and formulas to the correct place**. The "cut" control will cause changes in the references to follow the movement. **Do not use the Excel "insert columns" or "delete columns" controls, either, for the same reason.** Instead, either manually retype the data in the correct place or use the "copy" control to copy the data and formulas to the right location. Then delete the data and formulas from the old location.

When the user selects the "Connect/Disconnect" control in the Controller workbook, it will create the formulas in RawData to use these values in the proper places.

7.3 IMPLEMENTING THE USER- OR DIAMOND- WORKSHEET CHOICE

When the user selects the "Connect/Disconnect" control in the Controller workbook, the control will create the formulas in ExternalInputs to use the values from the User- or Diamond- Worksheet in the proper places.

This control will also connect the values in the Preprocessor User- or Diamond- Worksheet in the proper places in the RawData worksheet. If you are building the total logic in pieces, you will have to use the Connect/Disconnect control each time you add new logic, as this control only makes the connections that are available at the time of its use, not any that are added later.

7.4 CHECKING YOUR LOGIC

You should use examine the TimeChart2 (Figure 5-17) charts that contain the results of all of your custom logic to look for anomalies. After you have added all of you Preprocessor custom logic, you may perform an additional, more thorough check of your logic by using the Save Data and Logic control on the Controller's Controls worksheet. This process will institute several logic checks.

8. OTHER MODIFIABLE PARTS OF THE ISSM MAIN V4.0 LOGIC

Some of the modifications that a user can make to the ISSM Main logic are normal accommodations to modeling the situation at hand, such as changes to the Time Delays and the Start Points variables. However, others must be considered as intrinsic parts of the ISSM Model, so that changes to them result in the creation of a different model. The point is not that the current model is perfect and should never be changed, but that any changes must be well considered and defended on grounds of demonstrable improvements to the model.

8.1 EXTERNAL INPUTS

There are four modifiable variables that are contained in the external inputs section of the model that are not direct data inputs: date interval, time delays, weights, and start points. The user should definitely check the values of the time delays and start points to make sure they conform to the situation being modeled.

8.1.1 Date Interval

The date interval is entered on the ExternalInputs worksheet (normally seven days, shown in Figure 8-1as "30" days). This input determines the interval between the input dates for the external inputs. It is independent of the intervals for the internal inputs. For real situations, seven or 14 days are best; whereas for simulated situations, 30 days or longer are normal choices when things don't change very quickly.

Direct Aid Activities			**Date Interval in Days**	**30**	**Date Activity Started**	
Node #	**Sector**	**Activity**	**Value Definition**	**Units**	**03/20/03**	**04/19/03**
		Normal Factors				
		Coalition Forces			0	
		Other US Depts & Agencies			1000	0
		UN Depts & Agencies				
		NGOs & PVOs			0	0
		From DiamondWorksheet				
150	Needs	Medical treatment	Quantity Treated, Max 100000000	People	1000	0
150.1	Needs	Medical treatment	Quantity Needing Treatment, Max 100000000	People	5000	20000
		Coalition Forces				
		Other US Depts & Agencies				
		UN Depts & Agencies				
		NGOs & PVOs			0	0
		From DiamondWorksheet				
237	Needs	Health infrastructure repair	Quantity finished in 8.57142857142857 wks, Max 100000000	units	0	0
237.1	Needs	Health infrastructure repair	Quantity Needed, Max 100000000	units		

Figure 8-1. Section of ExternalInputs sheet

8.1.2 Time Delays

The time delay values (in days delay) are entered on the External 2 sheet, as shown in Figure 8-2. Note the correspondence between the interventions (or activities) shown on the ExternalInputs worksheet and the Activity shown here. The terminology used in the model is that the raw interventions reported on the External Inputs sheet are called activities and that these activities feed into the interventions that are reported to the observational part of the ISSM. More than one activity may feed into an intervention.

In fact, a single activity, may also feed into more than one intervention. Here the activity is "create local governments." This one activity has an impact on justice, the central authority, and social services. Note that in this example the time delays can vary. Here the user has determined that the impact of creating local governments will take 56 days to impact the quality of the central authority, even longer before the quality of social services changes, and even longer before the quality of justice changes.

Direct Aid Activities					**Date Interval in Days**	7		**Date Activity Started**	
	Sector	**Activity**	**Node #**	**To Node #**	**Name**	**Time Delay in Days**	**Weight**	**03/28/03**	**04/04/03**
	Govt	Create local governments	162	127	Intervention justice	84	0.5		
	Govt	Create local governments	162	129	Intervention central authority	56	0.5		
	Govt	Create local governments	162	144	Intervention social services	70	0.5		

Figure 8-2. Part of External 2 sheet

As discussed in Section 6.2, the choice of time delay value has multiple effects. The direct effect is that values for the activity that are entered into the ExternalInputs worksheet are delayed for the specified time before impacting the intervention in question. Indirect effects concern the special cases of starting a model (how far in advance should the external inputs be started before the internal inputs), problems with an intervention (negative impacts, delays in the activity, etc.), and modeling considerations (if the activity is subdivided, how does that affect the proper choice of the time delay value).

The direct effect, which generates the indirect effects, is that an activity value (or pair of values for numerator/denominator pairs) entered for a given date column on the ExternalInputs worksheet results in an entry on the External 2 worksheet in a column determined by the ExternalInputs date column, the date interval value (note that in Figure 8-2 this value is “7”), and the time delay. The column chosen is the one with the smallest date value greater than the original date, plus the time delay.

While it is true that the values for the time delay variables are not of major importance in a broad-brush model of a situation, if the user decides that a more detailed look is required, it is surprisingly difficult to go back and modify the external inputs data to account for changes in the time delays. Therefore, the user should attempt to define the intervention activities at the front end to keep the time delay values as small as possible.

8.1.3 Weights

The weights values are also entered on the External 2 worksheet, as they depend on both the application and the particular intervention destination. Note that while the entries under the Weight column are shown in red in Figure 8-2, these are not values that the user should casually change. **These weights are part of the model and changes to them change the model.**

As explained in Section 14 and illustrated in Table 14-4, these weights are used to determine how the values from all of the activities that impact a particular intervention are to be evaluated. The Total Weight column in the External 3 worksheet (Figure 8-3) contains the calculation of the total of all the application weights for a particular intervention. The calculation for a particular intervention node (row in External 3, uses the corresponding column name (always "To Node #") and node number found in rows two and three of the External 3 worksheet and the DSUM() Excel function to find and sum the weights. The number of activity/intervention pairings is recorded in the Num column, which uses a similar DCOUNT() function.

							To Node #	To Node #	To Node #
					Lookup Node		127	128	129
				Lookup Date Column			9	10	11
Node #	**Node Name**	**Start Point Min=-3**	**Scale Factor**	**Total Weight**	**Scaled Weight**	**Num**	**03/20/03**	**04/19/03**	**05/19/03**
127	Intervention justice	-2.25	5.25	5.50	1.05	6	#N/A	-2.24	-2.14
128	Intervention agriculture	-2.25	5.25	3.00	0.57	3	#N/A	#N/A	#N/A
129	Intervention central authority	-2.25	5.25	12.50	2.38	13	#N/A	#N/A	#N/A

Figure 8-3. Section of External 3 worksheet

8.1.4 Start Point

The external input fractions of the External 2 sheet are converted to scaled values on the External 3 sheet, shown in Figure 8-3. A fractional value of 1.0 will be converted to a +3, or very positive scaled value; however, the proper value for the lowest fractional value, 0.0, depends on the situation. The Start Point, which is entered on the External 3 worksheet controls the conversion process.

Because your interventions may not start on the same date as your observations, particularly if you have been observing the situation for some time before the interventions begin, you will not want a zero intervention to suddenly make the situation dramatically worse or better than if you had the intervention function turned off. In Figure 8-3, you see that the first intervention date is 3/20/03. You should check the value for the Output value (Civil stability and durable peace exists) for this date with intervention turned off and use that value as your low value, or Start Point. You can find this value on the ScenarioHistory sheet at about row 124. Rounding of the value is permissible. If the actual value was -2.10, then a value of -2.25 is reasonable as the first Start Point. The formulas in the following rows copy this value for all the other intervention variables. The result is that a fractional value of 0.0 will be converted to a scaled value of -2.25; a fractional value of 1.0 will be converted to a scaled value of 3.00; and intermediate fractional values will be converted linearly to intermediate scaled values.

The computation is accomplished by creating the Scale Factor to be three more than the Start Point (with a floor of -3.00) and dividing the Total Weight by the Scale Factor to arrive at the Scaled Weight. The date entries in the worksheet are (for a given intervention node or row) the Num value times the sum (using DSUM() again) of all of the External 2 values for activities that contribute to that intervention (for that column date [defined by the column number in row 4]) in External 2, divided by the number of those activities (using DCOUNT() again), then added to the Scaled Weight value.

8.2 NODES

The discussion in Section 2.1 on the general ISSM node model applies to the nodes in the ISSM Main. That discussion covers the mathematical impacts of changing the three variable node parameters.

8.2.1 From Node Weights

Except for the From Nodes that pass their weight as the variable, rather than their value, the user may change the From Node weights on the node logic worksheets in the ISSM Main. **However, these weights are part of the model and changes to them change the model.**

8.2.2 To Node Inflate Values

Except for the To Nodes that that are paired with the Node as part of a reversible and variable special factor, the user may change the To Node inflate values on the node logic worksheets in the ISSM Main. **However, these inflate values are part of the model and changes to them change the model.** The inflate values that are considered user variables are changed by the reversible and variable special factors on the ExternalInputs worksheet.

8.2.3 To Node Center Values

The user may change the To Node Center values on the node logic worksheets in the ISSM Main. **However, these center values are part of the model and changes to them change the model.**

8.3 CHANGING THE SCENARIO HISTORY

In the ISSM, you can change history. All of the inputs and intermediate results are recorded for plotting. Hence, if you change the inputs for a given date and recalculate all the intermediate results, you will have a new, consistent history. Naturally, this should be done to correct various types of errors, not to make the status look better.

8.3.1 Internal Inputs History

A global historical data editing function is provided on the ScenarioHistory worksheet. The cells with red contents contain the historical input data (that you entered). These cells are found in rows 5 & 7 through 40, columns F and beyond (Figure 8-4). The data below these rows consists of the history of the intermediate variables, which will be recalculated by the program.

					Initial	Dates			
			09/18/03	**Iraq, Test Scenario**	3/22/03	3/28/03	4/4/03	4/13/03	4/20/03
Group	**Sector**	**Nd#**	**VALUE**	**NODE Name**					
Input	Conflict	4	-1.00	Armed forces are well structured	2.00	0.00	-3.00	-3.00	-3.00
Input	Conflict	11	-1.00	Competing groups resolve differences	-1.00	-2.00	-3.00	-3.00	-3.00
Input	Conflict	59	-1.00	Opposition party does not espouse force	-1.00	-1.00	-3.00	-3.00	-3.00
Input	Conflict	60	-2.00	There haven't been any paramilitary forces	-1.00	-2.00	-3.00	-3.00	-3.00
Input	Conflict	61	1.50	There haven't been any regime-sponsored, non-military armed forces	-3.00	-3.00	-3.00	-3.00	-3.00
Input	Conflict	74	-1.00	There are no factional disputes	-2.00	-2.00	-3.00	-3.00	-3.00
Input	Conflict	148	0.00	No insurgents are operating	0.00	0.00	0.00	0.00	0.00
Input	Conflict	149	-1.50	No terrorists are operating	0.00	0.00	0.00	0.00	0.00
Input	Economy	124	-2.00	Foreign investment is available	0.00	-3.00	-3.00	-3.00	-3.00
Input	Economy	71	-2.00	Financial system is solid	-1.00	-3.00	-3.00	-3.00	-3.00
Input	Govt	35	1.00	Human rights are protected	-3.00	-3.00	-3.00	-2.00	-2.00
Input	Govt	45	1.50	Police are distinct from the military	-3.00	-3.00	-3.00	-3.00	-3.00
Input	Govt	49	-1.00	Prison structure is adequate	-2.00	-3.00	-3.00	-3.00	-3.00
Input	Govt	121	-2.00	Corruption in public office is not part of culture	-2.00	-2.00	-2.00	-2.00	-2.00
Input	Govt	122	1.00	Central government exists	3.00	2.00	0.00	-2.00	-3.00
Input	Govt	65	3.00	Drug cultivation is not a problem	3.00	3.00	3.00	3.00	3.00
Input	Govt	66	3.00	Drug manufacture is not a problem	3.00	3.00	3.00	3.00	3.00
Input	Govt	67	3.00	Drug transshipment is not a problem	3.00	3.00	3.00	3.00	3.00
Input	Govt	72	3.00	Drug use is not a problem	3.00	3.00	3.00	3.00	3.00
Input	Govt	69	0.00	Organized crime is not a problem	-1.00	-1.00	-1.00	0.00	0.00
Input	Govt	73	-1.50	Common crime is not a problem	1.00	0.00	0.00	-2.00	-2.00
Input	Misc	126	0.50	Education infrastructure is adequate	2.00	-3.00	-3.00	-3.00	-2.50
Input	Misc	21	-1.00	Educational system is tailored toward jobs	-1.00	-3.00	-3.00	-3.00	-3.00
Input	Misc	125	2.00	Government does not control domestic media's reporting of events	-3.00	-3.00	-3.00	-3.00	-3.00
Input	Misc	38	3.00	International media have open access to the reporting of events	-3.00	-3.00	-2.00	0.00	2.00
Input	Misc	43	0.50	People perceive that their interests are represented	-2.00	-3.00	-3.00	-3.00	-3.00
Input	Misc	44	2.00	People's spiritual needs are met	-1.50	-1.50	-1.50	-1.50	-1.50
Input	Movement	50	-0.50	Property ownership issues are resolved	-1.50	-1.50	-1.50	-1.50	-1.50
Input	Movement	54	1.00	Stress migration is not present	-2.00	-2.50	-3.00	-2.50	-2.50
Input	Movement	62	1.50	There are no expatriates	-2.00	-2.00	-2.00	-2.00	-2.00
Input	Movement	63	0.00	There is no displaced population	-3.00	-3.00	-3.00	-3.00	-3.00
Input	Movement	64	0.00	There are no migrants	-2.00	-2.00	-3.00	-2.00	-2.00
Input	Needs	5	0.00	Basic natural resource management is in place	-1.50	-3.00	-3.00	-3.00	-3.00
Input	Needs	58	0.50	Water distribution infrastructure is sufficient	-1.50	-3.00	-3.00	-3.00	-3.00
Intermediate	Conflict	16	-0.52	Demobilized armed forces are integrated into society	-0.5563	-1.182813	-2.332813	-2.332813	-2.332813
Intermediate	Conflict	17	-1.04	Disarmament is effective	-1.7604	-2.026042	-2.671875	-2.671875	-2.671875
Intermediate	Conflict	31	-0.37	Government-run military is effective	0.20833	-0.567708	-1.692708	-1.692708	-1.692708

Figure 8-4. Part of ScenarioHistory worksheet

If you find the need to modify the input data that has already been entered, you simply find the correct cells in the Records sheet, change their values, and press the Recalculate Data button on the Controls sheet. The progress meter will show the status of the recalculation. (The end point of the progress meter bar will not always coincide with the end point of the surround, depending on the number of dates you have input, because of rounding.) Typical reasons for needing this function include discovery of information that corrects prior inputs, realization that there has been an input error, or discovery of a systematic scaling problem.

The scaling problem will be frequently discovered in a first use of the ISSM. The user will discover after entering several sets of data that the cumulative improvement (or worsening) is too large, caused by using too large an increment of change (e.g., 1.00 vs 0.50) from one period to the next. The solution is to use the Time Chart to view the input variables, identifying the ones with too optimistic changes. As changes are made to the Records sheet, they will be reflected in the input data curves in the Time Chart. However, the calculated variables, Core and Output, will not change until the Recalculate Data button is used.

Typically, you will identify the presence of a scaling problem after you have entered fifteen to twenty dates. At this point, the problem of fixing the scaling error looks monumental. However, it is fairly simple to correct.

- Copy the entire block of history (without dates: rows 7 – 40, columns F onward) to a new, blank workbook.
- Assuming you have placed the first entry (in the new workbook) in cell A1 (otherwise, adjust the following formulas), create in cell B36 the formula "=B1-A1". Copy this formula to the right and

downward so that you have a blank column in column A and numerical entries in all the other columns corresponding to your inputs and rows corresponding to all of your inputs. These are the increments you have actually used in going from one date to the next.

- Determine the size and nature of the scaling problem for each input.
    - By the nature of the curves you must determine whether you have a constant error (all the entries are too large or too small (the entire curve is too high or too low on the graph), a slope problem (too fast a rise or decline [or too fast in rises and too fast in declines]), a slope problem in only the rises or the declines (which may be a problem from a given date onward [or backward].
    - In constant error problems, it is fairly easy to see where the error originated and how large it is. You will only need to apply this correction on the date of origination.
    - In slope problems, for example, if the last values of the input is too large by +1.0 and the overall trend is upward, you have probably been using increments that are too large. If the value is too large but the overall trend is downward, you have probably been using increments that are too small. By looking at the actual increments you used, you can determine the delta by algebraicly adding the increments during the slope, counting the number of those increments, and dividing by the number of increments (average actual increment). Divide the error value (here +1.00) by the number of increments and you have the average excess that needs to be removed from the increments (that were not zero). Divide the average actual increment into the difference between the average actual increment and the average excess and you have a factor that can be multiplied times that actual increments during the slope to obtain the desired increment. This multiplication leaves zero increments alone.
- Create an array of the same size as the actual increments array that contains your multiplier(s). Ignore any constant error problems for now. If all of the inputs require corrections that are multipliers for all dates, this is simple. For any dates and inputs requiring no correction, place a value of 1.0 in that date and input cell. Examine the multipliers. Rethink any that are grossly inconsistent in value or time with all of the others. It is more likely that you were incorrect in your choice of increment in much the same way throughout than that you were incorrect in different ways, although it is possible. Look at the actual input definitions to see if there is a reason for inconsistency. Now look to see if you can improve the consistency by choosing one set of multipliers (or an average value) for many other inputs. The ideal is to discover that you have been choosing increments that are X times larger than they should have been (with a correcting multiplier of 1/X).
- Now create a fourth array that is the product of the actual increments and the multipliers.
- Create a fifth array (if necessary) that contains any constant corrections. This will consist largely of zeros with the constant correction for a given input at the proper position.
- Create a sixth array (if necessary) that adds the fifth array and the fourth array.
- Finally, create an array that copies the cells A1 through A34 for its first column and adds (algebraicly) the previous (fourth or sixth) array's column 1 to this new array's column 1, adds the previous array's column 2 to the new array's column 2, and so forth. This is your new history.
- Copy the new history and use the "paste special" (under Edit) command to paste only the **values** of the new history back into place (rows 7 – 40, columns F onward) in the ScenarioHistory worksheet of the ISSM Main workbook.

If you are using the Preprocessor, this process will work; however, your changes will be overlaid with the old data the next time you "copy data" from the Preprocessor to the ISSM Main. To avoid this, make the changes in the Preprocessor, then perform the "copy data" function.

8.3.2 Interventions History

To change interventions, simply change the data in the External Inputs sheet and push the Recalculate Data button on the Controls sheet.

8.3.3 Implementing Changes

Because the ISSM only works on one date/observation at a time, changes to the history require sequential recalculation of any dates with changed data. Rather than attempting to keep track of data changes, the model is designed to recalculate all data when the Recalculate Data button on the Controls sheet is pushed.

9. PREPROCESSOR V4.0 LOGIC

The Preprocessor is a shell that supports the creation of custom processing logic that converts one set of values (available data) into another set of values (inputs for the ISSM Main). The Preprocessor supports two types of custom logic, a standardized linear combination methodology and an optional free-form methodology that can precede the standardized logic.

The standardized Preprocessor logic is represented in three layers. The first layer, the input layer is required in order to have any logic at all. The third layer, the output layer is required because these are the variables that are the internal inputs of the main ISSM program. The second layer, the middle layer, is optional. You may add nodes that are not required for the inputs or the outputs to implement more complex logic than you would create with only two layers.

The free-form methodology is embodied in two worksheets, one for use with the DIAMOND simulation and one for use in real-world situations. The results from the chosen worksheet are relayed into the standardized logic.

Section 9.1 gives an abstract description of how the logic works, defining the notation of the node model. Section 9.2 describes the pre-defined set of inputs, the "professional opinion" inputs. Section 9.3 describes the available free-form custom logic that can be used to create non-linear relationships.

Section 9.4 describes the connection between the node model and the Excel implementation in the Preprocessor. This implementation is more fully described in Section 10. Section 11 contains the process description for custom logic.

9.1 PREPROCESSOR STANDARDIZED LOGIC FORMS

Figure 9-1 through Figure 9-4 illustrate three simple types of Preprocessor logic. In Figure 9-1, the row of symbols shows the simplest type, in which the raw data lead to a Preprocessor input that flows solely to a Preprocessor output, which is an ISSM Input Variable. Figure 9-2 shows a variant, in which two pieces of raw data are required, an amount present and an amount desired, the two being divided to obtain the fractional data.

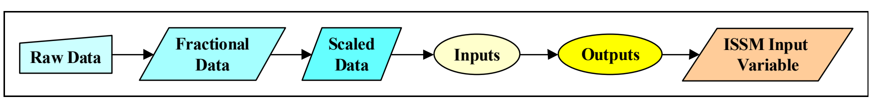


Figure 9-1. Simple types of Preprocessor logic - #1

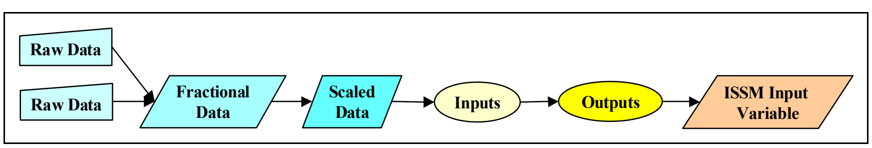


Figure 9-2. A variant of Preprocessor logic - #1

In Figure 9-3, two Preprocessor inputs are required to produce the Preprocessor output.

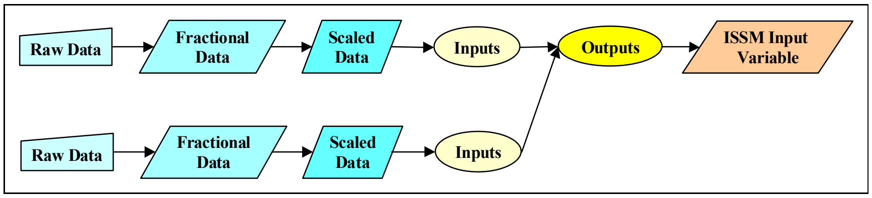


Figure 9-3. Simple types of Preprocessor logic - #2

In Figure 9-4, one of the Preprocessor inputs feeds into more than one Preprocessor outputs.

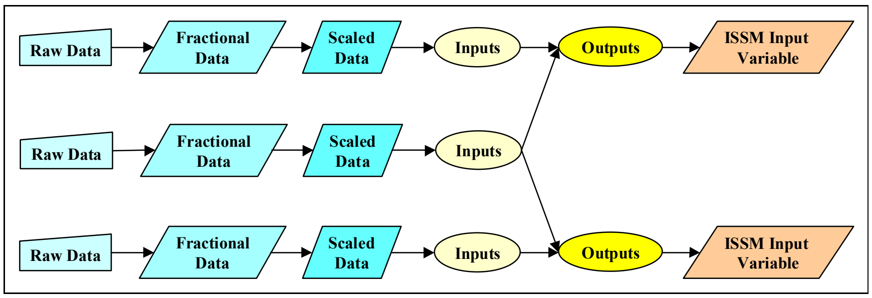


Figure 9-4. Simple types of Preprocessor logic - #3

Figure 9-5 shows how a middle layer logic node can be used to combine three simple inputs to produce more complex logic.

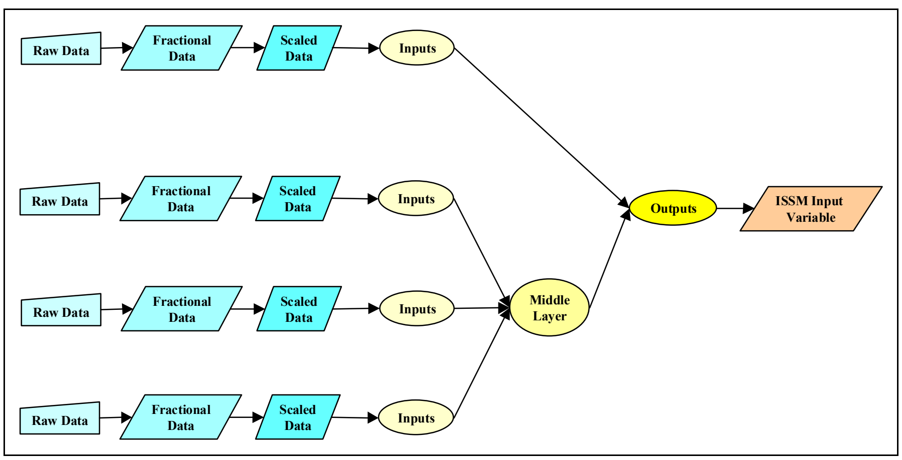


Figure 9-5. Adding a middle layer to the logic

As shown in Figure 9-6, you can add as many middle layer nodes as required to implement your logic. The main reason for creating middle layer nodes is to allow you to use them in multiple outputs, as shown at the bottom of the figure.

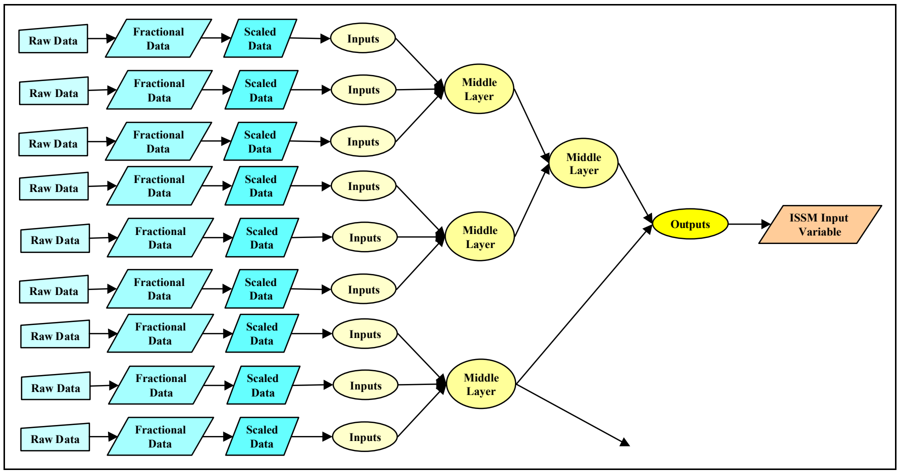


Figure 9-6. The Preprocessor allows multiple middle layers

9.2 PREPROCESSOR PROFESSIONAL OPINION INPUTS

One standard set of inputs consists of Professional Opinion on each of the outputs. You will always have some professional opinion on the correct value of each output. You should use this as a check on the computed value of the output from your other inputs and logic. If there is a difference, you should make sure it is not an artifact of biased data collection and logic. For example, you included a factor because it was easy to gather and was relevant to the output; however, you did not include a factor that might weight the result in another direction because you could not collect data on that factor. You might also find that your professional opinion was biased.

Having the professional opinion ensures that you will be able to construct logic for each of the required outputs. It makes it possible to double check your inputs and logic. It also allows you to counterbalance biased collection schemes.

9.3 PREPROCESSOR FREE-FORM LOGIC

The Preprocessor allows the user to create logic that processes available data into the data required by the ISSM Main. However, the logic described above is that of linear combination, which is adequate in most situations, but cannot handle the occasionally needed non-linear processing. The UserWorksheet and the DiamondWorksheet allow the user to include non-linear logic for real-world and DIAMOND-simulated situations, respectively, although at the cost of increased difficulty.

Figure 9-7 shows the structure of the User- and Diamond- Worksheets and the data flow into the standardized Preprocessor logic. The top half of these worksheets (upper left portion of the figure) contains a mostly unformatted area in which the user defines his inputs and creates any desired combinatorial logic (green block arrows). The format that is imposed on this area is a column-based identification of dates and data. The bottom half of these worksheets consists of a formatted area to which the final results must be copied (blue arrows). These worksheets are described in more detail in Section 10.4. The Connect/Disconnect control found in the Controller creates the links from the formatted part of the proper worksheet to the correct row in the RawData worksheet. The remainder of the processing uses the standardized Preprocessor custom logic.

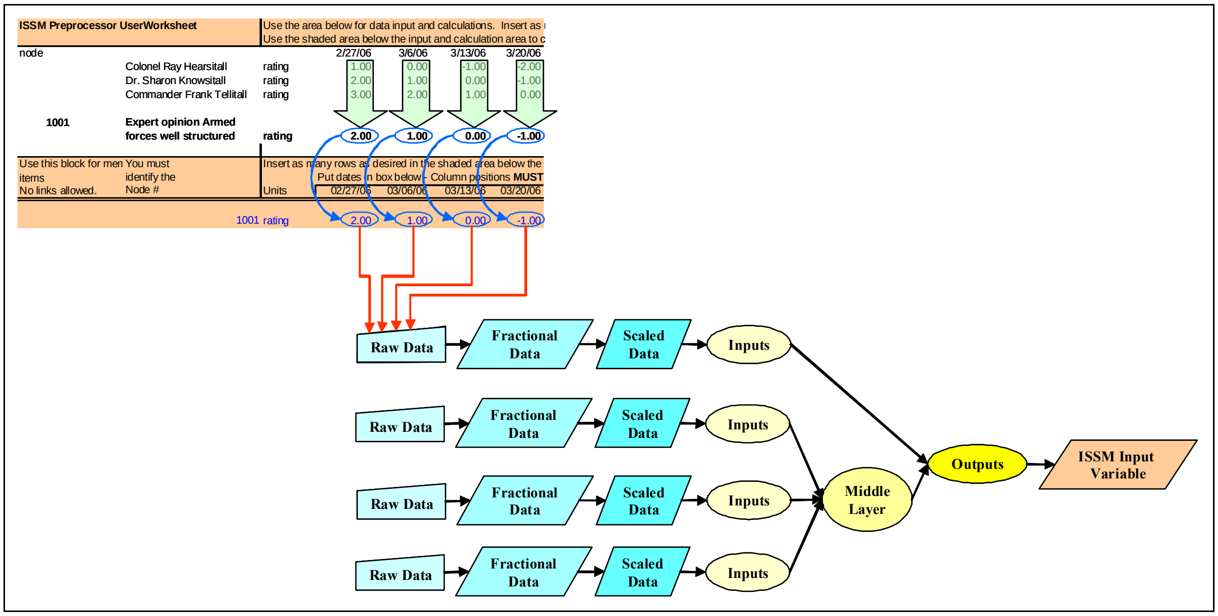


Figure 9-7. Preprocessor free-form logic

9.3.1 DiamondWorksheet

Figure 9-8 shows a section of the special sheet, named DiamondWorksheet, within the Preprocessor workbook for receiving the output from DIAMOND that will be processed into input for the ISSM. This section holds the strength values for the Blue side that are assigned to each AO in the scenario and calculates the totals for each period, beginning with the initial assignment and continuing for each month. Similar sections exist for the strengths of the other parties of interest.

			Initial	Month 1
	Put Blue BAMS values in where red place-holder numbers are showing			
Blue GCE BAMS in AO1		B(B,i,AO1)	8000000	7000000
Blue GCE BAMS in AO2		B(B,i,AO2)	7000000	6000000
Blue GCE BAMS in AO3		B(B,i,AO3)	4000000	3800000
Blue GCE BAMS in AO4		B(B,i,AO4)	500000	500000
Blue GCE BAMS in AO5		B(B,i,AO5)	500000	500000
Blue GCE BAMS in AO6		B(B,i,AO6)		
Blue air BAMS				
		TB(i)	20000000	17800000

Figure 9-8. Blue strength input

Figure 9-9 shows the inputs for the Green strength and some associated calculations.

				Initial	Month 1
Green Army Calculations	Put Green BAMS values in where red place-holder numbers are showing				
BGD=Green BAMS deflator=fraction of a Blue uni		0.6	B(G,i,AO1)	4000000	3500000
BRD= Red BAMS deflator=fraction of a Blue unit t			B(G,i,AO2)	5000000	4900000
ICD=initial combat deflator=presumed attrition bef		0.75	B(G,i,AO3)	2000000	1900000
			B(G,i,AO4)	1000000	975000
			B(G,i,AO5)	500000	475000
TG=total BAMS=(TB(0)/BGD+TR(0)/BRD)/ICD=assumed total force size needed for good ar			TG(i)	12500000	11750000
GF(i)=(sum over j {B(G,i,AOj)}/TB		53111111	GF(i)	0.235	0.221
Armed forces well structured = GF(i)*6-3 = scaled Green Fraction from -3 to +3		6	3	**-1.59**	**-1.67**

Figure 9-9. Green strength input

In this section, the Green strength is totaled, then divided by a large number (in this example, 53,111,111), which represents the total forces that the entire country might sustain. A preliminary value is obtained by inflating the total initial Red strength by the amount it was deflated to represent its value relative to the Blue strength, adding it to the similarly inflated Green strength, and inflating the total by the presumed attrition that has taken place prior to the start of the scenario. The resulting fraction is taken as a measure of the value of the Green strength over time. It can decrease as the Green forces are attrited and increase as the Green force successfully recruits new members and/or trains to higher standards. The final row constitutes an input to the ISSM Preprocessor, wherein the fractions are scaled to values between -3 and +3, representing a measure of the assertion that the indigenous armed forces are well structured.

9.3.2 DiamondWorksheet Preprocessor Logic

Table 9-1 shows the current groups of calculations in the DiamondWorksheet and the connections to nodes in the RawData worksheet. Some of these connections would be useful in all DIAMOND-ISSM studies and others would need modification. For example, in the study from which these were created, there were several parties of interest: Green represented the indigenous government forces; Red represented an indigenous insurgent army, who might use terrorist tactics (Harass mission); Terrorists represented a party of purely terrorist orientation; Blue represented external forces aiding the Green government; and NGO represented the collection of NGOs attempting to aid the population.

Table 9-1. DiamondWorksheet to RawData Connections

Computation	Units	Node	Use
Actual Blue strength	BAMS		Intermediate calculations
Actual Green strength	BAMS	1001	Well-structured Army
Well-structured Green strength	BAMS	1001.1	Well-structured Army
Red strength Indicator	Fraction	1003	Insurgent Activity
Red Brigade-equivalent combat days in period Indicator	Fraction	1004	Insurgent Activity
Civilian collateral deaths from combat & direct deaths from attacks on civilians (by Red) Indicator	Fraction	1005	Insurgent Activity
Hospital capacity loss Indicator	Scaled number	1006	Insurgent Activity
Shelter capacity loss Indicator	Scaled number	1007	Insurgent Activity
Food production loss Indicator	Scaled number	1008	Insurgent Activity
Airport capacity loss Indicator	Scaled number	1009	Insurgent Activity
Seaport capacity loss Indicator	Scaled number	1010	Insurgent Activity
NGO losses (by Red combat) Indicator	Scaled number	1011	Insurgent Activity
Red ownership of nodes, weighted by original population,	Scaled number	1012	Insurgent Activity
NGO losses (by Red Harass & by Terrorists) Indicator	Scaled number	1013	Terrorist Activity
Civilian collateral deaths from Red Harass & from Terrorists Indicator	Scaled number	1014	Terrorist Activity
Green losses from Red Harass & from Terrorists Indicator	Scaled number	1015	Terrorist Activity
Blue losses from Red Harass & from Terrorists Indicator	Scaled number	1016	Terrorist Activity
# Harass events Indicator	Scaled number	1017	Terrorist Activity
Green ownership of nodes, weighted by original population, Indicator	Scaled number	1018	Government Exists
Green + Blue ownership of nodes, weighted by original population, Indicator	Scaled number	1019	Government Exists
Civilian (lack of) Law & Order deaths Indicator	Scaled number	1021	Crime
Civilian migration Indicator	Scaled number	1022	Movement
Civilian starvation deaths Indicator	Scaled number	1023	Movement

9.3.3 Current Simulation Support for Preprocessor Inputs

Figure 9-10 shows the eleven (of 34) ISSM observation variables that can be supported by DIAMOND. Some of these do not yet have DIAMOND queries written to implement the support. Some of them also do not yet have ISSM Preprocessor logic created to implement this support. The legend indicates the status of each DIAMOND query / Preprocessor logic link. The missing links are supplied by study team assumptions, based on the scenario description and historical precedents from past operations.

Figure 9-11 shows the 29 (of 79) ISSM intervention variables that can be supported by DIAMOND or Pythagoras. Some of these do not yet have DIAMOND queries written to implement the support. Some of them also do not yet have ISSM Preprocessor logic created to implement this support. The majority of the missing links represent interventions that are not called for by the scenario's time frame.

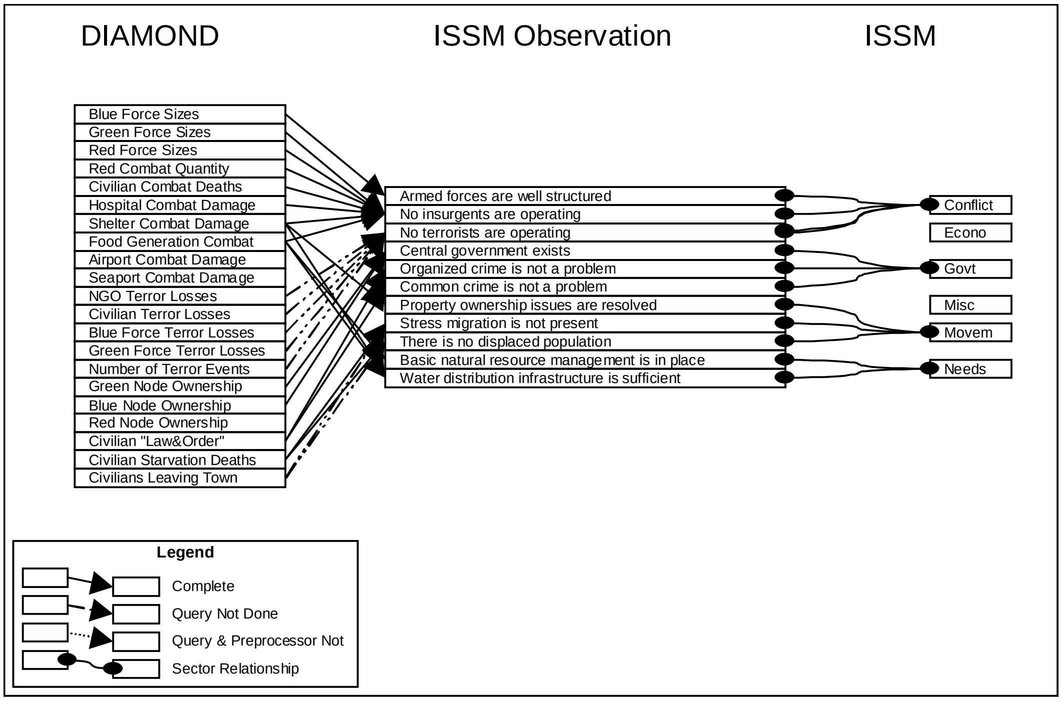


Figure 9-10. ISSM observation variables supported by simulations

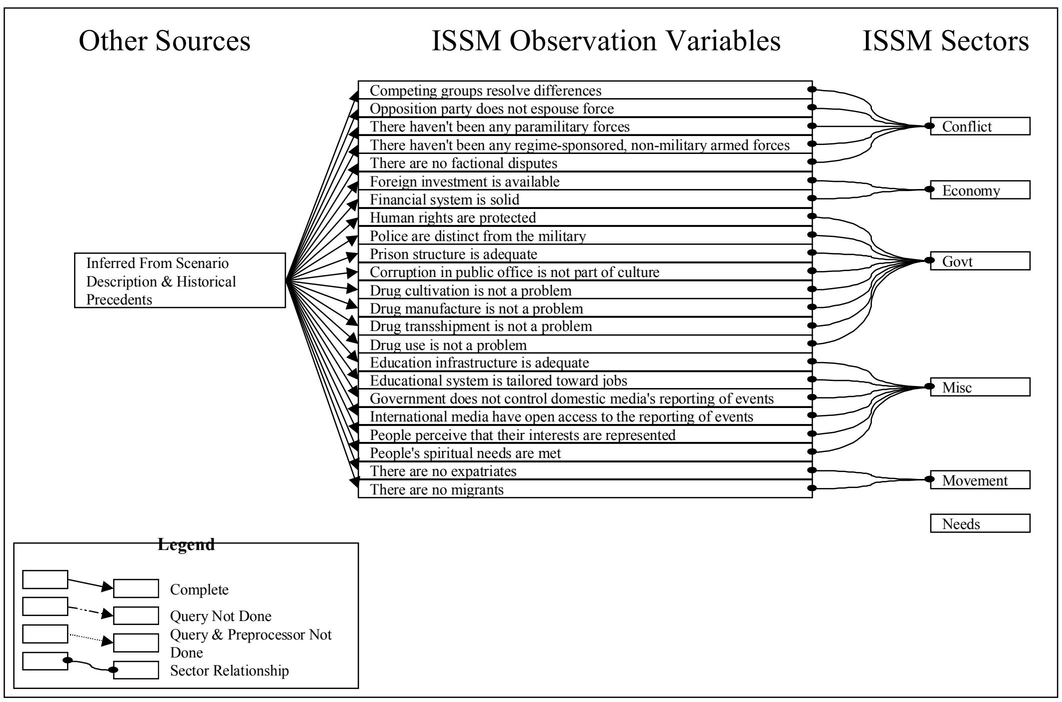


Figure 9-11. ISSM observation variables not supported by simulations

9.4 PREPROCESSOR PRINCIPAL LOGIC FLOWS

The explanations to this point have mainly concerned abstract logical structures and their connections. However, these logical structures require concrete implementation to be useful. Section 10 describes the Preprocessor Excel workbook and its worksheets. Figure 9-12 provides a visual transition between the abstract logic and the concrete implementation by showing the principal logic flows among the worksheets.

The user may begin with the UserWorksheet of DiamondWorksheet, which flows to the RawData worksheet (dotted arrow for optional flow), or the user may begin with RawData. RawData feeds into FractionalData, which feeds ScaledData, which flows to Inputs (one date column at a time).

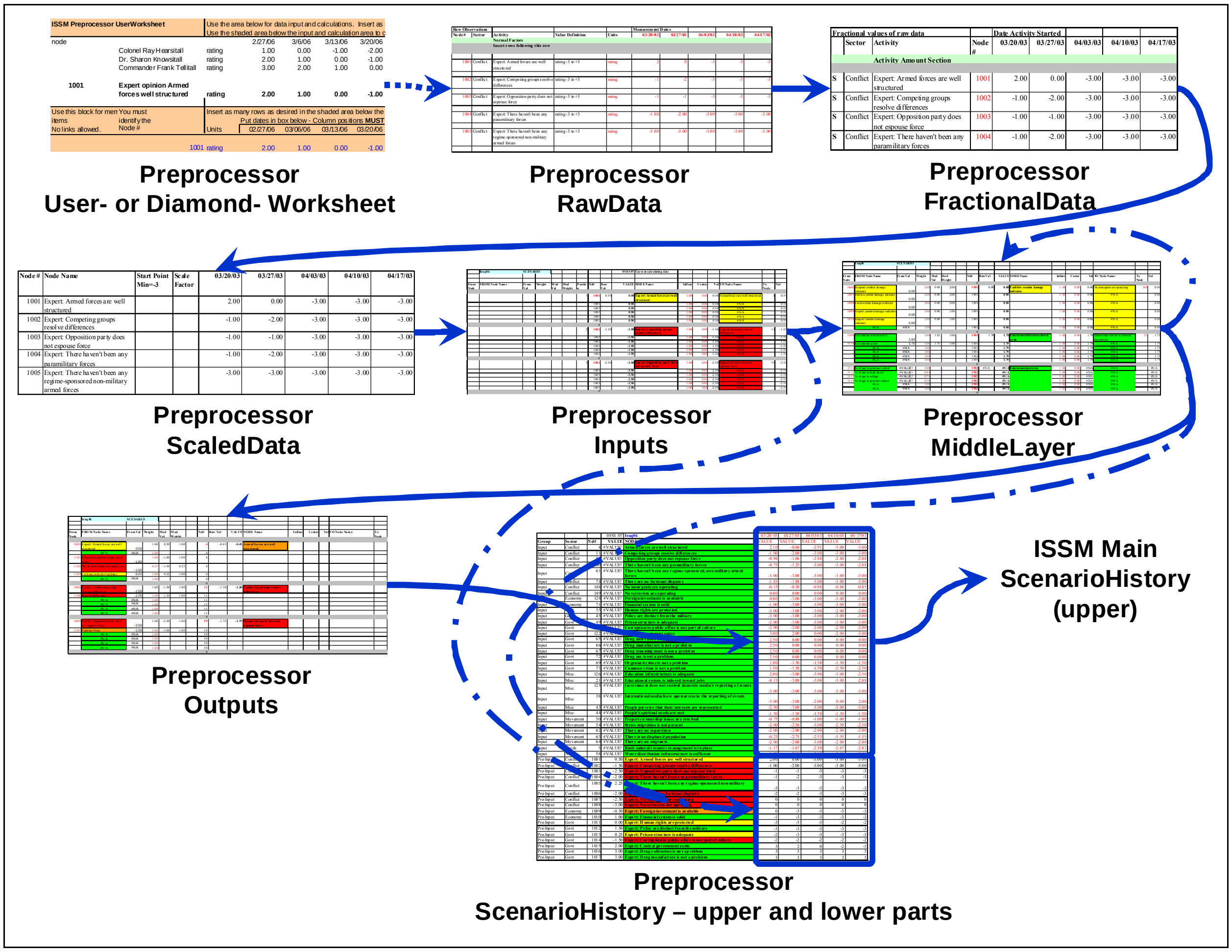


Figure 9-12. Preprocessor principal logic flows

The Inputs worksheet feeds the MiddleLayer worksheet, which has internal flows (arrow with two dots between dashes) and flows to the Outputs worksheet. The values of all of the nodes in Outputs for each date are stored in the ScenarioHistory worksheet (upper part) for display in the charts. They are also transferred to the ISSM Main to be available for use. The values of the nodes in Inputs and MiddleLayer for each date are stored in the ScenarioHistory worksheet (lower part) for display and logic checking.

10. PREPROCESSOR V4.0 IMPLEMENTATION

This section is provided to familiarize you with the 16 worksheets within the Preprocessor.

10.1 INSTRUCTIONS WORKSHEET

Figure 10-1 shows the Instructions worksheet, which contains the title, version number and version date.

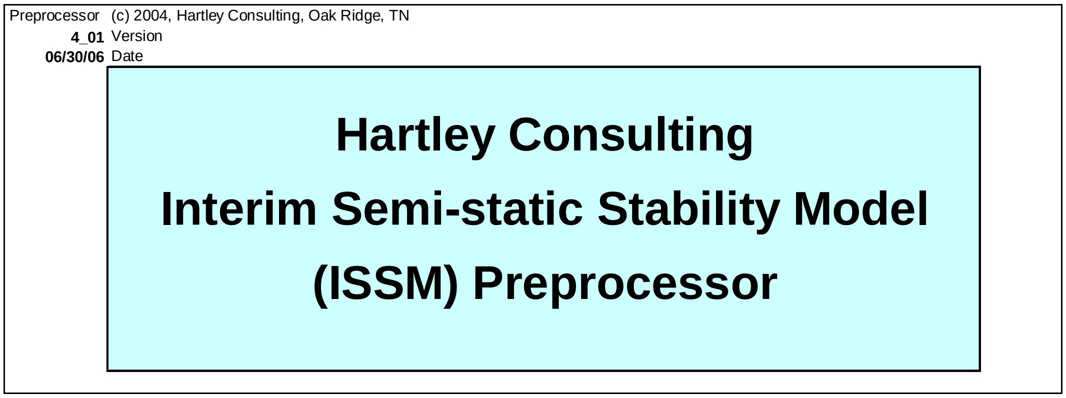


Figure 10-1. Instructions worksheet of the Preprocessor

10.2 CONTROLS WORKSHEET

Figure 10-2 shows the top half of the Controls worksheet. It contains the scenario name, the file name of the ISSM main, and six controls. The controls consist of Select Date Axis Method, the Select Value Axis Display, the Recalculate Data, Erase Old Data, Enter New Data, and Copy Data to ISSM.

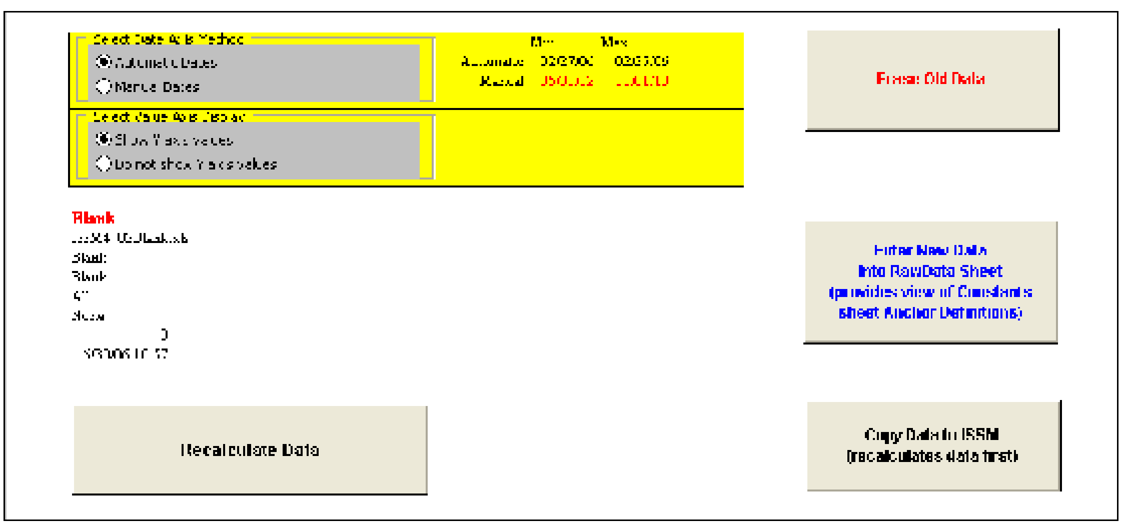


Figure 10-2. Top half of the Preprocessor Controls worksheet

Figure 10-3 shows the bottom half of the Controls sheet, with its twelve controls for the custom series for the Time Chart.

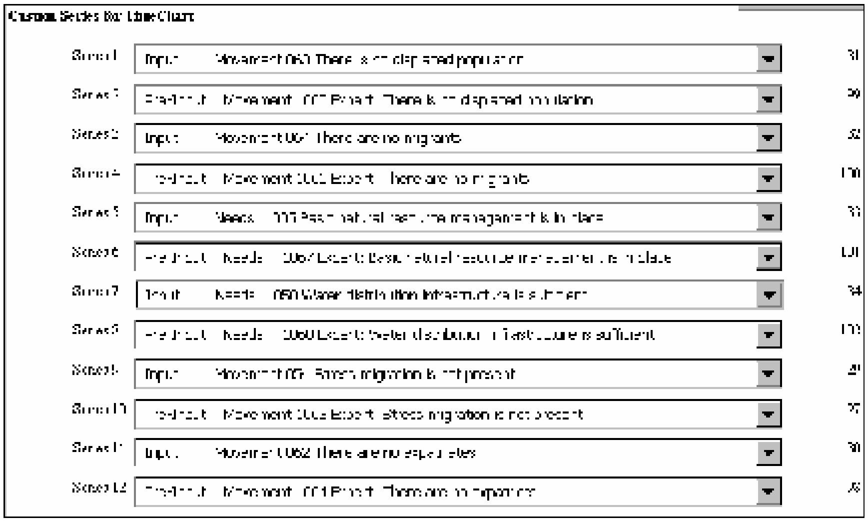


Figure 10-3. Bottom half of the Preprocessor Controls worksheet

10.3 TIMECHART WORKSHEET

Figure 10-4 shows the Time Chart that is defined by the custom series controls.

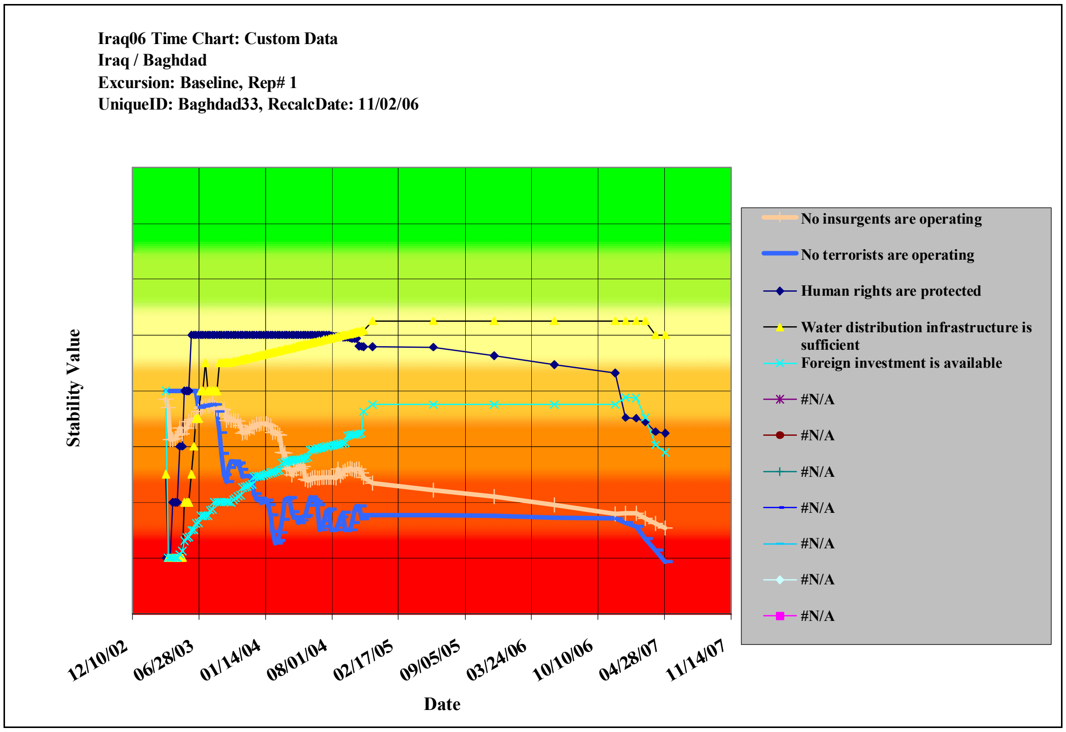


Figure 10-4. Preprocessor TimeChart

10.4 USER- AND DIAMOND- WORKSHEETS

The Preprocessor workbook contains two essentially blank, but structured, worksheets, named the “UserWorksheet” and the “DiamondWorksheet.” These worksheets allow the user to create free-form logic to calculate the values to be used for the ISSM internal inputs (Table 11-2) within the ISSM system itself and allow the user to retain metadata within the model, rather than in external files. For example, if the user has multiple sources for the data, he may annotate which data comes from each source before passing it on for use in the model. The user may also manipulate the data in any desired fashion in the worksheet prior to passing it on. These manipulations may be as simple as summing data from two sources or as complex as applying non-linear utility functions to the data so that the resulting scaled values reflect the correct relationships within the model.

10.4.1 The UserWorksheet

Figure 10-5 illustrates the concept. In the top half of the worksheet, the user builds in the worksheet a form that allows him to enter the data from available sources, then creates any needed computations based on these data.

The first row must contain the dates for the interventions and these dates must be exactly the same as the dates in the RawData worksheet.

In this example, a node for a scaled rating for displaced persons has been defined with the number 1130. Actual numbers of displaced persons are placed in the worksheet and converted to scaled values (-3.00 to +3.00) in the next row. The node number is placed in the first column of this row, the node name in the fourth column and the units (in this case, "rating") in the fifth column. The second example in the bottom of the figure has a node number of 1126 and represents a scaled investment value. Actual dollars invested are entered in columns representing dates beyond those shown in the figure and are converted by a formula that uses the constant ("4560," shown in column 1); however, these data were not available for the earlier dates shown in the figure. The numbers shown for node 1126 are user created extrapolations from the dates with data.

ISSM Preprocessor UserWorksheet				Use the area below for data input and calculations. Insert as many rows as des Use the shaded area below the input and calculation area to copy final results f						
node					3/20/03	3/27/03	4/3/03	4/10/03	4/17/03	4/24/03
			Displaced			300.00	246.00	13.00	13.00	13.00
1130			**Displaced**	**rating**	**2.55**	**-2.50**	**-2.05**	**-0.11**	**-0.11**	**-0.11**
	max=0	Invest $								
4560										
		Invest scaled								
1126			**Invest sca**	**rating**	**0.00**	**-3.00**	**-3.00**	**-3.00**	**-3.00**	**-3.00**

Figure 10-5. UserWorksheet, upper part, with sample data

In the bottom half of the worksheet (Figure 10-6), the user collects all of the entries that will connect to the RawData worksheet.

The first step is to place formulas in the "dates" box to copy the dates from the top of the worksheet. Make sure that the resulting dates correspond exactly to the dates in RawData, including the number of dates, so that the last date in this worksheet corresponds with the last date in RawData.

The inputs should be in numerical order of the nodes that will be connected. If additional rows are needed, use the Excel "insert row" function to insert rows within the light orange section, which defines the area that will be connected. The user should start the first row of data below the double lines separating the instructions and dates, leaving at least one blank row in case nodes with smaller numerical values need to be inserted later.

ISSM Preprocessor UserWorksheet		Use the area below for data input and calculations. Insert as many rows as des						
		Use the shaded area below the input and calculation area to copy final results fo						
Use this block for memo items No links allowed.	You must identify the Node #	Insert as many rows as desired in the shaded area below the double line and ab						
			Put dates in box below - Column positions **MUST CORRESPOND** w					
		Units	3/20/2003	3/27/2003	4/3/2003	4/10/2003	4/17/2003	4/24/2003
	1101	EffBatallior	175	50	10	0	0	0
	1101.1	EffBatallior	200	200	200	200	200	200
	1102	EffBatallior	175	40	0	0	0	0
	1102.1	EffBatallior	200	200	200	200	200	200
	1104	rating	-1.00	-1.00	-1.50	-2.00	-2.50	-2.50
	1105	rating	-1.00	-1.00	-3.00	-3.00	-3.00	-3.00

Figure 10-6. UserWorksheet, lower part, with sample data

In the "Node #" column, place a formula that copies the node number from the top half of the worksheet. If you used a constant goal, use a formula that adds 0.1 to the value for the node number. If you defined the units in the top half, place a formula that copies its value, otherwise, type the definition into the "Units" column.

Within the body of the section, place formulas that copy the values of the proper row, beginning at the desired date. The column identification of the formula will be the same as the column into which the formula is being placed.

When the user selects the "Connect/Disconnect" control in the Controller workbook, it will create the formulas in RawData to use these values in the proper places.

10.4.2 The DiamondWorksheet

To use the ISSM with DIAMOND, you should use the DiamondWorksheet, rather than the UserWorksheet. The DiamondWorksheet has the same structure; however, it contains pre-built logic to convert DIAMOND outputs to ISSM inputs.

The DIAMOND outputs are entered into the DiamondWorksheet and the manual inputs (such as the variables labeled "Expert …") are entered into the RawData worksheet. When the user selects the "Connect/Disconnect" control in the Controller workbook, it will create the formulas in RawData to use these values in the proper places.

10.5 RAWDATA WORKSHEET

Figure 10-7 shows a part of the RawData worksheet containing a two-entry node, three one-entry scaled data nodes, and a one-entry fractional data node.

Raw Observations					Measurement Dates		
Node #	**Sector**	**Activity**	**Value Definition**	**Units**	**3/22/03**	**3/28/03**	**4/4/03**
		Normal Factors					
		Insert rows following this row					
1030	Economy	Foreign investment in this country	US Dollars	$Millions	12500	0	0
1030.1	Economy	Twice the Avg Foreign Investment in countries of this size	US Dollars	$Millions	25000	25000	25000
1031	Economy	Currency strong	rating -3 to +3	rating	-1	-3	-3
1032	Economy	Banks adequate	rating -3 to +3	rating	0	-3	-3
1033	Economy	Underground economy not significant	rating -3 to +3	rating	-2	-3	-3
1034	Movement	Fraction undisplaced	fraction	fraction	0.95	0.85	0.75

Figure 10-7. Part of the Preprocessor RawData worksheet

Figure 10-8 shows the bottom of the worksheet, with its warning to insert rows above the orange line.

Raw Observations					Measurement Dates		
Node #	**Sector**	**Activity**	**Value Definition**	**Units**	**3/22/03**	**3/28/03**	**4/4/03**
		Normal Factors					
		Insert rows following this row					
1066	Movement	Expert: There are no migrants	rating -3 to +3	rating	-2	-2	-3
1067	Needs	Expert: Basic natural resource management is in place	rating -3 to +3	rating	-1.5	-3	-3
1068	Needs	Expert: Water distribution infrastructure is sufficient	rating -3 to +3	rating	-1.5	-3	-3
		Insert rows preceding this row					

Figure 10-8. Bottom of the Preprocessor RawData worksheet

Figure 10-9 shows the bottom of the worksheet after the DiamondWorksheet has been connected to RawData.

Raw Observations							
Node #	**Sector**	**Activity**	**Value Definition**	**Units**	**01/01/07**	**02/01/07**	**03/01/07**
		Normal Factors					
		Insert rows following this row					
1423	Needs	Utility Delivery Score	rating -3 to +3	rating	0.00	-0.01	-0.35
1424	Needs	HADR Delivery Score	rating -3 to +3	rating	0.00	-0.01	-1.09
1425	Conflict	Attack Level Score	rating -3 to +3	rating	-2.07	-2.12	-2.31
1426	Conflict	Bridge Damage Score	rating -3 to +3	rating	-0.58	-0.54	-1.45
1427	Conflict	Civilian Level Score	rating -3 to +3	rating	0.00	0.00	0.00
1428	Conflict	Coalition Level Score	rating -3 to +3	rating	3.00	2.99	2.98
		Insert rows preceding this row					

Figure 10-9. Bottom of the Preprocessor RawData worksheet with DiamondWorksheet connections

10.6 FRACTIONALDATA WORKSHEET

Figure 10-10 shows the part of the FractionalData sheet containing the nodes with a single row in RawData ("S" in column 1) and nodes with two rows in Raw Data ("C" in column 1). Nodes with no data in RawData show the "#VALUE!" Excel message, which is used to prevent their use in logic calculations.

Fractional values of raw data				Date Activity Started		
	Sector	**Activity**	**Node #**	**03/20/03**	**03/27/03**	**04/03/03**
		Activity Amount Section				
S	Economy	Currency strong	1127	-1.00	-3.00	-3.00
S	Economy	Banks adequate	1128	0.00	-3.00	-3.00
S	Economy	Underground economy not significant	1129	-2.00	-3.00	-3.00
S	Moveme	Fraction undisplaced	1130	2.55	-2.50	-2.05
C	Conflict	Host Nation forces	1401	#VALUE!	#VALUE!	#VALUE!
C	Conflict	NG & other battalion sized units	1402	#VALUE!	#VALUE!	#VALUE!
S	Conflict	Host Nation overmatch of Insurgents	1403	#VALUE!	#VALUE!	#VALUE!

Figure 10-10. Part of the Preprocessor FractionalData worksheet

10.7 SCALEDDATA WORKSHEET

Figure 10-11 shows part of the ScaledData sheet.

Node #	Node Name	Start Point Min=-3	Scale Factor	03/22/03	03/28/03	04/04/03
1030	Foreign investment in this country	-3.00	6	0.00	-3.00	-3.00
1031	Currency strong			-1.00	-3.00	-3.00
1032	Banks adequate			0.00	-3.00	-3.00
1033	Underground economy not significant			-2.00	-3.00	-3.00
1034	Fraction undisplaced	-6.00	9.00	2.55	1.65	0.75

Figure 10-11. Part of the Preprocessor ScaledData worksheet

10.8 INPUTS WORKSHEET

Figure 10-12 shows two node logic blocks at the top of the Inputs worksheet.

	Bare Bones	SCENARIO							09/18/03	Current calculating date						
From Node	FROM Node Name	From Val	Weight	Mod Val	Mod Weight	Position	Nd#	Raw Val	VALUE	NODE Name	Inflate	Center	Val	TO Node Name:	To Node	Val
						1	1001	-0.60	-0.60	Equivalent battalion sized units	1.00	0.00	-0.60	Armed forces are well structured	4	-0.60
							1001		-0.60		1.00	0.00	-0.60	#N/A		-0.60
							1001		-0.60		1.00	0.00	-0.60	#N/A		-0.60
							1001		-0.60		1.00	0.00	-0.60	#N/A		-0.60
							1001		-0.60		1.00	0.00	-0.60	#N/A		-0.60
							1001		-0.60		1.00	0.00	-0.60	#N/A		-0.60
							0									
						2	1002	-1.20	-1.20	Equivalent competent generals	1.00	0.00	-1.20	Armed forces are well structured	4	-1.20
							1002		-1.20		1.00	0.00	-1.20	#N/A		-1.20
							1002		-1.20		1.00	0.00	-1.20	#N/A		-1.20
							1002		-1.20		1.00	0.00	-1.20	#N/A		-1.20
							1002		-1.20		1.00	0.00	-1.20	#N/A		-1.20
							1002		-1.20		1.00	0.00	-1.20	#N/A		-1.20
							0									

Figure 10-12. Top of the Preprocessor Inputs worksheet

Figure 10-13 shows two empty logic blocks and the insert-above warning at the bottom of the Inputs worksheet.

						#N/A		#N/A	#N/A	#N/A	1.00	0.00	#N/A	#N/A		#N/A
							0		#N/A		1.00	0.00	#N/A	#N/A		#N/A
							0		#N/A		1.00	0.00	#N/A	#N/A		#N/A
							0		#N/A		1.00	0.00	#N/A	#N/A		#N/A
							0		#N/A		1.00	0.00	#N/A	#N/A		#N/A
							0		#N/A		1.00	0.00	#N/A	#N/A		#N/A
							0									
						#N/A		#N/A	#N/A	#N/A	1.00	0.00	#N/A	#N/A		#N/A
							0		#N/A		1.00	0.00	#N/A	#N/A		#N/A
							0		#N/A		1.00	0.00	#N/A	#N/A		#N/A
							0		#N/A		1.00	0.00	#N/A	#N/A		#N/A
							0		#N/A		1.00	0.00	#N/A	#N/A		#N/A
							0		#N/A		1.00	0.00	#N/A	#N/A		#N/A
							0									
	Insert rows above this row before copying in new nodes															

Figure 10-13. Bottom of the Preprocessor Inputs sheet

10.9 MIDDLELAYER WORKSHEET

Figure 10-14 shows two logic blocks at the top of the MiddleLayer worksheet.

	Bare Bones	SCENARIO														
From Node	FROM Node Name	From Val	Weight	Mod Val	Mod Weight		Nd#	Raw Val	VALUE	NODE Name	Inflate	Center	Val	TO Node Name:	To Node	Val
							0									
1009	Educational infrastructure	0.50	1.00	0.50	1.00		**1501**	-0.25	**-0.25**	**Educational infrastructure & goals**	1.00	0.00	-0.25	Educational system is tailored toward jobs	21	-0.25
1010	Educational goals	-1.00	1.00	-1.00	1.00		1501		**-0.25**		1.00	0.00	-0.25	#N/A		-0.25
	#N/A	#N/A	1.00				1501		**-0.25**		1.00	0.00	-0.25	#N/A		-0.25
	#N/A	#N/A	1.00				1501		**-0.25**		1.00	0.00	-0.25	#N/A		-0.25
	#N/A	#N/A	1.00				1501		**-0.25**		1.00	0.00	-0.25	#N/A		-0.25
	#N/A	#N/A	1.00				1501		**-0.25**		1.00	0.00	-0.25	#N/A		-0.25
							0									
1011	% of age in grammar school	-0.50	1.00	-0.50	1.00		**1502**	-1.23	**-1.23**	**Educational percents**	1.00	0.00	-1.23	Educational system is tailored toward jobs	21	-1.23
1012	% of age in high school	-2.25	0.95	-2.25	0.95		1502		**-1.23**		1.00	0.00	-1.23	#N/A		-1.23
1013	% of age in college	-1.75	0.75	-1.75	0.75		1502		**-1.23**		1.00	0.00	-1.23	#N/A		-1.23
1014	% of age in graduate school	0.00	0.50	0.00	0.50		1502		**-1.23**		1.00	0.00	-1.23	#N/A		-1.23
	#N/A	#N/A	1.00				1502		**-1.23**		1.00	0.00	-1.23	#N/A		-1.23
	#N/A	#N/A	1.00				1502		**-1.23**		1.00	0.00	-1.23	#N/A		-1.23
							0									

Figure 10-14. Top of the Preprocessor MiddleLayer sheet

Figure 10-15 shows two nodes at the bottom of the MiddleLayer sheet, with the insert-above warning.

1024	Faction 1 hasn't had any paramilitary forces	-2.00	1.00	-2.00	1.00		**1504**	-2.00	**-2.00**	**Factional paramilitary**	1.00	0.00	-2.00	There haven't been any paramilitary forces	60	-2.00
1025	Faction 2 hasn't had any paramilitary forces	-2.00	1.00	-2.00	1.00		1504		**-2.00**		1.00	0.00	-2.00	There are no factional disputes	74	-2.00
1026	Faction 3 hasn't had any paramilitary forces	-2.00	1.00	-2.00	1.00		1504		**-2.00**		1.50	1.50	-1.50	No insurgents are operating	148	-1.50
	#N/A	#N/A	1.00				1504		**-2.00**		1.00	0.00	-2.00	#N/A		-2.00
	#N/A	#N/A	1.00				1504		**-2.00**		1.00	0.00	-2.00	#N/A		-2.00
	#N/A	#N/A	1.00				1504		**-2.00**		1.00	0.00	-2.00	#N/A		-2.00
							0									
1006	Civil discourse among competing groups	-1.00	1.00	-1.00	1.00		**1505**	-1.00	**-1.00**	**Factional dispute resolution**	1.00	0.00	-1.00	There are no factional disputes	74	-1.00
1008	Compromises among competing groups	-1.00	1.00	-1.00	1.00		1505		**-1.00**		1.00	0.00	-1.00	#N/A		-1.00
	#N/A	#N/A	1.00				1505		**-1.00**		1.00	0.00	-1.00	#N/A		-1.00
	#N/A	#N/A	1.00				1505		**-1.00**		1.00	0.00	-1.00	#N/A		-1.00
	#N/A	#N/A	1.00				1505		**-1.00**		1.00	0.00	-1.00	#N/A		-1.00
	#N/A	#N/A	1.00				1505		**-1.00**		1.00	0.00	-1.00	#N/A		-1.00
							0									
	Insert rows above this row before copying in new nodes															

Figure 10-15. Bottom of the Preprocessor MiddleLayer sheet

10.10 OUTPUTS WORKSHEET

Figure 10-16 shows two of the output nodes on the Outputs sheet.

	Bare Bones	SCENARIO													
From Node	FROM Node Name	From Val	Weight	Mod Val	Mod Weight		Nd#	Raw Val	VALUE	NODE Name	Inflate	Center	Val	TO Node Name:	To Node
1001	Equivalent battalion sized units	-0.60	0.80	-0.60	0.80		**4**	-0.76	**-0.76**	**Armed forces are well structured**					
1002	Equivalent competent generals	-1.20	0.90	-1.20	0.90		4								
1003	Civilian control of military	-1.00	1.00	-1.00	1.00		4								
1020	Forces are well equiped	0.00	1.00	0.00	1.00		4								
1035	Expert: Armed forces are well structured	-1.00	1.00	-1.00	1.00		4								
	#N/A	#N/A	1.00				4								
1006	Civil discourse among competing groups	-1.00	1.00	-1.00	1.00		**11**	-1.14	**-1.14**	**Competing groups resolve differences**					
1007	Change of government between competing groups	-1.00	1.00	-1.00	1.00		11								
1008	Compromises among competing groups	-1.00	1.00	-1.00	1.00		11								
1503	Overt opposition force	-2.25	0.50	-2.25	0.50		11								
1036	Expert: Competing groups resolve differences	-1.00	1.00	-1.00	1.00		11								
	#N/A	#N/A	0.75				11								

Figure 10-16. Top of Preprocessor Outputs worksheet

10.11 SCENARIOHISTORY WORKSHEET

Figure 10-17 shows the top of the ScenarioHistory worksheet, with dates and output values.

					Dates		
			09/18/03	Bare Bones	3/22/03	3/28/03	4/4/03
Group	Sector	Nd#	VALUE	NODE Name	VALUE	VALUE	VALUE
Input	Conflict	4	-0.76	Armed forces are well structured	2.09	0.00	-3.00
Input	Conflict	11	-1.14	Competing groups resolve differences	-1.06	-1.94	-3.06
Input	Conflict	59	-1.35	Opposition party does not espouse force	-0.88	-1.12	-2.88
Input	Conflict	60	-2.00	There haven't been any paramilitary forces	-1.13	-1.92	-3.00
Input	Conflict	61	1.50	There haven't been any regime-sponsored, non-military armed	-3.00	-3.00	-3.00
Input	Conflict	74	-1.29	There are no factional disputes	-1.71	-1.81	-3.00
Input	Conflict	148	-0.19	No insurgents are operating	-0.05	-0.41	-0.88
Input	Conflict	149	-1.50	No terrorists are operating	0.00	0.00	0.00

Figure 10-17. Top of Preprocessor ScenarioHistory sheet

Figure 10-18 shows a lower section of the ScenarioHistory sheet, where the records of the inputs begin.

					Dates		
			09/18/03	Bare Bones	3/22/03	3/28/03	4/4/03
Group	Sector	Nd#	VALUE	NODE Name	VALUE	VALUE	VALUE
Input	Movement	63	0.73	There is no displaced population	-1.61	-1.84	-2.06
Input	Movement	64	0.00	There are no migrants	-2.00	-2.00	-3.00
Input	Needs	5	-0.08	Basic natural resource management is in place	-1.17	-2.50	-2.67
Input	Needs	58	0.50	Water distribution infrastructure is sufficient	-1.50	-3.00	-3.00
Pre-Input	Conflict	1001	-0.60	Equivalent battalion sized units	2.25	0.00	-3.00
Pre-Input	Conflict	1002	-1.20	Equivalent competent generals	2.25	0.00	-3.00
Pre-Input	Conflict	1003	-1.00	Civilian control of military	2	0	-3
Pre-Input	Needs	1004	-0.50	Natural resource infrastructure	-1	-1.5	-2
Pre-Input	Needs	1005	0.25	Natural resource govt/private mgmt system	-1	-3	-3
Pre-Input	Conflict	1006	-1.00	Civil discourse among competing groups	-1	-2	-3

Figure 10-18. Middle section of Preprocessor ScenarioHistory sheet

Figure 10-19 shows a lower section where the records of the middle layer nodes begins.

					Dates		
			09/18/03	Bare Bones	3/22/03	3/28/03	4/4/03
Group	Sector	Nd#	VALUE	NODE Name	VALUE	VALUE	VALUE
Pre-Input	Needs	1068	0.50	Expert: Water distribution infrastructure is sufficient	-1.50	-3.00	-3.00
#N/A	#N/A						
#N/A	#N/A						
#N/A	#N/A						
#N/A	#N/A			#N/A			
#N/A	#N/A			#N/A			
#N/A	#N/A			#N/A			
#N/A	#N/A			#N/A			
#N/A	#N/A			#N/A			
#N/A	#N/A			#N/A			
#N/A	#N/A			#N/A			
Pre-Intermed	Misc	1501	-0.25	Educational infrastructure & goals	0.75	-3.00	-3.00
Pre-Intermed	Misc	1502	-1.23	Educational percents	-0.14	-2.30	-2.30

Figure 10-19. Lower section of Preprocessor ScenarioHistory sheet

Figure 10-20 shows the end of the records section and the no-input below warning.

					Dates		
			09/18/03	**Bare Bones**	3/22/03	3/28/03	4/4/03
Group	**Sector**	**Nd#**	**VALUE**	**NODE Name**	VALUE	VALUE	VALUE
#N/A	#N/A			**#N/A**			
#N/A	#N/A			**#N/A**			
#N/A	#N/A			**#N/A**			
#N/A	#N/A			**#N/A**			
#N/A	#N/A			**#N/A**			
#N/A	#N/A			**#N/A**			
#N/A	#N/A			**#N/A**			
No input below this line							

Figure 10-20. Bottom of the records part of Preprocessor ScenarioHistory sheet

Figure 10-21 shows a portion of the custom series section of the ScenarioHistory worksheet. This section creates the display of variables for the controls used to create TimeChart. The values are recorded in the TimeChartData sheet.

No input below this line				
5	9	4		
Custom Series Data Area				
Group	**Sector**	**Nd#**		**Group Sector Nd# NODE Name**
Input	Conflict	004		Input Conflict 004 Armed forces are well structured
Input	Conflict	011		Input Conflict 011 Competing groups resolve differences
Input	Conflict	059		Input Conflict 059 Opposition party does not espouse force
Input	Conflict	060		Input Conflict 060 There haven't been any paramilitary forces
Input	Conflict	061		Input Conflict 061 There haven't been any regime-sponsored, non-military armed forces

Figure 10-21. Custom series section of Preprocessor ScenarioHistory sheet

10.12 CONSTANTS WORKSHEET

Figure 10-22 shows the top left of the Constants worksheet and Figure 10-23 shows the top right part.

	Constants				
Nd#	**NODE Name**	**Group**	**Sector**	**Note**	**Influence notes & RawData Max**
4	Armed forces are well structured	Input	Conflict		
5	Basic natural resource management is in place	Input	Needs	two parts: infrastructure & govt/private management system; missing=-3, bad=-2, moderately bad=-1, fair=0, moderately good=1, good=2, excellent=3	
11	Competing groups resolve differences	Input	Conflict		

Figure 10-22. Top left of Preprocessor Constants worksheet

	Constants										
											RawData
									Node	**Node**	**Node**
Nd#	**NODE Name**	**-3**	**-2**	**-1**	**0**	**1**	**2**	**3**	**Row**	**End Row**	**Row**
4	Armed forces are well structured	non-existent						excellent C2 & subordinate to civilian govt	6	12	#N/A
5	Basic natural resource management is in place	infrastructure and govt/private management missing	avg of two parts is -2	avg=-1	avg=0	avg=1	avg=2	no problems	235	241	#N/A
11	Competing groups resolve differences	contempt for others, no dialogue at all, etc.	loss of power is considered loss to the enemy	loss of power is extremely serious matter	differences often result in fights, elections frequently be marred with violence or cheating	differences occasionally result in fights, elections may be marred with violence or cheating	discourse frequently is uncivil, willing to live with loss of points until next election; however, compromise is only grudging	civil discourse, willing to live with loss of points until next election or to compromise permanently	13	19	#N/A

Figure 10-23. Top right of Preprocessor Constants worksheet

Figure 10-24 shows a section in the middle of the Constants sheets where Notes are present and Influence notes & RawData max values are present.

Nd#	NODE Name	Group	Sector	Note	Influence notes & RawData Max
50	Property ownership issues are resolved	Input	Movement		influence on node 24 is scenario dependent
1001	Expert: Armed forces are well structured	Pre-Input	Conflict	rating -3 to +3	3
1002	Expert: Competing groups resolve differences	Pre-Input	Conflict	rating -3 to +3	3

Figure 10-24. Middle of Preprocessor Constants worksheet

Figure 10-25 shows the bottom left of the Constants sheet where the warning to insert rows above here is found.

Nd#	**NODE Name**	**Group**	**Sector**	**Note**	**Influence notes**	**-3**	**-2**
Insert rows before here							

Figure 10-25. Bottom left of the Preprocessor Constants worksheet

10.13 INPUTPIVOT WORKSHEET

Figure 10-26 shows a part of the InputPivot worksheet.

Inputs Pivot Table

Max of Val	To Node													
Nd#	4	5	11	21	35	38	43	44	45	49	50	54	58	59
1001	-0.60													
1002	-1.20													
1003	-1.00													
1004		-0.50												
1005		0.25												
1006			-1.00											-0.50
1007			-1.00											-0.50
1008			-1.00											-0.50
1009														

Figure 10-26. Part of the Preprocessor InputPivot sheet

10.14 MIDDLEPIVOT WORKSHEET

Figure 10-27 shows a part of the MiddlePivot worksheet.

Middle Layer Pivot Table

Max of Val	To Node					
Nd#	11	21	59	60	74	148
1501		-0.25				
1502		-1.23				
1503	-2.25		-1.75		-1.75	
1504				-2.00	-2.00	-1.50
1505					-1.00	

Figure 10-27. Part of the Preprocessor MiddlePivot sheet

10.15 TIMECHARTDATA WORKSHEET

Figure 10-28 shows part of the TimeChartData worksheet where the data for the TimeChart is created for display.

	Iraq06							
	Iraq / Baghdad Excursion: Baseline, Rep# 1 UniqueID: Baghdad33, RecalcDate: 11/02/06							
Time Chart: Cus	Iraq06 Time Chart: Custom Data Iraq / Baghdad Excursion: Baseline, Rep# 1 UniqueID: Baghdad33, RecalcDate: 11/02/06							
	3	4	5	6	7	8	9	10
Node	**Node Name**							
148	No insurgents are operating	-0.15454	-0.301143	-0.875	-0.875	-0.85	-0.795143	-0.668714
149	No terrorists are operating	0	0	0	0	0	0	0
35	Human rights are protected	-3	-3	-3	-2	-2	-2	-1
58	Water distribution infrastructure is sufficient	-1.5	-3	-3	-3	-3	-3	-3
124	Foreign investment is available	0	-3	-3	-3	-3	-3	-2.94
0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Figure 10-28. Part of the Preprocessor TimeChartData sheet

11. CREATING PREPROCESSOR V4.0 CUSTOM LOGIC

There are ten steps that you will need to perform to set up your logic. The steps may be collected into five groups: preparation, logic node implementation, input implementation, output implementation, and checking. It is likely that you will find yourself iterating through these groups and their steps. It will probably be easiest to start with a single one of the required Preprocessor outputs and create its entire logic before proceeding to another output's logic. You should pick one that you suspect will have no commonalities with any other output's logic. Once you are familiar with the process, you may find it easier to group the outputs that might have common elements, either in their inputs or in some intermediate results. **You should save your work regularly, using the Save control on the Controls sheet of the ISSM Controller.**

Preparation consists of two steps, discussed in Sections 11.2 and 11.3. In the first step of preparation, you design the logic you will be implementing. In the second step, you will register the node numbers that you will use, together with the node names and other pertinent information.

Logic node implementation consists of four steps, User-/Diamond- Worksheet logic, input layer logic, middle layer logic, and output logic, which are discussed in Sections 11.4, 11.5, 11.6, and 11.7, respectively.

Input implementation consists of four steps in which you create your input form, successively transform the inputs into the values required for the node logic, and then connect them to either the User- or the Diamond- Worksheet, if appropriate. These three steps are discussed in Sections 11.8, 11.9, 11.10, and 11.11.

Output implementation consists of one step, discussed in Section 11.12. In output implementation, you prepare the ScenarioHistory to record the results of your logic for each dated entry.

Checking also consists of one step, discussed in Section 11.13. Checking your logic is difficult; however, it is critical to insure that the Preprocessor produces the results that you mean for it to produce.

Once you are finished with an iteration, you should review the entire set of logic for that iteration and make sure that your diagram reflects any changes you may have made before proceeding to another iteration. Once you are through with all of the iterations, you should review the entire set of logic and make sure that all connections reflect what you have implemented because it is likely that you will want to make changes, such as adding inputs later. Having an up to date set of diagrams will make these changes much simpler.

11.1 "EXPERT …" INPUTS

The "Expert …" inputs are your way of controlling for various types of problems with the available data.

Some data are sporadic in nature, yielding very spiky data. If each spike represents a truly catastrophic occurrence, you may want to minimize the weight of the "Expert" input in calculating the Preprocessor output. However, if the spikes are indicative but not major, you may want to use the "Expert" input to smooth the result.

Similarly, some data sources quit reporting and others begin reporting. The "Expert" input provides continuity.

Many kinds of available data are biased, telling only part of the story. Ideally, you can find multiple inputs that will counteract the bias of any one input. This is the concept of the "market basket" approach to measuring inflation: any given item may experience a marked price rise in a given period; however, averaging with the prices of the other items yields a truer picture of the actual inflation in that period. If you can find a sufficient number of different indicators for a given Preprocessor output, you can use a small weight for the "Expert" input. On the other hand, if you believe that, while important, the hard data you have is biased, you will want to use a larger weight for the "Expert" input to control for the bias.

A similar, but slightly different situation arises when you can find hard data for one factor that influences a given Preprocessor output and need to use soft data for the other factor(s). You can use the "Expert" input to represent the soft factors, weighted appropriately.

You should always have an "Expert" input for each Preprocessor output. The difference is that you need not weight these inputs the same for each Preprocessor output.

11.2 DESIGNING THE LOGIC

The first step is to draw a picture of the desired logic. You may use paper and pencil or any drawing program with which you are comfortable. You will need this to make sure that you have performed all of the steps needed to connect the logic correctly within the Preprocessor. Label each node in the drawing with the name of the node. Make sure you have one input node labeled "Expert …" that flows to directly to each output node. These nodes should already exist in the Preprocessor; however, if you accidentally erased one or more, you will have to make sure to re-create them.

Once you are satisfied with the logic drawing, you will need to create node numbers. Input nodes should be in the range of 1001 to 1500. Use the existing numbers for the "Expert …" nodes, if they still exist. Middle layer nodes should be in the range of 1501 to 2000. The node numbers are further restricted, as shown in Table 11-1.

Table 11-1. Node Range Restrictions

Program and type	Node Range	Subtype
ISSM Main Input (internal & external)	1-999	Program Defined Inputs
Preprocessor Input	1001-1100	Program Defined Expert Input
Preprocessor Input	1101-1400	Custom Input
Preprocessor Input	1401-1500	Diamond Input
Preprocessor Middle Node	1501-1900	Custom Middle Node
Preprocessor Middle Node	1901-1999	Diamond Middle Node
Postprocessor Output	2001-2400	Custom Output
Postprocessor Output	2401-2500	Standard Output
Postprocessor MOMs	2501-2900	Custom MOMs
Postprocessor MOMs	2901-2999	Standard MOMs

There are only 34 possible outputs and they are pre-numbered, as they are the ISSM Main internal inputs. Your logic must include every one of these outputs. The valid output nodes are listed in Table 11-2.

Table 11-2. Preprocessor output variables

ND#	Node Name
4	Armed forces are well structured
11	Competing groups resolve differences
59	Opposition party does not espouse force
60	There haven't been any paramilitary forces
61	There haven't been any regime-sponsored, non-military armed forces
74	There are no factional disputes
148	No insurgents are operating
149	No terrorists are operating
124	Foreign investment is available
71	Financial system is solid
35	Human rights are protected
45	Police are distinct from the military
49	Prison structure is adequate
121	Corruption in public office is not part of culture
122	Central government exists
65	Drug cultivation is not a problem
66	Drug manufacture is not a problem
67	Drug transshipment is not a problem
72	Drug use is not a problem
69	Organized crime is not a problem
73	Common crime is not a problem
126	Education infrastructure is adequate
21	Educational system is tailored toward jobs
125	Government does not control domestic media's reporting of events
38	International media have open access to the reporting of events
43	People perceive that their interests are represented
44	People's spiritual needs are met
50	Property ownership issues are resolved
54	Stress migration is not present
62	There are no expatriates
63	There is no displaced population
64	There are no migrants
5	Basic natural resource management is in place
58	Water distribution infrastructure is sufficient

Figure 11-1 shows two simple logic diagrams illustrating two methods for transforming three sources for an expert opinion input for use by one of the Preprocessor outputs. The user has three experts who are qualified to judge whether the the indigenous armed forces are well structured. In the first method (upper half of the figure), the user plans to employ the standard expert opinion to output link, node 1001 to node 4, augmented by free-form logic calculations on the UserWorksheet to average the three opinions, which will feed node 1001. Figure 11-2 shows the UserWorksheet entries. Note that no new node numbers are created, as the UserWorksheet value must equal the node number to which it will be transferred in the RawData worksheet, and all of the input data are entered on the UserWorksheet. You should wait to implement the User- or Diamond- worksheet logic until later (Section 11.4).

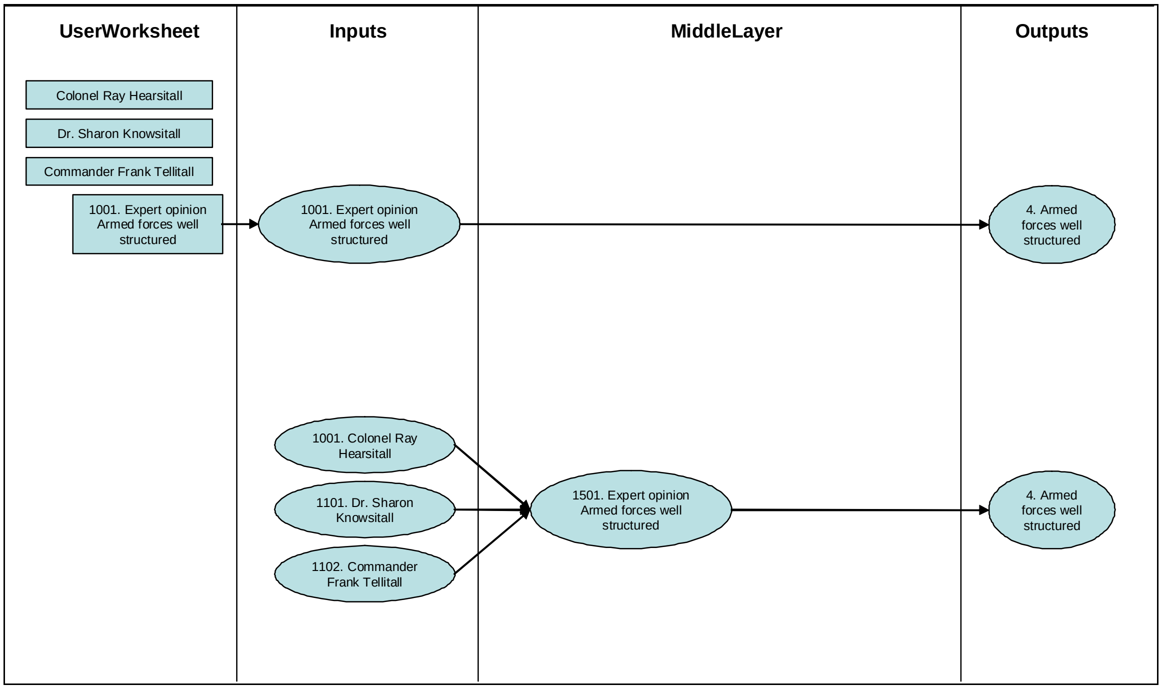


Figure 11-1. Multiple sources for expert opinion

ISSM Preprocessor UserWorksheet		Use the area below for data input and calculations. Insert as Use the shaded area below the input and calculation area to c				
node			2/27/06	3/6/06	3/13/06	3/20/06
	Colonel Ray Hearsitall	rating	1.00	0.00	-1.00	-2.00
	Dr. Sharon Knowsitall	rating	2.00	1.00	0.00	-1.00
	Commander Frank Tellitall	rating	3.00	2.00	1.00	0.00
1001	**Expert opinion Armed forces well structured**	**rating**	**2.00**	**1.00**	**0.00**	**-1.00**
Use this block for men items No links allowed.	You must identify the Node #	Insert as many rows as desired in the shaded area below the Put dates in box below - Column positions **MUST** Units	02/27/06	03/06/06	03/13/06	03/20/06
	1001	rating	2.00	1.00	0.00	-1.00

Figure 11-2. UserWorksheet entries for multiple sources for expert opinion

In the second method (lower half of Figure 11-1), the existing expert opinion node (1001) is renamed for one of the sources, two new input nodes are created (1101 and 1102), and a new middlelayer node is created (1501). All of the input data will be entered directly on the RawData worksheet (to be transferred ultimately to the Inputs worksheet).

In this example, the two methods are mathematically equivalent and the choice of method is simply a matter of convenience to the user. In the illustration, each of the sources is given an equal weight in the average. Even if the weights were unequal (perhaps the armed forces are primarily naval and the naval officer's opinion is judged to be more likely correct), the two methods are equivalent. The reason for this is that both the UserWorksheet and the computations on the MiddleLayer worksheet permit weighted averages to be computed. However, suppose that the civilian expert's opinion is only valid when the situation is bad. The flexibility of the worksheet allows the user to compute the average using the civilian expert's opinion only when her valuation is below 0.0 and only averaging the two military officers' opinions when the civilian expert's valuation is 0.0 or above. In this case, the second method should not be used.

11.3 CREATING THE CONSTANTS ENTRIES

When you create a node number, you must enter it on the Constants sheet. Do not create entries for the outputs, they are already there. Do not create entries for the "Expert …" nodes, if they still exist. If you are building a scenario from a pre-existing scenario or sample, you may simply type your names and other entries over the values for pre-existing nodes, except where there are formulas. Leave the formulas as is. Keep your node numbers in ascending sequence. You may insert rows, using the Excel insert row function as needed; however, remember to copy the formulas, as described below.

Figure 11-3 shows the left hand side of the Constants sheet, where the input nodes begin. Two types of input nodes are shown. The first type requires two entries, the defined node number and that number with 0.1 added to it. The second type only requires one entry. As shown, these numbers are entered into column A. Enter the text you desire to be shown for the node name in column B. Enter "Pre-Input" in the Group column (for nodes numbered from 1001 to 1499) and the appropriate sector in its column. For nodes numbered from 1500 to 1999, put "Pre-Intermed" in column C and the appropriate sector in column D. The Note column will be displayed on other worksheets and describes the node data. The Influence notes column is not needed in the Preprocessor.

Nd#	NODE Name	Group	Sector	Note	Influence notes
1001	Equivalent battalion sized units	Pre-Input	Conflict	Well organized & trained battalion sized units	
1001.1	Total battalion sized units	Pre-Input	Conflict	All units	
1002	Equivalent competent generals	Pre-Input	Conflict	Competent generals	
1002.1	Total generals	Pre-Input	Conflict	All generals	
1003	Civilian control of military	Pre-Input	Conflict	rating -3 to +3	
1004	Natural resource infrastructure	Pre-Input	Needs	rating -3 to +3	
1005	Natural resource govt/private mgmt system	Pre-Input	Needs	rating -3 to +3	

Figure 11-3. Left part of Preprocessor Constants sheet

Figure 11-4 shows the middle part of the Constants sheet. You enter anchor information in the columns labeled "-3" to "+3" in this part. This information is not needed for strictly numerical inputs; however, it is very important for scaled inputs, as this ensures consistency of your future data entries.

Nd#	NODE Name	-3	-2	-1	0	1	2	3
1001	Equivalent battalion sized units							
1001.1	Total battalion sized units							
1002	Equivalent competent generals							
1002.1	Total generals							
1003	Civilian control of military	-3=civilians have no control over military	-2=military coups are frequent or likely	-1=military coups have happened in past or are possible in future	0=coup is unlikely, but military spending, etc., is not controlled by civilians	1=military is known to hide large expenditures, etc.	2=military has some independence from civilian control	3= as in USA
1004	Natural resource infrastructure	infrastructure missing	infrastructure bad	infrastructure mod bad	infrastructure fair	infrastructure mod good	infrastructure good	infrastructure excellent
1005	Natural resource govt/private mgmt system	govt/private management missing	govt/private management bad	govt/private management mod bad	govt/private management fair	govt/private management mod good	govt/private management good	govt/private management excellent

Figure 11-4. Middle part of Preprocessor Constants sheet

Figure 11-5 shows the right part of the Constants sheet. It is vital that you enter the correct formulas in the Node Row and Node End Row columns, as the program will not generate your logic without these values.

For the Node Row (the first row of the logic block dedicated to this node), copy a cell from an existing node's Node Row column and paste it into your node's cell. The formula will look like the following:

=MATCH(A41,Inputs!$H$5:$H$537,0)+4 ,

where "A41" represents the cell address of your node's node number and "$H$537" represents the column H cell lying in the row marked "Insert rows above this row" on the Inputs worksheet. This formula looks on the Inputs sheet and finds the location of your node's first row in the logic. MATCH reports the sequence number of the row. Because the range in which it searches begins at row 5, it adds 4 to the result to obtain the actual row number. You may check to see that the Node Row equals the actual first row of the node in the logic after completing the next section on creating node logic. For nnnn.1 nodes, no results are found and "#N/A" appears. This is correct.

					RawData
			Node	Node	Node
Nd#	NODE Name	3	Row	End Row	Row
1101	Effective battalion Army sized units		398	404	74
1101.1	Needed battalion sized units		#N/A	#N/A	75
1102	Civilian control of military	3= as in USA	405	411	77
1103	Natural resource infrastructure	infrastructure excellent	412	418	79
1104	Natural resource govt/private mgmt system	govt/private management excellent	419	425	81

Figure 11-5. Right part of Preprocessor Constants sheet

For middle layer nodes, the formula will look like the following:

=MATCH(A122,MiddleLayer!$H$5:$H$62,0)+4 , where "A122" represents the address of your node's node number and "$H$62" represents the column H cell lying in the row marked "Insert rows above this row" on the MiddleLayer worksheet. The only differences between middle layer nodes and input nodes are that middle layer nodes look on the MiddleLayer sheet for the logic and that all middle layer nodes have only a single node number and row.

The formula for the Node End Row (the last row of the logic block dedicated to this node) should be copied and entered in the same way. Its formula should look like the following:

=MATCH(0,INDIRECT(CONCATENATE("Inputs!H", N41),TRUE):Inputs!$H$537,0)+N41-1 ,

where "N41" represents the address of the corresponding Node Row cell (directly to the left) and "$H$537" represents the column H cell lying in the row marked "Insert rows above this row" on the Inputs worksheet. The Match function in this formula looks for the first 0 in the H column, starting with the location of the first row of the node's logic. You can see that the 0 in the gray cell is critical, as it indicates the end of the logic. Because the range searched starts at the first logic row, the proper actual ending row number is found by adding the row number of the first row for the node and subtracting one.

The formula for a middle layer nodes Node End Row cell looks like the following:

=MATCH(0,INDIRECT(CONCATENATE("MiddleLayer!H",
N122),TRUE):MiddleLayer!$H$62,0)+N122-1 ,

where "N122" represents the address of the corresponding Node Row cell (directly to the left) and "$H$62" represents the column H cell lying in the row marked "Insert rows above this row" on the MiddleLayer worksheet.

The final column, Raw Data Node Row, contains the row in the RawData worksheet that is dedicated to this node. MiddleLayer nodes, by definition do not have rows in RawData and show the "#N/A" message in this column. The formula in all cases looks like the following:

=MATCH(A133,RawData!$A$4:$A$187,0)=3,

where "A133" represents the address of your node's node number and "$A$187" represents the cell in column A of the row containing the "Insert rows preceding this row" message on the RawData worksheet.

11.4 CREATING LOGIC ON THE USER- OR DIAMOND- WORKSHEET

This step is optional, depending on whether you are using one of these two worksheets to create free-form logic or not. The choice must be the same one that was made for the ISSM Main. Note, that you need not have any data in the Preprocessor worksheet, despite having data in the ISSM Main worksheet (or vice versa). However, in this case, you must make sure that it is prepared properly so that no data is transferred inappropriately.

If you are using one of these worksheets, you must first select which one it will be. Again, the selection must be the same, Diamond- or User- Worksheet, as you chose for the ISSM Main.

Figure 10-5 illustrates the concept. In the top half of the worksheet, the user builds in the worksheet a form that allows him to enter the data from available sources, then creates any needed computations based on these data.

The first row must contain the dates for the interventions and these dates must be exactly the same as the dates in the RawData worksheet.

In this example, a node for a scaled rating for displaced persons has been defined with the number 1130. Actual numbers of displaced persons are placed in the worksheet and converted to scaled values (-3.00 to

+3.00) in the next row. The node number is placed in the first column of this row, the node name in the fourth column and the units (in this case, "rating") in the fifth column. The second example in the bottom of the figure has a node number of 1126 and represents a scaled investment value. Actual dollars invested are entered in columns representing dates beyond those shown in the figure and are converted by a formula that uses the constant ("4560," shown in column 1); however, these data were not available for the earlier dates shown in the figure. The numbers shown for node 1126 are user created extrapolations from the dates with data.

ISSM Preprocessor UserWorksheet				Use the area below for data input and calculations. Insert as many rows as des Use the shaded area below the input and calculation area to copy final results f						
node					3/20/03	3/27/03	4/3/03	4/10/03	4/17/03	4/24/03
			Displaced			300.00	246.00	13.00	13.00	13.00
1130			**Displaced**	**rating**	**2.55**	**-2.50**	**-2.05**	**-0.11**	**-0.11**	**-0.11**
	max=0	Invest $								
4560										
		Invest scaled								
1126			**Invest sca**	**rating**	**0.00**	**-3.00**	**-3.00**	**-3.00**	**-3.00**	**-3.00**

Figure 11-6. UserWorksheet, upper part, with sample data

In the bottom half of the worksheet (Figure 10-6), the user collects all of the entries that will connect to the RawData worksheet.

The first step is to place formulas in the "dates" box to copy the dates from the top of the worksheet. Make sure that the resulting dates correspond exactly to the dates in RawData, including the number of dates, so that the last date in this worksheet corresponds with the last date in RawData.

The inputs should be in numerical order of the nodes that will be connected. If additional rows are needed, use the Excel "insert row" function to insert rows within the light orange section, which defines the area that will be connected. The user should start the first row of data below the double lines separating the instructions and dates, leaving at least one blank row in case nodes with smaller numerical values need to be inserted later.

ISSM Preprocessor UserWorksheet				Use the area below for data input and calculations. Insert as many rows as des Use the shaded area below the input and calculation area to copy final results f						
Use this block for memo items No links allowed.			You must identify the Node #	Insert as many rows as desired in the shaded area below the double line and ab Units	Put dates in box below - Column positions **MUST CORRESPOND** w 3/20/2003	3/27/2003	4/3/2003	4/10/2003	4/17/2003	4/24/2003
			1101	EffBatallior	175	50	10	0	0	0
			1101.1	EffBatallior	200	200	200	200	200	200
			1102	EffBatallior	175	40	0	0	0	0
			1102.1	EffBatallior	200	200	200	200	200	200
			1104	rating	-1.00	-1.00	-1.50	-2.00	-2.50	-2.50
			1105	rating	-1.00	-1.00	-3.00	-3.00	-3.00	-3.00

Figure 11-7. UserWorksheet, lower part, with sample data

In the "Node #" column, place a formula that copies the node number from the top half of the worksheet. If you used a constant goal, use a formula that adds 0.1 to the value for the node number. If you defined the units in the top half, place a formula that copies its value, otherwise, type the definition into the "Units" column.

Within the body of the section, place formulas that copy the values of the proper row, beginning at the desired date. The column identification of the formula will be the same as the column into which the formula is being placed.

If you discover that you have made a mistake in the column references, **do not use the Excel "cut" control to move the column of data and formulas to the correct place**. The "cut" control will cause changes in the references to follow the movement. **Do not use the Excel "insert columns" or "delete columns" controls, either, for the same reason.** Instead, either manually retype the data in the correct place or use the "copy" control to copy the data and formulas to the right location. Then delete the data and formulas from the old location.

When the user selects the "Connect/Disconnect" control in the Controller workbook, it will create the formulas in RawData to use these values in the proper places.

11.5 CREATING NODE LOGIC ON THE INPUTS SHEET

Once you have completed creating the entries in the Constants worksheet (and the User- or Diamond-Worksheet), you may create the nodes in the logic sheets, starting with the Inputs sheet.

You may erase old values of a pre-existing logic; however, you will probably find it easier to simply replace the old data with your entries. If you do this, **make sure you have completed all of the replacement and leave no residue of the previous logic**.

Figure 11-8 shows the left side of the Preprocessor Inputs logic sheet. The gray lines bound a single node's rows of entries. The left side of all input nodes is always empty, as shown, because there are no From Nodes for an input node.

	Iraq, Test Scenario	**SCENARIO**			
From Node	**FROM Node Name**	**From Val**	**Weight**	**Mod Val**	**Mod Weight**

Figure 11-8. Left side of the Preprocessor Inputs sheet

Figure 11-9 shows the middle part of the Inputs sheet. A standard node has one input cell, shown in red as the first row in the Nd# column. You enter the node number of the input in question (always an integer, as two entry inputs are converted to a single node reference by the time this stage is reached). A standard node has six rows, as it can output to six To Nodes (shown in the right side, below). The first row contains the original node information. Data that are needed for the right side are copied by formula to the other rows. You may insert additional rows above the gray line**; however, you must remember to copy all formulas to the new rows**. In most cases, you will find six To Nodes to be sufficient. You must also make sure that the gray line at the end of the node logic **must have a 0 in the Nd# column**.

			09/18/03	**Current calculating date**
Positio n	**Nd#**	**Raw Val**	**VALUE**	**NODE Name**
1	**1001**	-0.60	**-0.60**	**Equivalent battalion sized units**
	1001		**-0.60**	
	1001		**-0.60**	
	1001		**-0.60**	
	1001		**-0.60**	
	1001		**-0.60**	
	0			

Figure 11-9. Middle part of the Preprocessor Inputs sheet

Assuming that you have filled in the Constants with data for this node number, when you enter the node number, the node name will automatically be displayed. The correct raw value will not be displayed until you have filled in the RawData, FractionalData, and ScaledData rows, as described later. If you are re-using a node number from a pre-existing scenario, there may be a numerical entry drawn from the pre-existing inputs.

The Position entry is calculated using the following formula:

=MATCH(H391,ScaledDataNodes,0),

where "H391) represents the cell containing the node number. The position number gives the sequence of the input on the ScaledData sheet.

The Nd# entry (for the first row) is where you enter the node number for this logic block. The Nd# entries for the other rows copy the contents of the cell above.

The Raw Val entry (for the first row) is calculated using the following formula:

Raw Val =HLOOKUP(Inputs!$J$1,ExternalData,G6+1,FALSE) ,

where "G6" is the value in the Position column for the node. The Raw Val formula, finds the value by looking in the column that matches the date at the top of the Inputs sheet and the row for the node (sequence number plus one) in the ScaledData sheet. The result will be incorrect until you have filled in the …Data sheets correctly. The position number will also not be correct until that time.

The VALUE entry (for the first row) is calculated using the following formula:

=MIN(4,MAX(-4,I391),

where "I391" is the Raw Val entry. The VALUE entries for the other rows copy the contents of the cell above.

The NODE Name entry (for the first row) is calculated using the following formula:

=VLOOKUP(H391,NodeNumber,2,FALSE),

where "H391" represents the cell containing the node number.

Figure 11-10 shows the right side of the Inputs sheet. From your diagram, fill in each of the To Node numbers in the To Node column. The numbers do not need to be in any particular order. To Nodes may be middle layer nodes or output nodes. Assuming you have filled in the Constants data, the node names will be displayed as you enter the node number. The two Val columns will not reflect correct values, yet. If you are using a pre-defined scenario and there were more To Nodes in the block than you need now, simply delete the excess To Node **numbers**.

Inflate	**Center**	**Val**	**TO Node Name:**	**To Node**	**Val**
1.00	0.00	-0.60	Armed forces are well structured	4	-0.60
1.00	0.00	-0.60	#N/A		-0.60
1.00	0.00	-0.60	#N/A		-0.60
1.00	0.00	-0.60	#N/A		-0.60
1.00	0.00	-0.60	#N/A		-0.60
1.00	0.00	-0.60	#N/A		-0.60

Figure 11-10. Right side of the Preprocessor Inputs sheet

Now you must fill in Inflate and Center values for each To Node. In the absence of any other information, use 1.00 for Inflate and 0.00 for Center. The discussion concerning Figure 2-5 on the effects of these values are relevant for the Preprocessor, also.

The first Val entry is calculated using the following formula:

=M391+L391*J391,

where "M391" represents the Center value, "L391" represents the Inflate value, and "J391" represents the VALUE value for the To Node in question.

The TO Node Name entry is calculated using the following formula:

=VLOOKUP(P391,NodeNumber,2,FALSE),

where "P391" represents the To Node number in question.

The second Val entry merely repeats the value of the first Val entry in column N.

Figure 11-11 shows the bottom of the Inputs sheet. If you find that there are insufficient pre-defined node logic blocks, you may create more. Simply insert extra rows in groups of seven below the last gray line and before the peach colored line that says to insert rows above that row. Then copy the last node block, beginning below the gray line at its top and including its (bottom) gray line, to the blank area as many times as needed, but not extending to the peach line.

	Iraq, Test Scenario	SCENARIO							09/18/03	Current calculating date						
From Node	FROM Node Name	From Val	Weight	Mod Val	Mod Weight	Position	Nd#	Raw Val	VALUE	NODE Name	Inflate	Center	Val	TO Node Name:	To Node	Val
							0									
						#N/A		#N/A	#N/A	#N/A	1.00	0.00	#N/A	#N/A		#N/A
							0		#N/A		1.00	0.00	#N/A	#N/A		#N/A
							0		#N/A		1.00	0.00	#N/A	#N/A		#N/A
							0		#N/A		1.00	0.00	#N/A	#N/A		#N/A
							0		#N/A		1.00	0.00	#N/A	#N/A		#N/A
							0		#N/A		1.00	0.00	#N/A	#N/A		#N/A
							0									
	Insert rows above this row before copying in new nodes															

Figure 11-11. Bottom of the Preprocessor Inputs sheet

11.6 CREATING NODE LOGIC ON THE MIDDLELAYER SHEET

The middle and the right sides of the MiddleLayer sheet are virtually identical to those of the Inputs sheet. You fill them out in the same way, using middle layer nodes, rather than input nodes. The only differences are that the MiddleLayer sheet has a blank column in place of the Position column of the Inputs sheet and its Raw Val comes from the From Nodes as described below. The Raw Val entry is calculated from the following formula:

=IF(ISERROR(SUMPRODUCT(E6:E12,F6:F12)/SUM(F6:F12)),NA(),SUMPRODUCT(E6:E12,F6:F12)/SUM(F6:F12)),

where “E6:E12” represents the Mod Val range of the node and “F6:F12” represents the Mod Weight range. As long as there is at least one From Node with a numeric From Val and Weight, the Excel SUMPRODUCT() and SUM() functions will pass a valid result, the weighted average of the values.

The left side is different, however. Figure 11-12 shows a section of the left side. For each Node (in the center), you must enter into the From Node column every node that lists the Node as a To Node. Assuming you have filled out the Constants sheet, the From Node Name will be displayed when you enter its number. Again the various values will be incorrect. However, enter the Weight values for each From Node. Any positive numbers are valid. Equal numbers for all From nodes will generate equal contributions. In the example below, all Weights equal 2.00 would yield the same result as having all Weights equal 1.00.

	Iraq, Test Scenario	**SCENARIO**				
From Node	**FROM Node Name**	**From Val**	**Weight**	**Mod Val**	**Mod Weight**	
1009	Educational infrastructure	0.50	1.00	0.50	1.00	
1010	Educational goals	-1.00	1.00	-1.00	1.00	
	#N/A	#N/A	1.00			
	#N/A	#N/A	1.00			
	#N/A	#N/A	1.00			
	#N/A	#N/A	1.00			

Figure 11-12. Left side of the Preprocessor MiddleLayer sheet

The calculated value that will be passed to the Node is the weighted average of the displayed From Node values. In this case, the following formula would be accurate:

Raw Val = (1.00 * 0.5 + 1.00 * (-1.00))/(1.00 + 1.00).

The discussion of Figure 2-2 describes the actual calculations and the use of Mod Val and Mod Weight.

The calculations that produce the From Val entries are among the more complex formulas in the workbook. The following formula is an example.

FromVal=IF(A6<=1500,VLOOKUP(H6,INDIRECT(CONCATENATE("Inputs!P",VLOOKUP(A6,NodeNumber,14,FALSE),":Q",VLOOKUP(A6,NodeNumber,15,FALSE))),2,FALSE),VLOOKUP(H6,INDIRECT(CONCATENATE("MiddleLayer!P",VLOOKUP(A6,NodeNumber,14,FALSE),":Q",VLOOKUP(A6,NodeNumber,15,FALSE))),2,FALSE))

The formula looks forbidding; however, it can be understood more easily with some substitutions. The basic structure is an IF test. If the From Node number ("A6" here) is an input node, its node number will be less than or equal to 1500 and its From Val will be x; otherwise, the From Val is y.

FromVal=IF(A6<=1500,x,y)

The value of x is based on a vertical lookup function, where "H6" is the node number of the Node (not the From Node whose value is being calculated, but the Node where that value will be sent).

x=VLOOKUP(H6,INDIRECT(a),2,FALSE)

a=CONCATENATE("Inputs!P",VLOOKUP(A6,NodeNumber,14,FALSE),":Q",VLOOKUP(A6,NodeNumber,15,FALSE))

The INDIRECT function defines a two-column range, using "a" for its range. "x" is the value in the second column, where the value in the first column matches H6. "A6" is the From Node number and NodeNumber is a named range that contains the information on the Constants sheet. The formula VLOOKUP(A6,NodeNumber,14,FALSE) returns the first row of the where "A6" is the Node and the other VLOOKUP returns the last row. The P columns of the logic sheets contain the To Node numbers and the Q columns contain the To Node values.

Thus x is the value in column Q of the Inputs sheet in the logic block where the current From Node is the Node, where the corresponding cell in column P contains a To Node number that equals the Node number for the current Node. Therefore, if the current From Node is an input node, we have found the correct value that it produced in its logic block to send to this Node.

If the current From Node is a middle layer node, we look for its logic block in the MiddleLayer sheet in the same way.

y=VLOOKUP(H6,INDIRECT(b),2,FALSE)

b=CONCATENATE("MiddleLayer!P",VLOOKUP(A6,NodeNumber,14,FALSE),":Q",VLOOKUP(A6,NodeNumber,15,FALSE))

The FROM Node Name entry is calculated by the following formula:

=VLOOKUP(A6,NodeNumber,2,FALSE),

where "A6" represents the From Node number.

The Mod Val entry converts the From Val entry to a blank if it doesn't have a valid numerical entry; otherwise, it repeats the From Val value. It is calculated using the following formula:

=IF(OR(ISNA(C6),ISBLANK(C6),ISERR(C6)),"",C6),

where “C6” represents the From Val cell.

The Mod Weight entry repeats the Weight value unless the Mod Val cell has been set to blank. It is calculated using the following formula:

=IF(E6="","",D6),

where “E6” represents the Mod Val cell and “D6” represents the Weight cell.

The Mod Val and Mod Weight cells are provided to take advantage of the method Excel uses to calculate weighted averages. Blank cells in a range that is used in the Excel SUMPRODUCT() and SUM() functions do not contribute to the results, allowing the use of cells that may or may not represent logical variables.

If you are using a pre-defined scenario and there were more From Nodes or To Nodes in the block than you need now, simply delete the excess From Node and To Node **numbers**.

As with the Inputs page additional From Nodes or additional To Nodes (beyond the standard six) can be accommodated by adding rows, **as long as all formulas are copied**. Similarly, additional node blocks can be added above the peach line at the bottom of the page, **as long as all formulas are copied**.

11.7 CREATING NODE LOGIC ON THE OUTPUTS SHEET

The center part of the Outputs sheet is exactly like the center part of the MiddleLayer sheet, except that you do not input any values for the Node. They are all predefined, as they are precisely the 34 inputs to the Main ISSM. The right side of the Outputs sheet is blank because the outputs to not have any To Nodes. They are the end-product of the Preprocessor.

The left side of the Outputs sheet is exactly like the left side of the MiddleLayer sheet and is the only part into which you need to enter anything. You simply enter every middle layer and input node that lists an output node as one of its To Nodes. The calculations that produce the From Val entries identical to the calculations for the From Val entries on the MiddleLayer sheet.

As before, you may increase the number of From Nodes. However, you may not increase the number of node blocks. If you are using a pre-defined scenario and there were more From Nodes in the block than you need now, simply delete the excess From Node **numbers**.

11.8 CREATING RAWDATA INPUTS

You should maintain your RawData nodes in ascending order by Node #. You may insert or delete rows at any time. It is easier to read the data if you place a blank row between each pair of nodes. There are three types of nodes that you may create, two-entry nodes, one-entry nodes with fractional data, and one-entry nodes with scaled data.

11.8.1 RawData Two-entry Nodes

Figure 11-13 shows a section of the RawData sheet for inputs with two entries. The first row will contain actual values and the second row will contain desired values. The desired values need not be constant with time. In general, the actual values will be smaller than the desired values. In the FractionalData sheet, the entries in the first row will be divided by the entries in the second row. In the ScaledData sheet, the fractions will be scaled to values between -3 and +3. Fractions greater than 1.00 will be clipped to the maximum scaled value of +3 (unless you input unusual control values, discussed in the ScaledData section below).

Raw Observations					Measurement Dates	
Node #	**Sector**	**Activity**	**Value Definition**	**Units**	**3/22/03**	**3/28/03**
		Normal Factors				
		Insert rows following this row				
1001	Conflict	Equivalent battalion sized units	Well organized & trained battalion sized units	#Units	350	200
1001.1	Conflict	Total battalion sized units	All units	#Units	400	400

Figure 11-13. Two-entry RawData input

The simplest method for creating two-entry inputs is to copy one that already exists. However, you may also create the pair of rows from scratch. The first row begins with an integral Node #, with red font to indicate it is a user input. The second row begins with a formula that adds 0.1 to the cell above, with black font to indicate it is not an input cell.

The next three columns contain the following formulas, where "A6" is the address of the node number:

=VLOOKUP(A6,NodeNumber,4,FALSE) ,

=VLOOKUP(A6,NodeNumber,2,FALSE) ,

=VLOOKUP(A6,NodeNumber,5,FALSE) .

These formulas find and display the appropriate sector, node names, and note text in the Constants sheet for the node.

You then enter the units that you wish to use in the data entry for the following dated columns, with red font. The units for both rows must be the same (as the entries must have the same units because the second will divide the first).

11.8.2 RawData One-entry Nodes with Fractional Data

Figure 11-14 shows a section of RawData with a fractional data node.

Raw Observations					Measurement Dates	
Node #	**Sector**	**Activity**	**Value Definition**	**Units**	**3/22/03**	**3/28/03**
		Normal Factors				
		Insert rows following this row				
1034	Movement	Fraction undisplaced	fraction	fraction	0.95	0.85

Figure 11-14. One-entry RawData input with fractional data

Create a fractional data node in the same way as you created the first row of a two-entry node (details above). The difference is that you use the word "fraction" in the units column and the values should be fractions between 0.0 and 1.0.

11.8.3 RawData One-entry Nodes with Scaled Data

Figure 11-15 shows a section of RawData with a scaled data node.

Raw Observations					Measurement Dates	
Node #	Sector	Activity	Value Definition	Units	3/22/03	3/28/03
		Normal Factors				
		Insert rows following this row				
1035	Conflict	Expert: Armed forces are well structured	rating -3 to +3	rating	2	0

Figure 11-15. One-entry RawData input with scaled data

Create a scaled data node in the same way as you created the first row of a two-entry node (details above). The difference is that you use the word "rating" in the units column, the values should be numbers between -3.0 and +3.0, and you should have defined anchors to describe the meanings for the integral values in the Constants sheet for this node.

11.8.4 Bottom of the RawData Sheet

Figure 11-16 illustrates that there are limits between which all RawData nodes should be placed. You may insert extra rows between these limits, but may not place nodes outside these limits.

Raw Observations					Measurement Dates	
Node #	Sector	Activity	Value Definition	Units	3/22/03	3/28/03
		Normal Factors				
		Insert rows following this row				
1068	Needs	Expert: Water distribution infrastructure is sufficient	rating -3 to +3	rating	-1.5	-3
		Insert rows preceding this row				

Figure 11-16. Bottom of the RawData sheet

11.9 CREATING FRACTIONALDATA ROWS

You should maintain your FractionalData nodes in ascending order by Node #. You may insert or delete rows at any time. **Do not place a blank row between each pair of nodes.** There is no bottom limit to the rows. The three types of nodes, two-entry nodes, one-entry nodes with fractional data, and one-entry nodes with scaled data, have two distinct treatments in the FractionalData sheet.

11.9.1 FractionalData Two-entry Nodes

Figure 11-17 shows the format of two-entry nodes in the FractionalData sheet.

Fractional values of raw data				Date Activity Started	
	Sector	Activity	Node #	03/22/03	03/28/03
		Activity Amount Section			
C	Conflict	Equivalent battalion sized units	1001	0.88	0.50

Figure 11-17. Two-entry FractionalData nodes

It is easiest to copy an existing two-entry row. You should copy the entire row, which currently extends to column EV, to make sure that you have all of the proper formulas. Pick a row that has a capital "C" (for "Composite") in the first column.

If you are creating a row from scratch, place a capital "C" in the first column. The next two columns contain formulas like the following:

=VLOOKUP(D5,NodeNumber,4,FALSE),

=VLOOKUP(D5,NodeNumber,2,FALSE),

where "D5" represents the address of the node number. Place the node number in the fourth column, with red font. The sector and node name columns will now pick up and display the correct data. The dated columns contain formulas similar to the following:

=Fractional2($A5,COLUMN(),$D5,NodeNamesB).

Assuming the entry in column A is a "C", the logic of the custom function, Fractional2(), is to check the RawData sheet (where NodeNamesB is a named range) in the row of the current node (e.g., "$D5") in the column numbered one more than the current FractionalData column (because RawData has an extra context data column, this yields the same date column) to see if the cell is blank. If it is blank, the value "#VALUE" is displayed. Otherwise, the formula checks to see if the corresponding cell of the node + 0.1 is zero. If it is, "# VALUE " is displayed. Otherwise, the formula divides the node cell value by the node + 0.1 cell value and displays the result.

This formula creates fractional data from the two entries.

11.9.2 FractionalData One-entry Nodes of Both Kinds

Figure 11-18 shows two one-entry nodes. The treatment of fractional data nodes and scaled data nodes is identical. Note that the first column contains an "S" (for "Single") to mark the fact that these are one-entry nodes.

Fractional values of raw data				**Date Activi**
	Sector	**Activity**	**Node #**	**02/27/06**
		Activity Amount Section		
S	Conflict	Expert: Armed forces are well structured	1001	#VALUE!
S	Conflict	Expert: Competing groups resolve differences	1002	#VALUE!

Figure 11-18. One-entry FractionalData nodes

Creating rows for one-entry nodes is similar to creating rows for two-entry nodes. The simplest method is to copy another one-entry node row. If you are starting from scratch, place an "S" in the first column blank and create the next three columns exactly as described for two-entry nodes. The formulas for the dated columns are also the same.

=Fractional2($A5,COLUMN(),$D5,NodeNamesB).

Assuming that the value in column A is an “S”, the formula checks the corresponding dated cell in RawData to see if it is blank. If it is blank, "#VALUE" is displayed. Otherwise the value from the corresponding RawData cell is displayed.

This formula retains the fractional format for fractional data nodes and the scaled format for scaled data nodes.

11.10 CREATING SCALEDDATA ROWS

You will be maintaining your ScaledData nodes in precisely the same row numbers as the corresponding FractionalData nodes. **It is advised that you do not insert or delete rows at any time.** Do not place a blank row between each pair of nodes. There is no bottom limit to the rows.

The first two columns maintain the connection with the FractionalData sheet. The formulas for the first data row (row 2) are as follow and the formulas for subsequent rows are similar.

=FractionalData!D5, in cell A2,

=FractionalData!C5, in cell B2.

That is the first column cell always equals the value of the fourth column cell three rows lower on the FractionalData sheet and the second column cell equals the value of the third column cell three rows lower. If you insert or delete rows, this correspondence is broken. **To fix such a problem, make sure the values are as shown for cells A2 and B2, then copy these cells down the A and B columns to the end of your data.**

The three types of nodes, two-entry nodes, one-entry nodes with fractional data, and one-entry nodes with scaled data, have two distinct treatments in the ScaledData sheet. However, unlike in the FractionalData sheet where the fractional nodes and the scaled nodes were treated the same, in the ScaledData sheet, it is the two-entry nodes and the fractional nodes that are treated the same. The reason is that these two nodes have a fractional format in the FractionalData sheet, whereas the scaled nodes have a scaled format.

11.10.1 ScaledData Two-entry and Fractional Data Nodes

Figure 11-19 shows three two-entry nodes followed by a single one-entry fractional data node.

Node #	Node Name	Start Point Min=-3	Scale Factor	03/22/03	03/28/03
1001	Equivalent battalion sized units	-3.00	6	2.25	0.00
1002	Equivalent competent generals	-3.00	6	2.25	0.00
1030	Foreign investment in this country	-3.00	6	0.00	-3.00
1034	Fraction undisplaced	-6.00	9.00	2.55	1.65

Figure 11-19. Two-entry and one-entry with fractional data ScaledData nodes

These two node types have fractional data in the FractionalData sheet, which must be converted to scaled data. **It is your responsibility to make sure that each of these nodes have Start Point and Scale Factor entries. Otherwise, the program will assume that the node is a scaled data node.** There are two values that permit you to control the conversion of the fractional data to scaled data, the Start Point and the Scale Factor. The standard values are -3.00 for the Start Point and 6.00 for the Scale Factor. The formula with these values,

= Start Point + Scale Factor * fractional value = -3.00 + 6.00 * fractional value, results in a linear conversion of the fractional values (0.00 to 1.00) to (-3.00 to +3.00). The use of the standard values is illustrated by the black diagonal line in Figure 11-20.

There are some cases in which this standard conversion does not produce the desired result. For example, node number 1034 in Figure 11-19 represents the fraction of people who are not displaced (1.0 - fraction displaced) in the scenario. Using the standard values would require that 100% of the population be displaced before that factor would generate a worst case value of -3.00. This seems unreasonable. On the other hand, requiring that 100% are undisplaced to achieve a best case value of +3.00 seems reasonable. By adjusting the Start Point and Scale Factor, various conversions are possible. In this example, a start point of -6.00 and a Scale Factor of 9.00 will yield the conversion shown in the blue diagonal line in Figure 11-20. These values mean that a 67% displacement will yield a -3.00 scaled value and 0% displacement will yield a +3.00 scaled value.

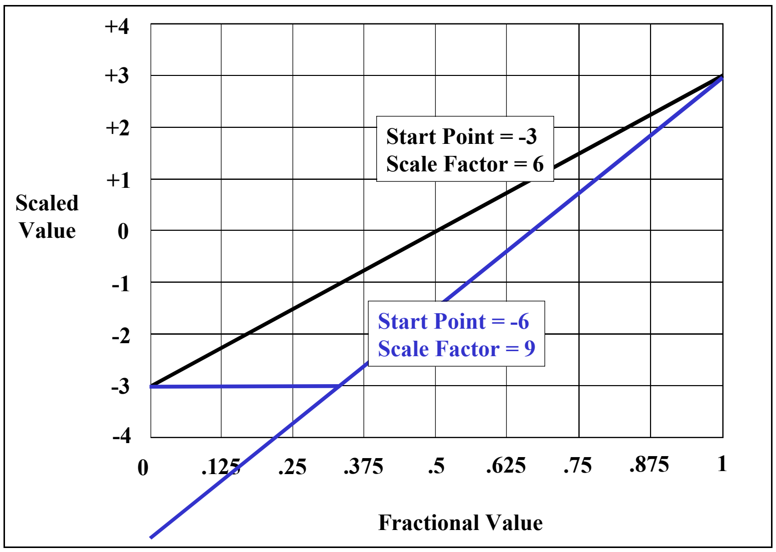


Figure 11-20. Effect of Start Point & Scale Factor on conversion: fractional value to scaled value

Figure 11-21 shows how to compute the Start Point and Scale Factor, given your desired inflection points. L is the Fractional Value at and below which you desire to have the Scaled Value equal to -3. H is the Fractional Value at and above which you desire to have the Scaled Value equal to +3.

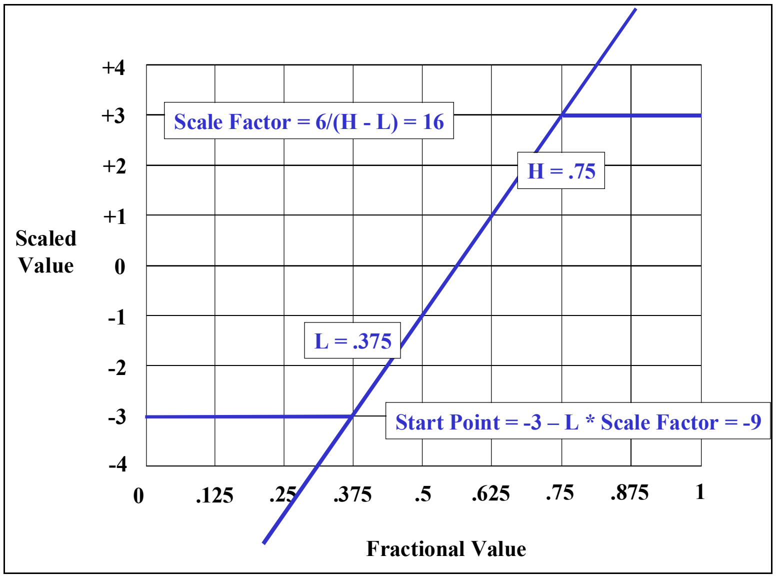


Figure 11-21. Calculating the Start Point and Scale Factor

In this example, L = .375 and H = .75. You calculate as follows:

Scale Factor = 6 / (H - L) = 6 / (.75 - .375) = 6 / (.375) = 16, and

Start Point = -3 - L * Scale Factor = -3 - .375 * 16 = -3 - 6 = -9.

The actual formulas in each of the dated cells for two-entry and fractional entry nodes look like the following:

=Scaled2($A2,NodeNamesB,FractionalData!E5,$C2,$D2),

where row 2 is the current row, row 5 is the corresponding row in FractionalData, and E is the current column (which is also the corresponding column in FractionalData). This formula displays "#VALUE" if the corresponding cell has an error value. Otherwise, it displays the scaled value, clipped at -3.0 and +3.0.

You must ensure that all dated cells have the proper formulas in them.

11.10.2 ScaledData One-entry Scaled Data Nodes

Figure 11-22 shows the format of scaled nodes. **The identifying feature of these nodes is that there are no Start Point or Scale Factor entries.** No entries are required because the data are already scaled.

Node #	Node Name	Start Point Min=-3	Scale Factor	03/22/03	03/28/03
1035	Expert: Armed forces are well structured			2.00	0.00

Figure 11-22. One-entry with scaled data ScaledData nodes

The formulas in the dated columns are identical to those for the other node types and look like the following:

=Scaled2($A36,NodeNamesB,FractionalData!E39,$C36,$D36),

where row 36 is the current row, row 39 is the corresponding row in FractionalData, and E is the current column in both. This formula displays "#VALUE" if the corresponding cell has an error value. Otherwise, it displays the corresponding value from FractionalData, clipped at -3.0 and +3.0. **If the node was not a scaled node (was a fractional node), its value will be repeated. This value will look valid, but it will not be valid.**

11.11 IMPLEMENTING THE USER- OR DIAMOND- WORKSHEET CHOICE

When the user selects the "Connect/Disconnect" control in the Controller workbook, the control will create the formulas in RawData to use the values from the User- or Diamond- Worksheet in the proper places. The corresponding nodes must be in place in the User- or Diamond- Worksheet and the RawData worksheet.

This control will also connect the values in the ISSM Main User- or Diamond- Worksheet in the proper places in the ExternalInputs worksheet. If you are building the total logic in pieces, you will have to use the Connect/Disconnect control each time you add new logic, as this control only makes the connections that are available at the time of its use, not any that are added later.

11.12 PREPARING THE SCENARIOHISTORY

Figure 11-23 shows the part of the ScenarioHistory worksheet where your input node values will be recorded. Your nodes will follow the last record labeled "Input" in the Group column. The records labeled "Input" are the inputs to the Main ISSM and are the outputs of the Preprocessor. You must not change any of these rows.

Keep your entries in sequential order of the node numbers. You will only enter text (numbers) into the Nd# column. The other four left-most columns contain formulas.

					Dates	
			09/18/03	**Bare Bones**	3/22/03	3/28/03
Group	**Sector**	**Nd#**	VALUE	**NODE Name**	VALUE	VALUE
Input	Needs	5	-0.08	**Basic natural resource management is in place**	-1.17	-2.50
Input	Needs	58	0.50	**Water distribution infrastructure is sufficient**	-1.50	-3.00
Pre-Input	Conflict	1001	-0.60	**Equivalent battalion sized units**	2.25	0.00
Pre-Input	Conflict	1002	-1.20	**Equivalent competent generals**	2.25	0.00
Pre-Input	Conflict	1003	-1.00	**Civilian control of military**	2	0
Pre-Input	Needs	1004	-0.50	**Natural resource infrastructure**	-1	-1.5

Figure 11-23. Beginning of the input nodes part of the Preprocessor ScenarioHistory sheet

The formulas are as follows:

Group =VLOOKUP(C41,NodeNumber,3,FALSE)

Sector =VLOOKUP(C41,NodeNumber,4,FALSE)

NODE Name =VLOOKUP(C41,NodeNumber,2,FALSE)

where "C41" is the cell address of the Nd# you are dealing with. These formulas look up the node number and display the appropriate results from the Constants worksheet.

The final column, VALUE, requires more care. In the example above, where "C41" contains node number 1001,

VALUE =ScenVal(C41,NodeNumber,NodeNamesB,CurrentDate).

This formula contains a user-defined function, scenval(), that computes the cell address of the VALUE column (column J) of the node on the Logic sheet that concerns node 2001, found in row 6.

You may enter the formulas by typing right-hand side of the formulas, above **(remember the "=")**. You should check that the correct formula has been entered in the cell.

Figure 11-24 shows the beginning of your middle layer nodes on the ScenarioHistory sheet. Note that it is permissible to have unused rows between nodes; however, you should avoid having too many of these, as it slows calculations. Your middle-layer nodes will be identified as "Pre-Intermed" nodes in the Group column. Proceed with them as you did with your Input nodes.

					Dates	
			09/18/03	**Bare Bones**	3/22/03	3/28/03
Group	**Sector**	**Nd#**	**VALUE**	**NODE Name**	VALUE	VALUE
Pre-Input	Needs	1068	0.50	**Expert: Water distribution infrastructure is sufficient**	-1.50	-3.00
#N/A	#N/A					
#N/A	#N/A					
#N/A	#N/A					
#N/A	#N/A			**#N/A**		
#N/A	#N/A			**#N/A**		
#N/A	#N/A			**#N/A**		
#N/A	#N/A			**#N/A**		
#N/A	#N/A			**#N/A**		
#N/A	#N/A			**#N/A**		
#N/A	#N/A			**#N/A**		
Pre-Intermed	Misc	1501	-0.25	**Educational infrastructure & goals**	0.75	-3.00
Pre-Intermed	Misc	1502	-1.23	**Educational percents**	-0.14	-2.30
Pre-Intermed	Conflict	1503	-1.75	**Overt opposition force**	-1.00	-1.00
Pre-Intermed	Conflict	1504	-2.00	**Factional paramilitary**	-1.25	-1.83
Pre-Intermed	Conflict	1505	-1.00	**Factional dispute resolution**	-1.00	-2.00
#N/A	#N/A			**#N/A**		

Figure 11-24. Beginning of the middle layer nodes part of the Preprocessor ScenarioHistory sheet

In all cases, you do not enter anything into the dated columns following the NODE Name column. When you click on the Recalculate control on the Preprocessor Controls sheet, these columns will be filled in with the appropriate numbers.

The bottom of the history section of the ScenarioHistory sheet is indicated with a peach colored line that says "No input below this line," as in Figure 11-25. If you need more rows for your nodes, insert them using the Excel insert rows menu item **above this line**.

					Dates		
			09/18/03	Bare Bones	3/22/03	3/28/03	4/4/03
Group	Sector	Nd#	VALUE	NODE Name	VALUE	VALUE	VALUE
#N/A	#N/A			#N/A			
#N/A	#N/A			#N/A			
#N/A	#N/A			#N/A			
#N/A	#N/A			#N/A			
#N/A	#N/A			#N/A			
#N/A	#N/A			#N/A			
#N/A	#N/A			#N/A			
No input below this line							

Figure 11-25. End of records in Preprocessor ScenarioHistory

If you have to insert rows, you will have to compensate below the peach colored line. The area below the history records contains a specially formatted copy of the names of the nodes that is used by the Custom Series controls. Figure 11-26 contains a schematic of the formatting.

	A	B	C	D
1	Other columns		Node#	
2	x1		2	
3	x2		4	
4	x3		125	
5	x4		34	
6	x5		22	
7	x6		56	
8	x7		43	
9	Other header info	A col formula	Node#	C col formula
10	x1	=A2	2	=C2
11	x2 Values equal	=A3	4	=C3
12	x3 corresponding	=A4	125	=C4
13	x4 values in upper	=A5	34	=C5
14	x5 block because	=A6	22	=C6
15	x6 of the formulas	=A7	56	=C7
16	x7	=A8	43	=C8

	A	B	C	D
1	Other columns		Node#	
2	x1		2	
3	x2		4	
4	x3		125	
5	....	Inserted Row...	....	
6	x4		34	
7	x5		22	
8	x6		56	
9	x7		43	
10	Other header info	A col formula	Node#	C col formula
11	x1 Values equal	=A2 Formulas	2	=C2
12	x2 OLD	=A3 were	4	=C3
13	x3 corresponding	=A4 changed	125	=C4
14	x4 values in upper	=A6 by the	34	=C6
15	x5 block because	=A7 row	22	=C7
16	x6 of the formulas	=A8 nsertion	56	=C8
17	x7	=A9	43	=C9

Figure 11-26. Inserting rows

The left hand side of the figure contains the situation before a row is inserted. The top eight rows represent all of the history records that are above the peach colored line. The bottom eight rows represent the data below the peach line. The A column represents the data that precedes the node number in a record and the C column represents the node numbers. Each record above the line has a corresponding record below the line. The B and D columns (below the line) shows the formulas that are contained in the A and C columns, which produce the values shown. The actual formulas are more complex; however, this schematic is sufficient to illustrate the point.

The right hand side of the figure shows what happens when a row is inserted in the top half. The data in the top half is undisturbed (although the row numbers containing some of the data change) and the data in the bottom half is unchanged. Inserting the row causes the formulas to change so that the bottom half rows refer to the same data as before, despite the change in row numbers. Up to this point, the inserted row(s) have caused no damage.

However, the purpose for inserting rows is to add places to record the history of new nodes. Once you have put the correct formulas into the cells in the new row, as described above, the history can be properly recorded. Unfortunately, as can be seen in Figure 11-26, there is no reference to the data in this new row in the bottom half. This means that this new node cannot be selected for graphing by the Custom Series controls.

The compensation mentioned above, starts with inserting the same number of rows into the bottom half as you inserted into the top half. Insert them some place in the middle of the current data in the bottom half. The exact location doesn't matter because you will be replacing most of the formulas anyway. Next, copy the formulas (in columns A - E) immediately below the headers in the bottom half and paste them down to the last entry. This action reestablishes the correspondence between top half rows and bottom half rows.

11.13 CHECKING YOUR LOGIC

There are two pivot tables in the Preprocessor workbook that will help you check your logic, the Inputs Pivot Table and the Middle Layer Pivot Table. You should enter one complete set of dated inputs (with a date) into the RawData sheet to provide data for these checks. **Then click on the Recalculate control on the Preprocessor Controls sheet.**

Figure 11-27 shows a portion of the Inputs Pivot Table in the InputPivot sheet. You should click on the cell in the upper left containing the entry "Max of Val" and then click on the Exclamation point on the tool bar to refresh the pivot table. If this toolbar is not showing, you may right click on the "Max of Val" cell and click on the "Refresh Data" entry on the popup menu.

Inputs Pivot Table

Max of Val	To Node					
Nd#	4	5	11	21	35	38
1001	-0.60					
1002	-1.20					
1003	-1.00					
1004		-0.50				
1005		0.25				
1006			-1.00			
1007			-1.00			
1008			-1.00			
1009						
1010						

Figure 11-27. Inputs Pivot Table

After you have refreshed the data, all of the connections between Nodes and To Nodes should be displayed in the pivot tables. Do not worry about the values that are shown. The important things to look for are that all of your input nodes are shown; all of the To Nodes in your design sketch should show up for each input node; and there should be no extra To Nodes. If there are errors, you will have to check back through the creation steps to see if you omitted any To Nodes or failed to delete any old references that no longer apply.

Figure 11-28 shows the Middle Layer Pivot Table. You should click on the cell in the upper left containing the entry "Max of Val" and then click on the Exclamation point on the tool bar to refresh the pivot table. If this toolbar is not showing, you may right click on the "Max of Val" cell and click on the "Refresh Data" entry on the popup menu.

Middle Layer Pivot Table

Max of Val	To Node					
Nd#	11	21	59	60	74	148
1501		-0.25				
1502		-1.23				
1503	-2.25		-1.75		-1.75	
1504				-2.00	-2.00	-1.50
1505					-1.00	

Figure 11-28. Middle Layer Pivot Table

Check this pivot table in the same way you did the Inputs Pivot Table. This one should have all of your middle layer nodes, all of their To Nodes, and no additional nodes.

The other logic checking is more difficult. You will have to manually look at all of the value entries starting with the RawData and following through to the Output logic. Make sure that you understand all of the values, especially any "#N/A" values.

Then, check the values in the ScenarioHistory sheet. The values (including the date) in the VALUE column should correspond to the node values in the Outputs sheet and these should also be the same as those of the last column to the right on the sheet.

					Dates		
			09/25/03	Bare Bones	3/22/03	9/18/03	9/25/03
Group	**Sector**	**Nd#**	**VALUE**	**NODE Name**	VALUE	VALUE	VALUE
Input	Conflict	4	0.21	**Armed forces are well structured**	2.09	-0.76	0.21
Input	Conflict	11	-0.11	**Competing groups resolve differences**	-1.06	-1.14	-0.11
Input	Conflict	59	-0.19	**Opposition party does not espouse force**	-0.88	-1.35	-0.19
Input	Conflict	60	-1.00	**There haven't been any paramilitary forces**	-1.13	-2.00	-1.00
Input	Conflict	61	2.00	**There haven't been any regime-sponsored, non-military armed**	-3.00	1.50	2.00
Input	Conflict	74	-0.25	**There are no factional disputes**	-1.71	-1.29	-0.25
Input	Conflict	148	1.00	**No insurgents are operating**	-0.05	-0.19	1.00
Input	Conflict	149	0.00	**No terrorists are operating**	0.00	-1.50	0.00
Input	Economy	124	-1.40	**Foreign investment is available**	0.00	-2.00	-1.40
Input	Economy	71	-1.00	**Financial system is solid**	-1.00	-2.00	-1.00

Figure 11-29. Portion of the Preprocessor ScenarioHistory sheet

Finally, you should use the custom series controls (Figure 11-30) on the Preprocessor Controls sheet to create TimeChart (Figure 11-31) series that contain all of your custom logic to look for anomalies. You should also select entries that should have similar results to compare the results with each other.

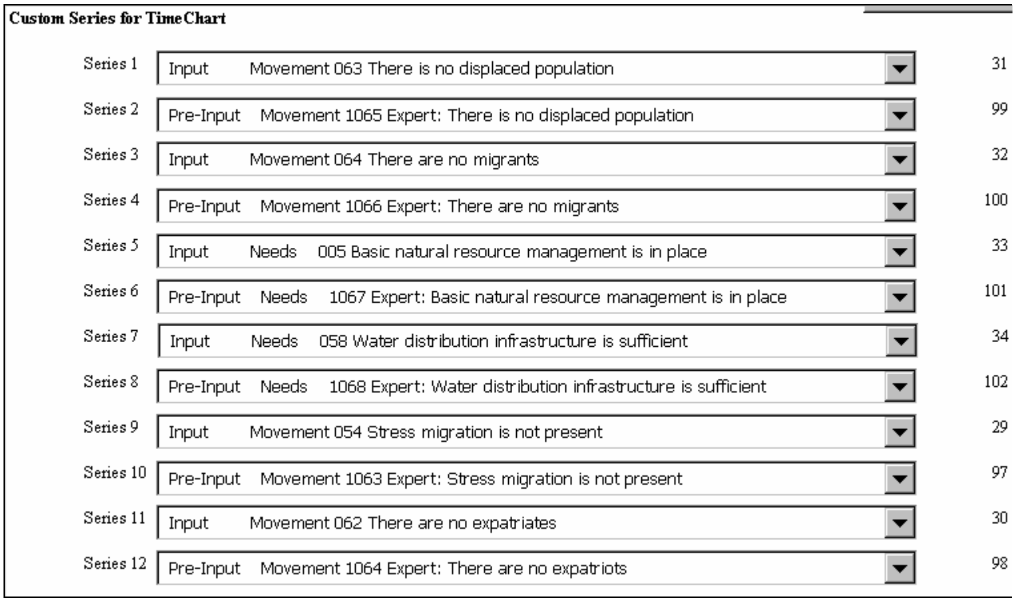


Figure 11-30. Preprocessor custom series controls

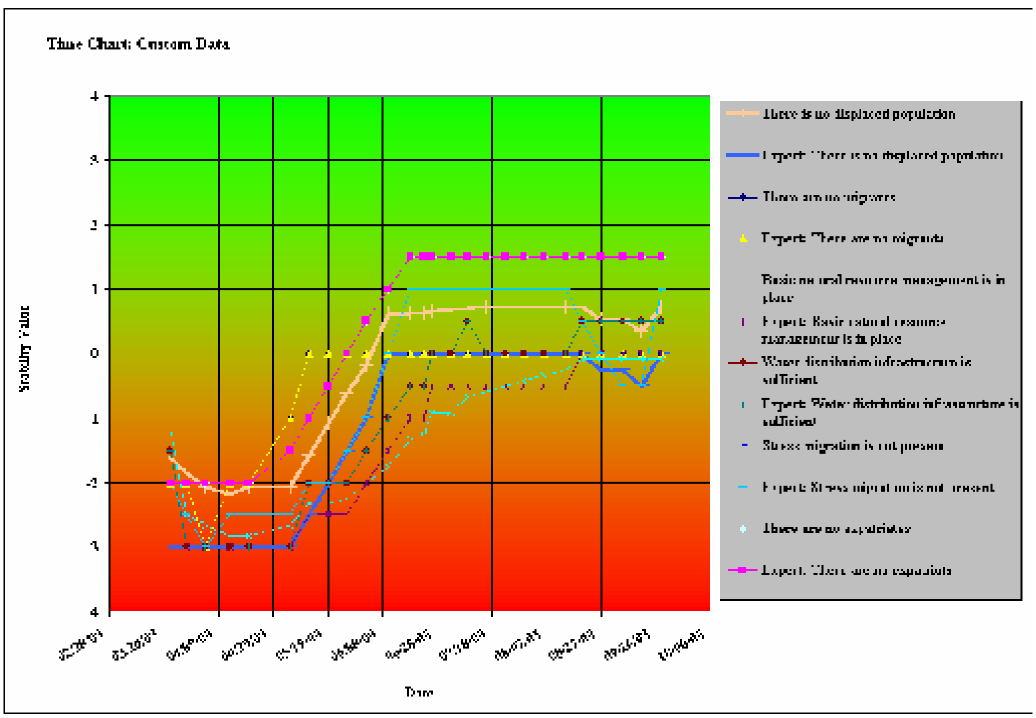


Figure 11-31. Preprocessor TimeChart

This figure show the TimeChart with the Value Axis (Y-Axis) Display turned on (on the Controls sheet). Turning the display off simply removes the scale values from the left-hand side of the chart.

After you have added all of you Preprocessor custom logic, you may perform an additional, more thorough check of your logic by using the Save Data and Logic control on the Controller's Controls worksheet. This process will institute several logic checks and draw the logic that you have defined.

12. POSTPROCESSOR V4.0 LOGIC

Unlike the Preprocessor logic, the Postprocessor logic is represented by only one layer. All of the variables from the ISSM Main are available as inputs to this layer and any user-created node in this layer can represent an output from the Postprocessor. However, this single layer designation does not preclude the user from connecting user-created nodes to each other in any desired configuration (as long as the nodes do not form a cycle).

Section 12.1 gives an abstract description of how the logic works, defining the notation of the node model. Section 12.2 describes the connection between the node model and the Excel implementation in the Postprocessor. This implementation is more fully described in Section 13. Section 14 provides technical descriptions of the calculations that generate the ISSM Main intermediate nodes, implicitly defining the nodes. This section is placed in the Postprocessor portion of this document because the need for these definitions is most needed for determining inputs to the Postprocessor. Section 15 contains the process description for creating the custom logic.

12.1 POSTPROCESSOR LOGIC REPRESENTATION

The nodes of the Postprocessor layer include nodes that have inputs from any node of the Main ISSM, nodes that represent outputs, and intermediate nodes, as shown in Figure 12-1. In this figure, the green nodes on the right represent Postprocessor nodes, the magenta node in the center is the ISSM output node, the dark orange nodes to the left are ISSM intermediate nodes, the light orange nodes are ISSM internal input nodes, and the yellow node is an ISSM external input/intervention node. In fact, a single Postprocessor node might have inputs from several nodes of the Main ISSM and might be an output node (not shown in the figure).

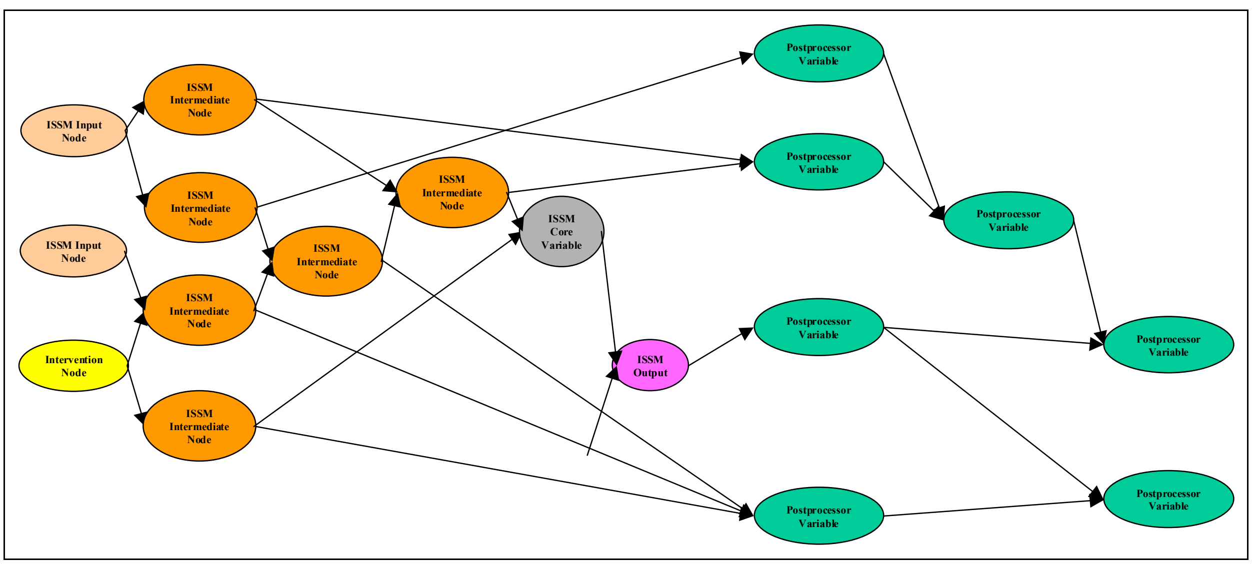


Figure 12-1. Notional Postprocessor logic

12.2 POSTPROCESSOR PRINCIPAL LOGIC FLOWS

The explanation to this point has concerned abstract logical structures and their connections. However, these logical structures require concrete implementation to be useful. Section 13 describes the Postprocessor Excel workbook and its worksheets. Figure 12-2 provides a visual transition between the abstract logic and the concrete implementation by showing the principal logic flows among the worksheets.

The Postprocessor captures all of the ScenarioHistory data from the ISSM Main and stores it in the upper part of its own ScenarioHistory worksheet. This data feeds into the Logic worksheet (one date column at a time).

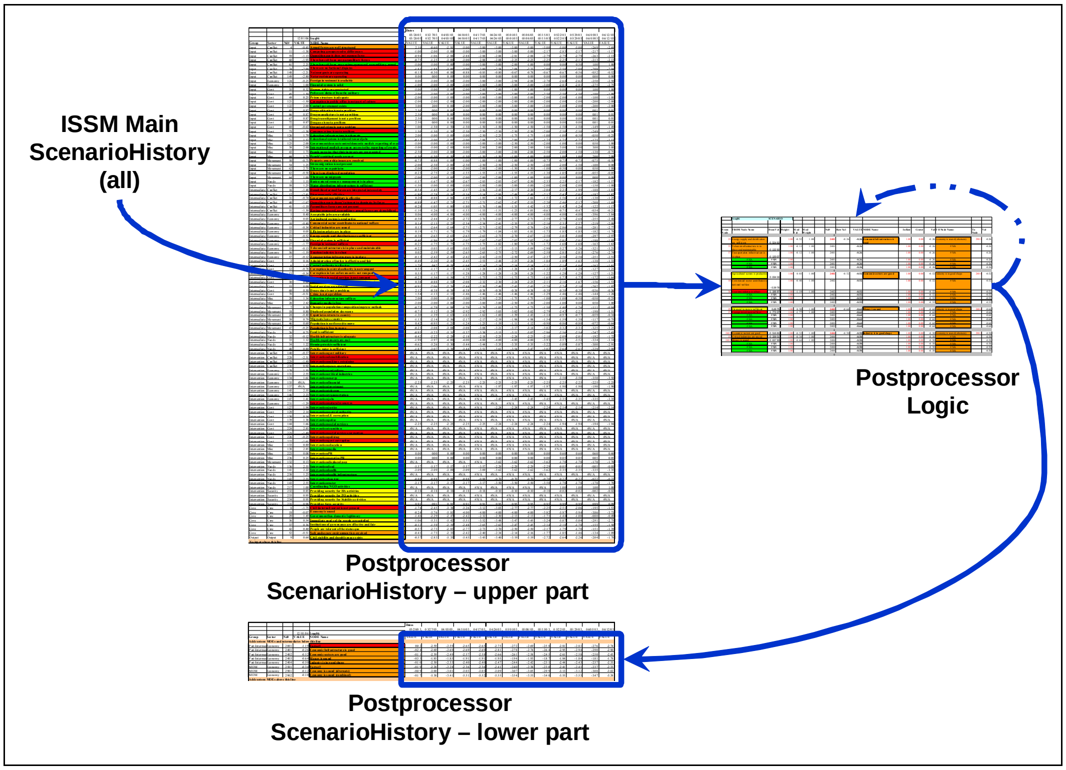


Figure 12-2. Postprocessor principal logic flows

The Logic worksheet has internal flows (arrow with two dots between dashes). The values of all of the nodes in Logic for each date are stored in the ScenarioHistory worksheet (lower part) for display in the charts.

13. POSTPROCESSOR V4.0 IMPLEMENTATION

This section is provided to familiarize you with the eight worksheets within the Postprocessor.

13.1 INSTRUCTIONS WORKSHEET

Figure 13-1 shows the Instructions sheet, which contains the title and the version number and date for the Postprocessor.

Figure 13-1. Instructions worksheet of the Postprocessor

13.2 CONTROLS WORKSHEET

Figure 13-2 shows the top half of the Controls worksheet, which contains the name of the current scenario and Main ISSM file name, plus four controls. The controls are Select Date Axis method, Select Value Axis Display, Erase Old Data, and Recalculate Data.

Figure 13-3 shows the bottom half of the Controls worksheet, which contains the 12 controls for the custom series selections for the TimeChart.

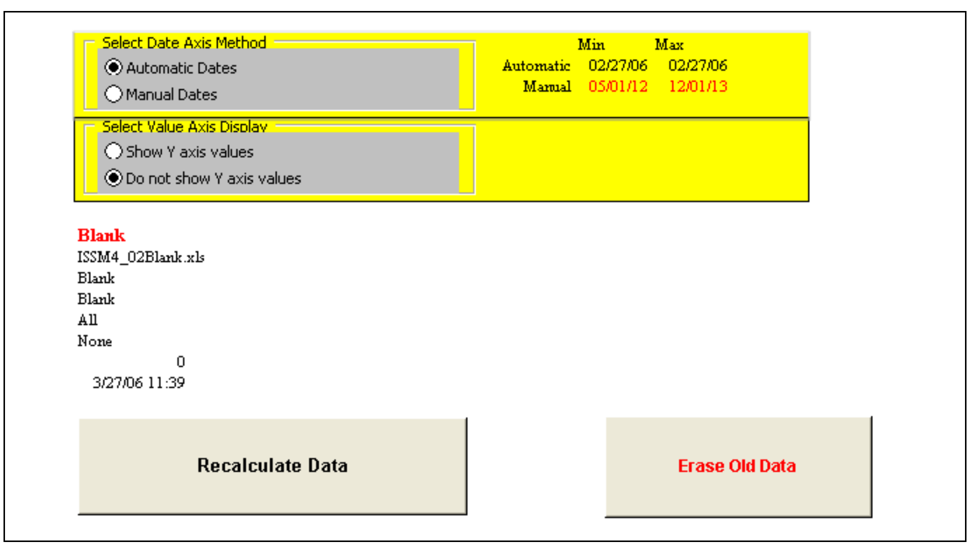


Figure 13-2. Top half of the Postprocessor Controls sheet

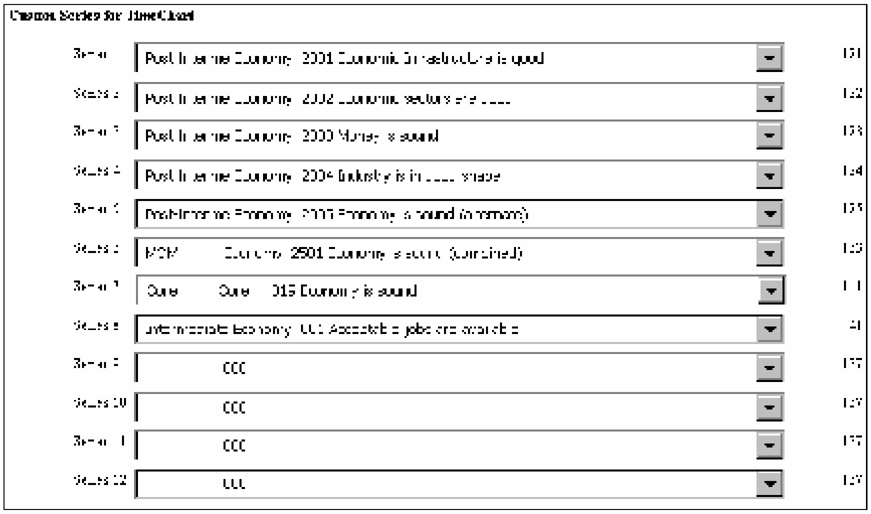


Figure 13-3. Bottom half of the Postprocessor Controls sheet

13.3 TIMECHART WORKSHEET

Figure 13-4 shows the Postprocessor TimeChart.

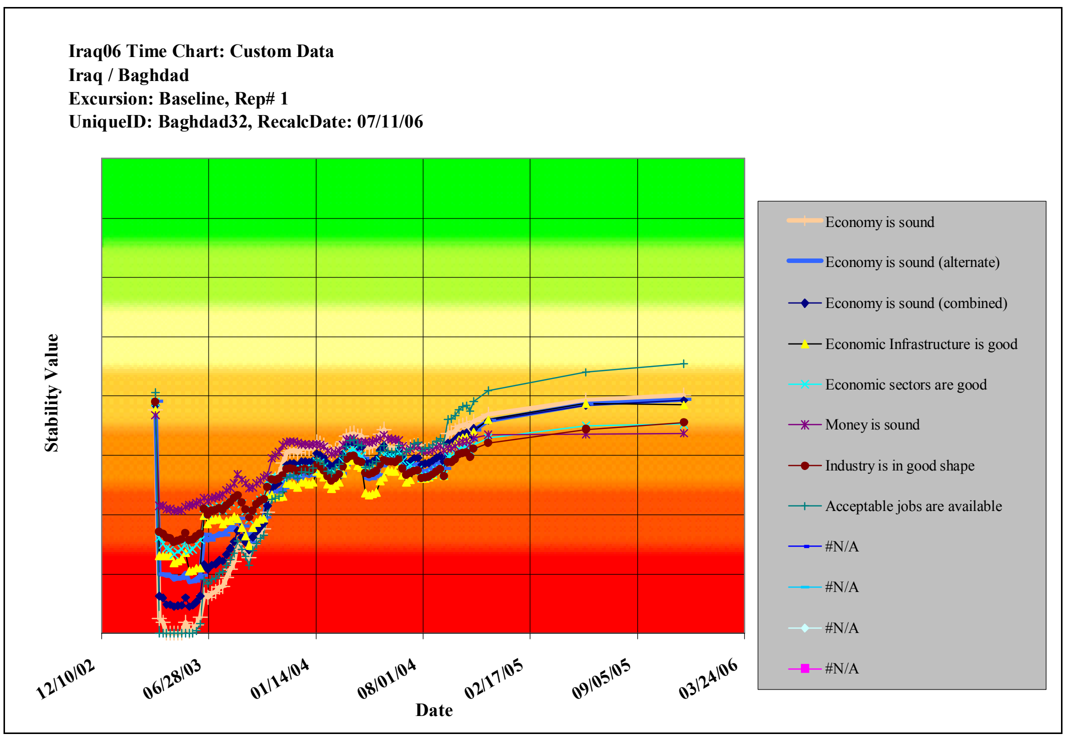


Figure 13-4. Postprocessor TimeChart

13.4 LOGIC WORKSHEET

Figure 13-5 shows the upper part of the Logic worksheet, with two node logic blocks visible.

	Bare Bones	**SCENARIO**														
						2004										
From Node	**FROM Node Name**	**From Val**	**Weight**	**Mod Val**	**Mod Weight**		**Nd#**	**Raw Val**	**VALUE**	**NODE Name**	**Inflate**	**Center**	**Val**	**TO Node Name:**	**To Node**	**Val**
							0									
23	Energy supply and distribution are sufficient	-1.02	1.00	-1.02	1.00		**2001**	-1.03	**-1.03**	**Economic Infrastructure is good**	1.00	0.00	-1.03	Economy is sound (alternate)	2005	-1.03
55	Telecom infrastructure is in place and maintainable	-1.21	1.00	-1.21	1.00		2001		**-1.03**		1.00	0.00	-1.03	#N/A		-1.03
57	Transportation infrastructure is in place	-0.85	1.00	-0.85	1.00		2001		**-1.03**		1.00	0.00	-1.03	#N/A		-1.03
	#N/A	#N/A	1.00				2001		**-1.03**		1.00	0.00	-1.03	#N/A		-1.03
	#N/A	#N/A	1.00				2001		**-1.03**		1.00	0.00	-1.03	#N/A		-1.03
	#N/A	#N/A	1.00				2001		**-1.03**		1.00	0.00	-1.03	#N/A		-1.03
							0									
3	Agricultural system is productive	-0.59	1.00	-0.59	1.00		**2002**	-0.88	**-0.88**	**Economic sectors are good**	1.00	0.00	-0.88	Industry is in good shape	2004	-0.88
10	Commercial sector contributes to national welfare	-0.62	1.00	-0.62	1.00		2002		**-0.88**		1.00	0.00	-0.88	#N/A		-0.88
56	Tourism industry is robust	-1.43	1.00	-1.43	1.00		2002		**-0.88**		1.00	0.00	-0.88	#N/A		-0.88
	#N/A	#N/A	1.00				2002		**-0.88**		1.00	0.00	-0.88	#N/A		-0.88
	#N/A	#N/A	1.00				2002		**-0.88**		1.00	0.00	-0.88	#N/A		-0.88
	#N/A	#N/A	1.00				2002		**-0.88**		1.00	0.00	-0.88	#N/A		-0.88
							0									

Figure 13-5. Upper part of Postprocessor Logic sheet

Figure 13-6 shows the bottom of the Logic sheet with the Insert above line showing.

	Bare Bones	**SCENARIO**														
						2004										
From Node	**FROM Node Name**	**From Val**	**Weight**	**Mod Val**	**Mod Weight**		**Nd#**	**Raw Val**	**VALUE**	**NODE Name**	**Inflate**	**Center**	**Val**	**TO Node Name:**	**To Node**	**Val**
2004	Industry is in good shape	-1.16	1.00	-1.16	1.00		**2005**	-1.13	**-1.13**	**Economy is sound (alternate)**	1.00	0.00	-1.13	Economy is sound (combined)	2501	-1.13
1	Acceptable jobs are available	-1.21	1.00	-1.21	1.00		2005		**-1.13**		1.00	0.00	-1.13	#N/A		-1.13
2001	Economic Infrastructure is good	-1.03	1.00	-1.03	1.00		2005		**-1.13**		1.00	0.00	-1.13	#N/A		-1.13
	#N/A	#N/A	1.00				2005		**-1.13**		1.00	0.00	-1.13	#N/A		-1.13
	#N/A	#N/A	1.00				2005		**-1.13**		1.00	0.00	-1.13	#N/A		-1.13
	#N/A	#N/A	1.00				2005		**-1.13**		1.00	0.00	-1.13	#N/A		-1.13
							0									
2005	Economy is sound (alternate)	-1.13	1.00	-1.13	1.00		**2501**	-1.14	**-1.14**	**Economy is sound (combined)**	1.00	0.00	-1.14	#N/A		-1.14
19	Economy is sound	-1.14	1.00	-1.14	1.00		2501		**-1.14**		1.00	0.00	-1.14	#N/A		-1.14
	#N/A	#N/A	1.00				2501		**-1.14**		1.00	0.00	-1.14	#N/A		-1.14
	#N/A	#N/A	1.00				2501		**-1.14**		1.00	0.00	-1.14	#N/A		-1.14
	#N/A	#N/A	1.00				2501		**-1.14**		1.00	0.00	-1.14	#N/A		-1.14
	#N/A	#N/A	1.00				2501		**-1.14**		1.00	0.00	-1.14	#N/A		-1.14
							0									
	Insert rows above this row before copying in new nodes															

Figure 13-6. Bottom of the Postprocessor Logic sheet

13.5 CONSTANTS WORKSHEET

Figure 13-7 shows the upper left part of the Constants sheet, containing Main ISSM nodes.

	Constants				
Nd#	NODE Name	Group	Sector	Note	Influence notes
1	Acceptable jobs are available	Intermediate	Economy		
2	Administration of justice is effective and fair	Intermediate	Govt		
3	Agricultural system is productive	Intermediate	Economy		
4	Armed forces are well structured	Input	Conflict		
5	Basic natural resource management is in place	Input	Needs	two parts: infrastructure & govt/private management system; missing=-3, bad=-2, moderately bad=-1, fair=0, moderately good=1, good=2, excellent=3	

Figure 13-7. Upper left part of Postprocessor Constants sheet

Figure 13-8 shows the center part of the Constants sheet, where the anchor data is contained.

	Constants							
Nd#	NODE Name	-3	-2	-1	0	1	2	3
1	Acceptable jobs are available							
2	Administration of justice is effective and fair							
3	Agricultural system is productive							
4	Armed forces are well structured	non-existent						excellent C2 & subordinate to civilian govt
5	Basic natural resource management is in place	infrastructure and govt/private management missing	avg of two parts is -2	avg=-1	avg=0	avg=1	avg=2	no problems

Figure 13-8. Upper center part of Postprocessor Constants sheet

Figure 13-9 shows the area toward the bottom of the Constants sheet where you enter data about the custom logic nodes before the "Insert rows before here" warning. Figure 13-10 shows the right hand columns that continue the node data.

Nd#	NODE Name	Group	Sector	Note	Influence notes
2001	Factor1	Post-Intermed	Economy		
2401	Economic Infrastructure is good	Post-Intermed	Economy		
2402	Economic sectors are good	Post-Intermed	Economy		
2403	Money is sound	Post-Intermed	Economy		
2404	Industry is in good shape	Post-Intermed	Economy		
2501	Factor2	MOM	Economy		
2901	Economy is sound (alternate)	MOM	Economy		
2902	Economy is sound (combined)	MOM	Economy		
Insert rows before here					

Figure 13-9. Lower left part of Postprocessor Constants sheet

Nd#	NODE Name	3	Row	End Row
2001	Factor1		48	54
2401	Economic Infrastructure is good		6	12
2402	Economic sectors are good		13	19
2403	Money is sound		20	26
2404	Industry is in good shape		27	33
2501	Factor2		55	61
2901	Economy is sound (alternate)		34	40
2902	Economy is sound (combined)		41	47
Insert rows before here				

Figure 13-10. Lower right part of Postprocessor Constants sheet

13.6 SCENARIOHISTORY WORKSHEET

Figure 13-11 shows part of the top of the ScenarioHistory sheet, where the data to be copied to the Main ISSM is stored.

					26	
					Dates	
					03/22/03	03/28/03
			09/18/03	Bare Bones	03/22/03	03/28/03
Group	Sector	Nd#		NODE Name		
Input	Conflict	4	-1.00	Armed forces are well structured	2.00	0.00
Input	Conflict	11	-1.00	Competing groups resolve differences	-1.00	-2.00
Input	Conflict	59	-1.00	Opposition party does not espouse force	-1.00	-1.00
Input	Conflict	60	-2.00	There haven't been any paramilitary forces	-1.00	-2.00
Input	Conflict	61	1.50	There haven't been any regime-sponsored, non-military armed	-3.00	-3.00
Input	Conflict	74	-1.00	There are no factional disputes	-2.00	-2.00

Figure 13-11. Part of top of Postprocessor ScenarioHistory sheet

Figure 13-12 shows the lower ScenarioHistory sheet, where the results of the custom logic nodes are stored. The figure includes the warnings about entering data above or below the peach colored lines and instructions to insert rows between the lines.

					Dates	
					03/22/03	03/28/03
			09/18/03	**Bare Bones**	03/22/03	03/28/03
Group	**Sector**	**Nd#**		**NODE Name**		
Output	Output	9	0.59	**Civil stability and durable peace exists**	-0.32	-1.60
No input above this line						
Add custom MOEs and intermediates below this line						
Post-Intermed	Economy	2001	-1.03	**Economic Infrastructure is good**	-0.24	-1.74
Post-Intermed	Economy	2002	-0.88	**Economic sectors are good**	-0.10	-1.52
Post-Intermed	Economy	2003	-1.28	**Money is sound**	-0.03	-1.07
Post-Intermed	Economy	2004	-1.16	**Industry is in good shape**	-0.04	-1.34
Post-Intermed	Economy	2005	-1.13	**Economy is sound (alternate)**	-0.10	-1.83
Post-Intermed	0	2006		**0**		
Post-Intermed	0	2007		**0**		
Post-Intermed	0	2008		**0**		
Post-Intermed	0	2009		**0**		
Post-Intermed	0	2010		**0**		
MOM	Economy	2501	-1.14	**Economy is sound (combined)**	0.06	-1.89
MOM	0	2502				
MOM	0	2503				
MOM	0	2504				
Add custom MOEs above this line						
No input below this line						

Figure 13-12. Part of the lower Postprocessor ScenarioHistory sheet

Figure 13-13 shows part of the bottom of the ScenarioHistory sheet, where the listings for the custom series controls are maintained.

			09/18/03	**Bare Bones**
Group	**Sector**	**Nd#**		**NODE Name**
5	9	4		
Custom Series Data Area				
Group	**Sector**	**Nd#**		**Group Sector Nd# NODE Name**
Input	Conflict	004		Input Conflict 004 Armed forces are well structured
Input	Conflict	011		Input Conflict 011 Competing groups resolve differences
Input	Conflict	059		Input Conflict 059 Opposition party does not espouse force
Input	Conflict	060		Input Conflict 060 There haven't been any paramilitary forces
Input	Conflict	061		Input Conflict 061 There haven't been any regime-sponsored, non-military armed forces

Figure 13-13. Part of the bottom of the Postprocessor ScenarioHistory sheet

13.7 LOGICPIVOT WORKSHEET

Figure 13-14 shows the contents of the LogicPivot worksheet.

Logic Pivot Table

Max of Val	To Node		
Nd#	2004	2005	2501
2001		-1.03	
2002	-0.88		
2003	-1.28		
2004		-1.16	
2005			-1.13

Figure 13-14. Postprocessor LogicPivot sheet

13.8 TIMECHARTDATA WORKSHEET

Figure 13-15 shows part of the TimeChartData worksheet, where the information for display in the TimeChart is kept.

	Iraq06							
	□Iraq / Baghdad□Excursion: Baseline, Rep# 1□UniqueID: Baghdad33, RecalcDate: 07/11/06							
Time Chart: Cus	Iraq06 Time Chart: Custom Data□Iraq / Baghdad□Excursion: Baseline, Rep# 1□UniqueID: Baghdad33, RecalcDate: 07/11/06							
	3	4	5	6	7	8	9	10
Node	**Node Name**	03/20/03	03/27/03	04/03/03	04/10/03	04/17/03	04/24/03	05/01/03
19	Economy is sound	-0.24	-3.76	-3.81	-4.00	-4.00	-4.00	-4.00
2901	Economy is sound (alternate)	-0.09	-3.00	-3.01	-3.03	-3.03	-3.09	-3.07
2902	Economy is sound (combined)	-0.17	-3.38	-3.41	-3.51	-3.52	-3.55	-3.54
141	Intervention health	-3.09	-3.09	-3.09	-3.09	-3.09	-3.62	-3.62
238	Intervention health infrastructure	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
142	Intervention housing	-0.88	-0.88	-0.88	-0.88	-0.88	-0.70	-0.70
143	Intervention water	-3.17	-3.17	-3.17	-3.17	-3.17	-3.50	-3.50
217	Coordinating NGO activities	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
36	Immediate needs of the people are satisfied	-1.06	-3.31	-3.42	-3.51	-3.52	-3.48	-3.47
32	Health infrastructure is adequate	-0.42	-2.22	-2.28	-2.18	-2.18	-2.25	-2.24
52	Safe and secure environment is perceived	-0.41	-1.73	-2.33	-2.42	-2.40	-2.34	-2.14
33	Health requirements are met	-1.98	-3.97	-4.00	-4.00	-4.00	-4.00	-4.00

Figure 13-15. Part of Postprocessor TimeChartData sheet

14. POSTPROCESSOR V4.0 "INPUTS"

The "inputs" to the Postprocessor consist of the ISSM Main inputs (internal and external), intermediate variables, core variables, and the output variable. This section is provided to aid the user in deciding how to create custom Postprocessor logic by describing each of the possible "inputs."

The interpretations of the ISSM Main inputs are described in Section 6. The other Postprocessor "inputs" must be interpreted by the logic that creates them and the names that they are given. Section 12 describes the form of the logic and the tables below contain the data that implements this logic.

Table 14-1 lists the From Nodes for each node that can be a Postprocessor "input." Most of the nodes are formed as a weighted average of the From Nodes, with variable values (From Val) and the weights given in the table. The variable values that are passed to the node are modifications of the From Node values, which depend on the node to which they are passed. Table 14-2 lists the parameter values used in these transformations. Two of the From Nodes pass variable weights (Weight Is Variable = TRUE) with the From Val given in the table. The Intervention nodes derive their basic values from the external inputs, modified by multiplier values from their From Nodes (Value Is Multiplier = TRUE). Table 14-3 defines the connections among the external inputs and the intervention nodes.

Table 14-1. Main From Nodes

Nd#	Node Name	From Node	From Node Name	From Val	Weight	Weight Is Variable	Value Is Multiplier
1	Acceptable jobs are available	10	Commercial sector contributes to national welfare		1		
1	Acceptable jobs are available	15	Critical industries are sound		1		
1	Acceptable jobs are available	25	Financial system is sufficient		1		
1	Acceptable jobs are available	56	Tourism industry is robust		1		
1	Acceptable jobs are available	21	Educational system is tailored toward jobs		1		
1	Acceptable jobs are available	147	Intervention jobs		1		
1	Acceptable jobs are available	19	Economy is sound		1		
2	Administration of justice is effective and fair	12	Corruption in central authority is not rampant		1		
2	Administration of justice is effective and fair	13	Corruption in law enforcement is not rampant		1		
2	Administration of justice is effective and fair	30	Government police force is effective against crime		1		
2	Administration of justice is effective and fair	35	Human rights are protected		1		
2	Administration of justice is effective and fair	49	Prison structure is adequate		1		
2	Administration of justice is effective and fair	70	Crime is not a problem		1		
2	Administration of justice is effective and fair	127	Intervention justice		1		
2	Administration of justice is effective and fair	226	Intervention policing		1		
3	Agricultural system is productive	23	Energy supply and distribution are sufficient		1		
3	Agricultural system is productive	25	Financial system is sufficient		1		
3	Agricultural system is productive	27	Foreign investment suffices		1		
3	Agricultural system is productive	57	Transportation infrastructure is in place		1		
3	Agricultural system is productive	65	Drug cultivation is not a problem		1		
3	Agricultural system is productive	5	Basic natural resource management is in place		1		
3	Agricultural system is productive	128	Intervention agriculture		1		

Nd#	Node Name	From Node	From Node Name	From Val	Weight	Weight Is Variable	Value Is Multiplier
3	Agricultural system is productive	231	Intervention natural resources		1		
6	Central authority is effective	12	Corruption in central authority is not rampant		1		
6	Central authority is effective	122	Central government exists		1		
6	Central authority is effective	129	Intervention central authority		1		
7	Changes in population composition improve outlook	18	Displaced population decreases		1		
7	Changes in population composition improve outlook	24	Expatriates return to country		1		
7	Changes in population composition improve outlook	39	Migrants leave country		1		
7	Changes in population composition improve outlook	47	Population is free to move		1		
8	Civil (internal) unrest is not present	16	Demobilized armed forces are integrated into society		1		
8	Civil (internal) unrest is not present	17	Disarmament is effective		1		
8	Civil (internal) unrest is not present	40	Opposition party doesn't attempt to dominate by force		1		
8	Civil (internal) unrest is not present	41	Paramilitary forces are not present		1		
8	Civil (internal) unrest is not present	51	Regime-sponsored, non-military armed forces are demobilized		1		
8	Civil (internal) unrest is not present	11	Competing groups resolve differences		1		
8	Civil (internal) unrest is not present	28	Domestic media is free		1		
8	Civil (internal) unrest is not present	38	International media have open access to the reporting of events		1		
9	Civil stability and durable peace exists	8	Civil (internal) unrest is not present		1		
9	Civil stability and durable peace exists	19	Economy is sound		1		
9	Civil stability and durable peace exists	29	Government has domestic legitimacy		1		
9	Civil stability and durable peace exists	36	Immediate needs of the people are satisfied		1		
9	Civil stability and durable peace exists	37	Institutions of governance are effective and fair		1		
9	Civil stability and durable peace exists	42	People are tolerant of the status quo		1		
9	Civil stability and durable peace exists	52	Safe and secure environment is perceived		1		
10	Commercial sector contributes to national welfare	3	Agricultural system is productive		1		
10	Commercial sector contributes to national welfare	15	Critical industries are sound		1		
10	Commercial sector contributes to national welfare	56	Tourism industry is robust		1		
10	Commercial sector contributes to national welfare	70	Crime is not a problem		1		
10	Commercial sector contributes to national welfare	24	Expatriates return to country		1		
12	Corruption in central authority is not rampant	68	Drug crime is not a problem		1		
12	Corruption in central authority is not rampant	70	Crime is not a problem		1		
12	Corruption in central authority is not rampant	121	Corruption in public office is not part of culture		1		
12	Corruption in central authority is not rampant	227	Intervention govt corruption		1		
13	Corruption in law enforcement is not rampant	68	Drug crime is not a problem		1		
13	Corruption in law enforcement is not rampant	70	Crime is not a problem		1		
13	Corruption in law enforcement is not rampant	121	Corruption in public office is not part of culture		1		
13	Corruption in law enforcement is not rampant	130	Intervention LE corruption		1		

Nd#	Node Name	From Node	From Node Name	From Val	Weight	Weight Is Variable	Value Is Multiplier
14	Corruption in social services is not rampant	70	Crime is not a problem		1		
14	Corruption in social services is not rampant	121	Corruption in public office is not part of culture		1		
14	Corruption in social services is not rampant	225	Intervention social services corruption		1		
15	Critical industries are sound	23	Energy supply and distribution are sufficient		1		
15	Critical industries are sound	27	Foreign investment suffices		1		
15	Critical industries are sound	55	Telecom infrastructure is in place and maintainable		1		
15	Critical industries are sound	57	Transportation infrastructure is in place		1		
15	Critical industries are sound	70	Crime is not a problem		1		
15	Critical industries are sound	131	Intervention critical industries		1		
16	Demobilized armed forces are integrated into society	4	Armed forces are well structured		1		
16	Demobilized armed forces are integrated into society	41	Paramilitary forces are not present		1		
16	Demobilized armed forces are integrated into society	51	Regime-sponsored, non-military armed forces are demobilized		1		
16	Demobilized armed forces are integrated into society	74	There are no factional disputes		1		
16	Demobilized armed forces are integrated into society	229	Intervention military retraining		1		
17	Disarmament is effective	41	Paramilitary forces are not present		1		
17	Disarmament is effective	51	Regime-sponsored, non-military armed forces are demobilized		1		
17	Disarmament is effective	74	There are no factional disputes		1		
18	Displaced population decreases	46	Population is not forced to move		1		
18	Displaced population decreases	54	Stress migration is not present		1		
18	Displaced population decreases	63	There is no displaced population		1		
18	Displaced population decreases	1	Acceptable jobs are available		1		
18	Displaced population decreases	34	Housing stock is sufficient		1		
18	Displaced population decreases	132	Intervention displaced pop		1		
19	Economy is sound	10	Commercial sector contributes to national welfare		1		
19	Economy is sound	22	Efficient markets are in place		1		
19	Economy is sound	25	Financial system is sufficient		1		
20	Education infrastructure suffices	126	Education infrastructure is adequate		1		
20	Education infrastructure suffices	133	Intervention education		1		
22	Efficient markets are in place	25	Financial system is sufficient		1		
22	Efficient markets are in place	55	Telecom infrastructure is in place and maintainable		1		
22	Efficient markets are in place	57	Transportation infrastructure is in place		1		
22	Efficient markets are in place	13	Corruption in law enforcement is not rampant		1		
22	Efficient markets are in place	70	Crime is not a problem		1		
22	Efficient markets are in place	47	Population is free to move		1		
23	Energy supply and distribution are sufficient	27	Foreign investment suffices		1		
23	Energy supply and distribution are sufficient	134	Intervention energy		1		
24	Expatriates return to country	50	Property ownership issues are resolved		1		
24	Expatriates return to country	62	There are no expatriates		1		
24	Expatriates return to country	148	No insurgents are operating		1		
25	Financial system is sufficient	71	Financial system is solid		1		
25	Financial system is sufficient	70	Crime is not a problem		1		
25	Financial system is sufficient	135	Intervention financial		1		
26	Food is sufficient	3	Agricultural system is productive		1		
26	Food is sufficient	22	Efficient markets are in place		1		
26	Food is sufficient	57	Transportation infrastructure is in		1		

Nd#	Node Name	From Node	From Node Name	From Val	Weight	Weight Is Variable	Value Is Multiplier
			place				
26	Food is sufficient	136	Intervention food		1		
27	Foreign investment suffices	124	Foreign investment is available		1		
27	Foreign investment suffices	137	Intervention investment		1		
27	Foreign investment suffices	149	No terrorists are operating		1		
28	Domestic media is free	125	Government does not control domestic media's reporting of events		1		
28	Domestic media is free	138	Intervention media		1		
29	Government has domestic legitimacy	53	Social services are adequate		1		
29	Government has domestic legitimacy	28	Domestic media is free		1		
29	Government has domestic legitimacy	38	International media have open access to the reporting of events		1		
29	Government has domestic legitimacy	43	People perceive that their interests are represented		1		
29	Government has domestic legitimacy	24	Expatriates return to country		1		
29	Government has domestic legitimacy	37	Institutions of governance are effective and fair		1		
29	Government has domestic legitimacy	224	Intervention transition		1		
30	Government police force is effective against crime	13	Corruption in law enforcement is not rampant		1		
30	Government police force is effective against crime	45	Police are distinct from the military		1		
30	Government police force is effective against crime	122	Central government exists		1		
30	Government police force is effective against crime	41	Paramilitary forces are not present		1		
30	Government police force is effective against crime	139	Intervention police		1		
31	Government-run military is effective	4	Armed forces are well structured		1		
31	Government-run military is effective	41	Paramilitary forces are not present		1		
31	Government-run military is effective	51	Regime-sponsored, non-military armed forces are demobilized		1		
31	Government-run military is effective	140	Intervention govt military		1		
32	Health infrastructure is adequate	23	Energy supply and distribution are sufficient		1		
32	Health infrastructure is adequate	14	Corruption in social services is not rampant		1		
32	Health infrastructure is adequate	238	Intervention health infrastructure		1		
32	Health infrastructure is adequate	18	Displaced population decreases		1		
33	Health requirements are met	26	Food is sufficient		1		
33	Health requirements are met	32	Health infrastructure is adequate		1		
33	Health requirements are met	48	Potable water is sufficient		1		
33	Health requirements are met	141	Intervention health		1		
34	Housing stock is sufficient	19	Economy is sound		1		
34	Housing stock is sufficient	142	Intervention housing		1		
36	Immediate needs of the people are satisfied	19	Economy is sound		1		
36	Immediate needs of the people are satisfied	50	Property ownership issues are resolved		1		
36	Immediate needs of the people are satisfied	26	Food is sufficient		1		
36	Immediate needs of the people are satisfied	33	Health requirements are met		1		
36	Immediate needs of the people are satisfied	34	Housing stock is sufficient		1		
36	Immediate needs of the people are satisfied	48	Potable water is sufficient		1		
37	Institutions of governance are	31	Government-run military is		1		

Nd#	Node Name	From Node	From Node Name	From Val	Weight	Weight Is Variable	Value Is Multiplier
	effective and fair		effective				
37	Institutions of governance are effective and fair	2	Administration of justice is effective and fair		1		
37	Institutions of governance are effective and fair	6	Central authority is effective		1		
37	Institutions of governance are effective and fair	45	Police are distinct from the military		1		
39	Migrants leave country	46	Population is not forced to move		1		
39	Migrants leave country	47	Population is free to move		1		
39	Migrants leave country	54	Stress migration is not present		1		
39	Migrants leave country	64	There are no migrants		1		
39	Migrants leave country	19	Economy is sound		1		
40	Opposition party doesn't attempt to dominate by force	11	Competing groups resolve differences		1		
40	Opposition party doesn't attempt to dominate by force	31	Government-run military is effective		1		
40	Opposition party doesn't attempt to dominate by force	59	Opposition party does not espouse force		1		
40	Opposition party doesn't attempt to dominate by force	74	There are no factional disputes		1		
40	Opposition party doesn't attempt to dominate by force	148	No insurgents are operating		1		
40	Opposition party doesn't attempt to dominate by force	149	No terrorists are operating		1		
40	Opposition party doesn't attempt to dominate by force	230	Intervention peace operations		1		
41	Paramilitary forces are not present	60	There haven't been any paramilitary forces		1		
41	Paramilitary forces are not present	74	There are no factional disputes		1		
41	Paramilitary forces are not present	68	Drug crime is not a problem		1		
41	Paramilitary forces are not present	24	Expatriates return to country		1		
41	Paramilitary forces are not present	228	Intervention demobilization		1		
42	People are tolerant of the status quo	1	Acceptable jobs are available		1		
42	People are tolerant of the status quo	35	Human rights are protected		1		
42	People are tolerant of the status quo	53	Social services are adequate		1		
42	People are tolerant of the status quo	20	Education infrastructure suffices		1		
42	People are tolerant of the status quo	44	People's spiritual needs are met		1		
42	People are tolerant of the status quo	7	Changes in population composition improve outlook		1		
42	People are tolerant of the status quo	46	Population is not forced to move		1		
42	People are tolerant of the status quo	19	Economy is sound		1		
42	People are tolerant of the status quo	36	Immediate needs of the people are satisfied		1		
42	People are tolerant of the status quo	223	Intervention PR	3		TRUE	
42	People are tolerant of the status quo	236	Intervention negative PR	-3		TRUE	
46	Population is not forced to move	24	Expatriates return to country		1		
46	Population is not forced to move	41	Paramilitary forces are not present		1		
46	Population is not forced to move	68	Drug crime is not a problem		1		
46	Population is not forced to move	26	Food is sufficient		1		
46	Population is not forced to move	34	Housing stock is sufficient		1		
46	Population is not forced to move	48	Potable water is sufficient		1		
46	Population is not forced to move	148	No insurgents are operating		1		
47	Population is free to move	23	Energy supply and distribution are sufficient		1		
47	Population is free to move	57	Transportation infrastructure is in place		1		
48	Potable water is sufficient	5	Basic natural resource management is in place		1		
48	Potable water is sufficient	58	Water distribution infrastructure is sufficient		1		
48	Potable water is sufficient	23	Energy supply and distribution are sufficient		1		
48	Potable water is sufficient	143	Intervention water		1		
48	Potable water is sufficient	231	Intervention natural resources		1		
51	Regime-sponsored, non-military	11	Competing groups resolve		1		

Nd#	Node Name	From Node	From Node Name	From Val	Weight	Weight Is Variable	Value Is Multiplier
	armed forces are demobilized		differences				
51	Regime-sponsored, non-military armed forces are demobilized	61	There haven't been any regime-sponsored, non-military armed forces		1		
51	Regime-sponsored, non-military armed forces are demobilized	148	No insurgents are operating		1		
51	Regime-sponsored, non-military armed forces are demobilized	149	No terrorists are operating		1		
51	Regime-sponsored, non-military armed forces are demobilized	228	Intervention demobilization		1		
52	Safe and secure environment is perceived	11	Competing groups resolve differences		1		
52	Safe and secure environment is perceived	31	Government-run military is effective		1		
52	Safe and secure environment is perceived	41	Paramilitary forces are not present		1		
52	Safe and secure environment is perceived	2	Administration of justice is effective and fair		1		
52	Safe and secure environment is perceived	30	Government police force is effective against crime		1		
52	Safe and secure environment is perceived	20	Education infrastructure suffices		1		
52	Safe and secure environment is perceived	24	Expatriates return to country		1		
52	Safe and secure environment is perceived	8	Civil (internal) unrest is not present		1		
52	Safe and secure environment is perceived	29	Government has domestic legitimacy		1		
52	Safe and secure environment is perceived	148	No insurgents are operating		1		
52	Safe and secure environment is perceived	149	No terrorists are operating		1		
52	Safe and secure environment is perceived	226	Intervention policing		1		
53	Social services are adequate	14	Corruption in social services is not rampant		1		
53	Social services are adequate	144	Intervention social services		1		
53	Social services are adequate	37	Institutions of governance are effective and fair		1		
55	Telecom infrastructure is in place and maintainable	23	Energy supply and distribution are sufficient		1		
55	Telecom infrastructure is in place and maintainable	27	Foreign investment suffices		1		
55	Telecom infrastructure is in place and maintainable	145	Intervention telecom		1		
56	Tourism industry is robust	23	Energy supply and distribution are sufficient		1		
56	Tourism industry is robust	27	Foreign investment suffices		1		
56	Tourism industry is robust	55	Telecom infrastructure is in place and maintainable		1		
56	Tourism industry is robust	57	Transportation infrastructure is in place		1		
56	Tourism industry is robust	70	Crime is not a problem		1		
56	Tourism industry is robust	149	No terrorists are operating		1		
57	Transportation infrastructure is in place	23	Energy supply and distribution are sufficient		1		
57	Transportation infrastructure is in place	27	Foreign investment suffices		1		
57	Transportation infrastructure is in place	55	Telecom infrastructure is in place and maintainable		1		
57	Transportation infrastructure is in place	146	Intervention transportation		1		
68	Drug crime is not a problem	65	Drug cultivation is not a problem		1		
68	Drug crime is not a problem	66	Drug manufacture is not a problem		1		
68	Drug crime is not a problem	67	Drug transshipment is not a problem		1		

Nd#	Node Name	From Node	From Node Name	From Val	Weight	Weight Is Variable	Value Is Multiplier
68	Drug crime is not a problem	72	Drug use is not a problem		1		
70	Crime is not a problem	68	Drug crime is not a problem		1		
70	Crime is not a problem	69	Organized crime is not a problem		1		
70	Crime is not a problem	73	Common crime is not a problem		1		
127	Intervention justice	234	Providing security for Stability activities				TRUE
128	Intervention agriculture	232	Providing security for HA activities				TRUE
129	Intervention central authority	234	Providing security for Stability activities				TRUE
130	Intervention LE corruption	234	Providing security for Stability activities				TRUE
131	Intervention critical industries	232	Providing security for HA activities				TRUE
132	Intervention displaced pop	232	Providing security for HA activities				TRUE
133	Intervention education	232	Providing security for HA activities				TRUE
134	Intervention energy	232	Providing security for HA activities				TRUE
135	Intervention financial	234	Providing security for Stability activities				TRUE
136	Intervention food	232	Providing security for HA activities				TRUE
136	Intervention food	217	Coordinating NGO activities				TRUE
137	Intervention investment	234	Providing security for Stability activities				TRUE
138	Intervention media	234	Providing security for Stability activities				TRUE
139	Intervention police	234	Providing security for Stability activities				TRUE
140	Intervention govt military	233	Providing security for PO activities				TRUE
141	Intervention health	232	Providing security for HA activities				TRUE
141	Intervention health	217	Coordinating NGO activities				TRUE
142	Intervention housing	232	Providing security for HA activities				TRUE
142	Intervention housing	217	Coordinating NGO activities				TRUE
143	Intervention water	232	Providing security for HA activities				TRUE
143	Intervention water	217	Coordinating NGO activities				TRUE
144	Intervention social services	234	Providing security for Stability activities				TRUE
145	Intervention telecom	232	Providing security for HA activities				TRUE
146	Intervention transportation	232	Providing security for HA activities				TRUE
147	Intervention jobs	232	Providing security for HA activities				TRUE
224	Intervention transition	234	Providing security for Stability activities				TRUE
225	Intervention social services corruption	234	Providing security for Stability activities				TRUE
226	Intervention policing	234	Providing security for Stability activities				TRUE
227	Intervention govt corruption	234	Providing security for Stability activities				TRUE
228	Intervention demobilization	233	Providing security for PO activities				TRUE
229	Intervention military retraining	233	Providing security for PO activities				TRUE
230	Intervention peace operations	233	Providing security for PO activities				TRUE
231	Intervention natural resources	232	Providing security for HA activities				TRUE
232	Providing security for HA activities	235	Providing force security				TRUE
233	Providing security for PO activities	235	Providing force security				TRUE
234	Providing security for Stability activities	235	Providing force security				TRUE
238	Intervention health infrastructure	232	Providing security for HA activities				TRUE
238	Intervention health infrastructure	217	Coordinating NGO activities				TRUE

Table 14-2 lists the nodes that pass data to other nodes (To Nodes) and the parameters (Inflate and Center) used to transform the node values into the values that are actually passed to each To Node. A few of the transformations use variable inflation parameters (Inflate Is Variable = TRUE). These transformations correspond to the variable and reversible connections described in Sections 6.2.2.3 and 6.2.12.

To use this table, use the From Node of interest in Table 14-1 as the Nd# in Table 14-2 and the Nd# in Table 14-1 as the To Node in Table 14-2. For example, if you are examining node number 18 in Table 14-1 and discover that it has node number 1 as a From Node, you will find this pairing as the first row in Table 14-2. There you will find that the value of node number 1 is multiplied by 1.5 and added to zero, before being passed to node number 18. (Note that a different value is passed from node number 1 to node number 42.) The import of this is that despite the initial view that all of the inputs (From Nodes) of node number 18 are equally weighted, it is the modified variables that are equally weighted. The difference is important.

Table 14-2. Main To Nodes

Nd#	Node Name	To Node	To Node Name	Inflate	Center	Inflate Is Variable
1	Acceptable jobs are available	18	Displaced population decreases	1.5	0	
1	Acceptable jobs are available	42	People are tolerant of the status quo	1	-0.5	
2	Administration of justice is effective and fair	37	Institutions of governance are effective and fair	2	0	
2	Administration of justice is effective and fair	52	Safe and secure environment is perceived	1.5	0	
3	Agricultural system is productive	10	Commercial sector contributes to national welfare	1	0	
3	Agricultural system is productive	26	Food is sufficient	1.5	0	
4	Armed forces are well structured	16	Demobilized armed forces are integrated into society	1	0	
4	Armed forces are well structured	31	Government-run military is effective	1	-0.25	
5	Basic natural resource management is in place	3	Agricultural system is productive	1.5	0	
5	Basic natural resource management is in place	48	Potable water is sufficient	1.5	0	
6	Central authority is effective	37	Institutions of governance are effective and fair	1	0	
7	Changes in population composition improve outlook	42	People are tolerant of the status quo	0.8	0	
8	Civil (internal) unrest is not present	9	Civil stability and durable peace exists	1	0	
8	Civil (internal) unrest is not present	52	Safe and secure environment is perceived	1.5	1	
10	Commercial sector contributes to national welfare	1	Acceptable jobs are available	2	0	
10	Commercial sector contributes to national welfare	19	Economy is sound	2	-0.5	
11	Competing groups resolve differences	8	Civil (internal) unrest is not present	2	0	
11	Competing groups resolve differences	40	Opposition party doesn't attempt to dominate by force	1.5	-0.25	
11	Competing groups resolve differences	51	Regime-sponsored, non-military armed forces are demobilized	0.5	-0.25	
11	Competing groups resolve differences	52	Safe and secure environment is perceived	1	0	
12	Corruption in central authority is not rampant	6	Central authority is effective	1	0	
12	Corruption in central authority is not rampant	2	Administration of justice is effective and fair	1	0	
13	Corruption in law enforcement is not rampant	2	Administration of justice is effective and fair	1.5	0	
13	Corruption in law enforcement is not rampant	22	Efficient markets are in place	0.25	0	
13	Corruption in law enforcement is not rampant	30	Government police force is effective against crime	2	0	
14	Corruption in social services is not rampant	32	Health infrastructure is adequate	1	0	
14	Corruption in social services is not rampant	53	Social services are adequate	1.5	0	
15	Critical industries are sound	1	Acceptable jobs are available	2	0	
15	Critical industries are sound	10	Commercial sector contributes to national welfare	1.5	0	
16	Demobilized armed forces are integrated into society	8	Civil (internal) unrest is not present	1	0	
17	Disarmament is effective	8	Civil (internal) unrest is not present	1.5	-0.5	
18	Displaced population decreases	32	Health infrastructure is adequate	1.5	0	
18	Displaced population decreases	7	Changes in population composition	1	0	TRUE

Nd#	Node Name	To Node	To Node Name	Inflate	Center	Inflate Is Variable
			improve outlook			
19	Economy is sound	1	Acceptable jobs are available	1.5	0	
19	Economy is sound	9	Civil stability and durable peace exists	1	0	
19	Economy is sound	34	Housing stock is sufficient	1.5	0	
19	Economy is sound	36	Immediate needs of the people are satisfied	1.5	0	
19	Economy is sound	39	Migrants leave country	0.4	-0.5	
19	Economy is sound	42	People are tolerant of the status quo	1	0	
20	Education infrastructure suffices	42	People are tolerant of the status quo	0.8	0	
20	Education infrastructure suffices	52	Safe and secure environment is perceived	0.8	0	
21	Educational system is tailored toward jobs	1	Acceptable jobs are available	2	0.5	
22	Efficient markets are in place	19	Economy is sound	1.5	0	
22	Efficient markets are in place	26	Food is sufficient	1.5	0.5	
23	Energy supply and distribution are sufficient	3	Agricultural system is productive	1	0	
23	Energy supply and distribution are sufficient	15	Critical industries are sound	1.5	0	
23	Energy supply and distribution are sufficient	32	Health infrastructure is adequate	1	0	
23	Energy supply and distribution are sufficient	47	Population is free to move	0.5	0	
23	Energy supply and distribution are sufficient	55	Telecom infrastructure is in place and maintainable	1.5	0	
23	Energy supply and distribution are sufficient	56	Tourism industry is robust	1.5	0	
23	Energy supply and distribution are sufficient	57	Transportation infrastructure is in place	0.8	0.5	
23	Energy supply and distribution are sufficient	48	Potable water is sufficient	0.8	0	
24	Expatriates return to country	7	Changes in population composition improve outlook	0.8	0	TRUE
24	Expatriates return to country	10	Commercial sector contributes to national welfare	0.8	0	TRUE
24	Expatriates return to country	29	Government has domestic legitimacy	1	0	TRUE
24	Expatriates return to country	41	Paramilitary forces are not present	0.5	0	TRUE
24	Expatriates return to country	46	Population is not forced to move	0.25	0	TRUE
24	Expatriates return to country	52	Safe and secure environment is perceived	0.5	0.5	TRUE
25	Financial system is sufficient	1	Acceptable jobs are available	1.5	0	
25	Financial system is sufficient	3	Agricultural system is productive	1.5	0	
25	Financial system is sufficient	19	Economy is sound	2	0	
25	Financial system is sufficient	22	Efficient markets are in place	1.5	0	
26	Food is sufficient	33	Health requirements are met	1.5	-0.5	
26	Food is sufficient	36	Immediate needs of the people are satisfied	1	0	
26	Food is sufficient	46	Population is not forced to move	1	1	
27	Foreign investment suffices	3	Agricultural system is productive	1	0	
27	Foreign investment suffices	15	Critical industries are sound	2	0	
27	Foreign investment suffices	23	Energy supply and distribution are sufficient	1.5	0	
27	Foreign investment suffices	55	Telecom infrastructure is in place and maintainable	1.5	0.5	
27	Foreign investment suffices	56	Tourism industry is robust	1.5	0	
27	Foreign investment suffices	57	Transportation infrastructure is in place	1.5	0	
28	Domestic media is free	8	Civil (internal) unrest is not present	0.5	-0.5	TRUE
28	Domestic media is free	29	Government has domestic legitimacy	0.5	-0.5	
29	Government has domestic legitimacy	9	Civil stability and durable peace exists	1.5	0.5	
29	Government has domestic legitimacy	52	Safe and secure environment is perceived	1.5	0.5	
30	Government police force is effective against crime	2	Administration of justice is effective and fair	2	0	
30	Government police force is effective against crime	52	Safe and secure environment is perceived	2	0	
31	Government-run military is effective	37	Institutions of governance are effective and fair	1	0	
31	Government-run military is effective	40	Opposition party doesn't attempt to dominate by force	1.5	0	
31	Government-run military is effective	52	Safe and secure environment is perceived	1	0	
32	Health infrastructure is adequate	33	Health requirements are met	1.5	0.5	

Nd#	Node Name	To Node	To Node Name	Inflate	Center	Inflate Is Variable
33	Health requirements are met	36	Immediate needs of the people are satisfied	1	0	
34	Housing stock is sufficient	18	Displaced population decreases	0.8	0	
34	Housing stock is sufficient	36	Immediate needs of the people are satisfied	1	0	
34	Housing stock is sufficient	46	Population is not forced to move	1	1	
35	Human rights are protected	2	Administration of justice is effective and fair	1.5	-0.5	
35	Human rights are protected	42	People are tolerant of the status quo	1	-0.5	
36	Immediate needs of the people are satisfied	9	Civil stability and durable peace exists	1	0	
36	Immediate needs of the people are satisfied	42	People are tolerant of the status quo	2	1	
37	Institutions of governance are effective and fair	9	Civil stability and durable peace exists	2	0.5	
37	Institutions of governance are effective and fair	29	Government has domestic legitimacy	2	1	
37	Institutions of governance are effective and fair	53	Social services are adequate	1	0	
38	International media have open access to the reporting of events	8	Civil (internal) unrest is not present	0.5	0.5	
38	International media have open access to the reporting of events	29	Government has domestic legitimacy	0.5	0.5	
39	Migrants leave country	7	Changes in population composition improve outlook	1	0	TRUE
40	Opposition party doesn't attempt to dominate by force	8	Civil (internal) unrest is not present	2	-1	
41	Paramilitary forces are not present	8	Civil (internal) unrest is not present	1	-1	
41	Paramilitary forces are not present	16	Demobilized armed forces are integrated into society	1	-1	
41	Paramilitary forces are not present	17	Disarmament is effective	1.5	-1	
41	Paramilitary forces are not present	30	Government police force is effective against crime	0.75	-0.5	
41	Paramilitary forces are not present	31	Government-run military is effective	0.5	-0.5	
41	Paramilitary forces are not present	52	Safe and secure environment is perceived	1	-0.5	
41	Paramilitary forces are not present	46	Population is not forced to move	1	1	
42	People are tolerant of the status quo	9	Civil stability and durable peace exists	1.5	1	
43	People perceive that their interests are represented	29	Government has domestic legitimacy	2	0.5	
44	People's spiritual needs are met	42	People are tolerant of the status quo	0.25	0	TRUE
45	Police are distinct from the military	30	Government police force is effective against crime	0.8	0.5	
45	Police are distinct from the military	37	Institutions of governance are effective and fair	0.5	0	
46	Population is not forced to move	18	Displaced population decreases	0.25	1	
46	Population is not forced to move	39	Migrants leave country	0.25	1	
46	Population is not forced to move	42	People are tolerant of the status quo	1	0	
47	Population is free to move	7	Changes in population composition improve outlook	0.25	0	
47	Population is free to move	22	Efficient markets are in place	0.5	0	
47	Population is free to move	39	Migrants leave country	0.8	0	
48	Potable water is sufficient	33	Health requirements are met	1.5	0	
48	Potable water is sufficient	36	Immediate needs of the people are satisfied	1	0	
48	Potable water is sufficient	46	Population is not forced to move	1	1	
49	Prison structure is adequate	2	Administration of justice is effective and fair	0.8	0	
50	Property ownership issues are resolved	24	Expatriates return to country	1	-0.5	TRUE
50	Property ownership issues are resolved	36	Immediate needs of the people are satisfied	0.8	0	
51	Regime-sponsored, non-military armed forces are demobilized	8	Civil (internal) unrest is not present	1	0	
51	Regime-sponsored, non-military armed forces are demobilized	16	Demobilized armed forces are integrated into society	0.8	-0.25	
51	Regime-sponsored, non-military armed forces are demobilized	17	Disarmament is effective	1.5	0	
51	Regime-sponsored, non-military armed forces are demobilized	31	Government-run military is effective	1	0.5	
52	Safe and secure environment is perceived	9	Civil stability and durable peace exists	1.5	1	
53	Social services are adequate	29	Government has domestic legitimacy	0.8	0	
53	Social services are adequate	42	People are tolerant of the status quo	1	0	

Nd#	Node Name	To Node	To Node Name	Inflate	Center	Inflate Is Variable
54	Stress migration is not present	39	Migrants leave country	2	0	
54	Stress migration is not present	18	Displaced population decreases	2	0	
55	Telecom infrastructure is in place and maintainable	15	Critical industries are sound	0.5	0	
55	Telecom infrastructure is in place and maintainable	22	Efficient markets are in place	0.8	0	
55	Telecom infrastructure is in place and maintainable	56	Tourism industry is robust	1	0	
55	Telecom infrastructure is in place and maintainable	57	Transportation infrastructure is in place	1	0	
56	Tourism industry is robust	1	Acceptable jobs are available	1.5	0.5	
56	Tourism industry is robust	10	Commercial sector contributes to national welfare	1	0	
57	Transportation infrastructure is in place	3	Agricultural system is productive	2	0	
57	Transportation infrastructure is in place	15	Critical industries are sound	1.5	0	
57	Transportation infrastructure is in place	22	Efficient markets are in place	1	0	
57	Transportation infrastructure is in place	26	Food is sufficient	1.5	0	
57	Transportation infrastructure is in place	47	Population is free to move	2	0	
57	Transportation infrastructure is in place	56	Tourism industry is robust	2	0	
58	Water distribution infrastructure is sufficient	48	Potable water is sufficient	1.5	0	
59	Opposition party does not espouse force	40	Opposition party doesn't attempt to dominate by force	1.5	0	
60	There haven't been any paramilitary forces	41	Paramilitary forces are not present	1	0	
61	There haven't been any regime-sponsored, non-military armed forces	51	Regime-sponsored, non-military armed forces are demobilized	1	0	
62	There are no expatriates	24	Expatriates return to country	1	0	
63	There is no displaced population	18	Displaced population decreases	1	0	
64	There are no migrants	39	Migrants leave country	1	0	
65	Drug cultivation is not a problem	68	Drug crime is not a problem	1	-0.5	
65	Drug cultivation is not a problem	3	Agricultural system is productive	0.1	0	
66	Drug manufacture is not a problem	68	Drug crime is not a problem	1	-0.5	
67	Drug transshipment is not a problem	68	Drug crime is not a problem	1	-0.5	
68	Drug crime is not a problem	70	Crime is not a problem	1	0	
68	Drug crime is not a problem	12	Corruption in central authority is not rampant	1	0	
68	Drug crime is not a problem	13	Corruption in law enforcement is not rampant	1	0	
68	Drug crime is not a problem	41	Paramilitary forces are not present	1	0	
68	Drug crime is not a problem	46	Population is not forced to move	1	1	
69	Organized crime is not a problem	70	Crime is not a problem	1	0	
70	Crime is not a problem	2	Administration of justice is effective and fair	1	0	
70	Crime is not a problem	12	Corruption in central authority is not rampant	1	0	
70	Crime is not a problem	13	Corruption in law enforcement is not rampant	1	0	
70	Crime is not a problem	14	Corruption in social services is not rampant	1	0	
70	Crime is not a problem	10	Commercial sector contributes to national welfare	1	0.5	
70	Crime is not a problem	15	Critical industries are sound	1	0.5	
70	Crime is not a problem	22	Efficient markets are in place	1	0.5	
70	Crime is not a problem	25	Financial system is sufficient	1	0.5	
70	Crime is not a problem	56	Tourism industry is robust	1	0.5	
71	Financial system is solid	25	Financial system is sufficient	1	0	
72	Drug use is not a problem	68	Drug crime is not a problem	1	0	
73	Common crime is not a problem	70	Crime is not a problem	1	0	
74	There are no factional disputes	41	Paramilitary forces are not present	1	0	
74	There are no factional disputes	16	Demobilized armed forces are integrated into society	1	0	
74	There are no factional disputes	40	Opposition party doesn't attempt to dominate by force	1	-0.5	
74	There are no factional disputes	17	Disarmament is effective	1	-0.5	
121	Corruption in public office is not part of culture	13	Corruption in law enforcement is not rampant	1	0	

Nd#	Node Name	To Node	To Node Name	Inflate	Center	Inflate Is Variable
121	Corruption in public office is not part of culture	12	Corruption in central authority is not rampant	1	0	
121	Corruption in public office is not part of culture	14	Corruption in social services is not rampant	1	0	
122	Central government exists	6	Central authority is effective	1	0	
122	Central government exists	30	Government police force is effective against crime	1	0	
124	Foreign investment is available	27	Foreign investment suffices	1	0	
125	Government does not control domestic media's reporting of events	28	Domestic media is free	1	0	
126	Education infrastructure is adequate	20	Education infrastructure suffices	1	0	
127	Intervention justice	2	Administration of justice is effective and fair	1	0	
128	Intervention agriculture	3	Agricultural system is productive	1	0	
129	Intervention central authority	6	Central authority is effective	1	0	
130	Intervention LE corruption	13	Corruption in law enforcement is not rampant	1	0	
131	Intervention critical industries	15	Critical industries are sound	1	0	
132	Intervention displaced pop	18	Displaced population decreases	1	0	
133	Intervention education	20	Education infrastructure suffices	1	0	
134	Intervention energy	23	Energy supply and distribution are sufficient	1	0	
135	Intervention financial	25	Financial system is sufficient	1	0	
136	Intervention food	26	Food is sufficient	1	0	
137	Intervention investment	27	Foreign investment suffices	1	0	
138	Intervention media	28	Domestic media is free	1	0	
139	Intervention police	30	Government police force is effective against crime	1	0	
140	Intervention govt military	31	Government-run military is effective	1	0	
141	Intervention health	33	Health requirements are met	1	0	
142	Intervention housing	34	Housing stock is sufficient	1	0	
143	Intervention water	48	Potable water is sufficient	1	0	
144	Intervention social services	53	Social services are adequate	1	0	
145	Intervention telecom	55	Telecom infrastructure is in place and maintainable	1	0	
146	Intervention transportation	57	Transportation infrastructure is in place	1	0	
147	Intervention jobs	1	Acceptable jobs are available	1	0	
148	No insurgents are operating	51	Regime-sponsored, non-military armed forces are demobilized	1	-0.5	
148	No insurgents are operating	46	Population is not forced to move	1	0	
148	No insurgents are operating	24	Expatriates return to country	1	-0.5	
148	No insurgents are operating	40	Opposition party doesn't attempt to dominate by force	1	0	
148	No insurgents are operating	52	Safe and secure environment is perceived	1	-0.5	
149	No terrorists are operating	51	Regime-sponsored, non-military armed forces are demobilized	1	0	
149	No terrorists are operating	27	Foreign investment suffices	1	-0.5	
149	No terrorists are operating	56	Tourism industry is robust	1	-0.5	
149	No terrorists are operating	40	Opposition party doesn't attempt to dominate by force	1	0	
149	No terrorists are operating	52	Safe and secure environment is perceived	1	-0.5	
217	Coordinating NGO activities	136	Intervention food	1	0	
217	Coordinating NGO activities	141	Intervention health	1	0	
217	Coordinating NGO activities	238	Intervention health infrastructure	1	0	
217	Coordinating NGO activities	142	Intervention housing	1	0	
217	Coordinating NGO activities	143	Intervention water	1	0	
223	Intervention PR	42	People are tolerant of the status quo	1	0	
224	Intervention transition	29	Government has domestic legitimacy	1	0	
225	Intervention social services corruption	14	Corruption in social services is not rampant	1	0	
226	Intervention policing	2	Administration of justice is effective and fair	1	0	
226	Intervention policing	52	Safe and secure environment is perceived	1	0	
227	Intervention govt corruption	12	Corruption in central authority is not rampant	1	0	
228	Intervention demobilization	41	Paramilitary forces are not present	1	0	

Nd#	Node Name	To Node	To Node Name	Inflate	Center	Inflate Is Variable
228	Intervention demobilization	51	Regime-sponsored, non-military armed forces are demobilized	1	0	
229	Intervention military retraining	16	Demobilized armed forces are integrated into society	1	0	
230	Intervention peace operations	40	Opposition party doesn't attempt to dominate by force	1	0	
231	Intervention natural resources	3	Agricultural system is productive	1	0	
231	Intervention natural resources	48	Potable water is sufficient	1	0	
232	Providing security for HA activities	128	Intervention agriculture	1	0	
232	Providing security for HA activities	131	Intervention critical industries	1	0	
232	Providing security for HA activities	134	Intervention energy	1	0	
232	Providing security for HA activities	145	Intervention telecom	1	0	
232	Providing security for HA activities	146	Intervention transportation	1	0	
232	Providing security for HA activities	147	Intervention jobs	1	0	
232	Providing security for HA activities	231	Intervention natural resources	1	0	
232	Providing security for HA activities	133	Intervention education	1	0	
232	Providing security for HA activities	132	Intervention displaced pop	1	0	
232	Providing security for HA activities	136	Intervention food	1	0	
232	Providing security for HA activities	141	Intervention health	1	0	
232	Providing security for HA activities	238	Intervention health infrastructure	1	0	
232	Providing security for HA activities	142	Intervention housing	1	0	
232	Providing security for HA activities	143	Intervention water	1	0	
233	Providing security for PO activities	140	Intervention govt military	1	0	
233	Providing security for PO activities	230	Intervention peace operations	1	0	
233	Providing security for PO activities	229	Intervention military retraining	1	0	
233	Providing security for PO activities	228	Intervention demobilization	1	0	
234	Providing security for Stability activities	135	Intervention financial	1	0	
234	Providing security for Stability activities	137	Intervention investment	1	0	
234	Providing security for Stability activities	127	Intervention justice	1	0	
234	Providing security for Stability activities	129	Intervention central authority	1	0	
234	Providing security for Stability activities	130	Intervention LE corruption	1	0	
234	Providing security for Stability activities	139	Intervention police	1	0	
234	Providing security for Stability activities	144	Intervention social services	1	0	
234	Providing security for Stability activities	225	Intervention social services corruption	1	0	
234	Providing security for Stability activities	227	Intervention govt corruption	1	0	
234	Providing security for Stability activities	226	Intervention policing	1	0	
234	Providing security for Stability activities	224	Intervention transition	1	0	
234	Providing security for Stability activities	138	Intervention media	1	0	
235	Providing force security	232	Providing security for HA activities	1	0	
235	Providing force security	233	Providing security for PO activities	1	0	
235	Providing force security	234	Providing security for Stability activities	1	0	
236	Intervention negative PR	42	People are tolerant of the status quo	1	0	
238	Intervention health infrastructure	32	Health infrastructure is adequate	1	0	

Table 14-3 lists the parameters that define the connections among the external inputs and the intervention nodes. Note that two-part external inputs have both parts listed, with the divisor shown (Divisor Node = TRUE). The time delays that are shown are the standard ones, not the values you may have entered. The Weight value is somewhat complex. An external input may pass data to more than one intervention node and each row (other than divisor rows) will have a Weight value (see From Node 162 in the table). These weights are not used in differentiated the values passed to multiple interventions. They are used in weighting the contributions to a single intervention from multiple external inputs. Notice that From Nodes, 162, 163, and 164 all pass data to To Node 127 (Intervention justice). The weights are used in computing a weighted average that will represent the value for the intervention node.

A few of the external inputs pass their data uniquely to an intervention node. This node has the same name and number (Replicated To Node = TRUE).

The user may find Table 14-4 more generally useful. It is sorted by To Node (Postprocessor "inputs"). This allows the user to see which external inputs contribute to each one. However, it omits the divisor nodes and the Replicated To Nodes.

Table 14-3. Main External Node Connections

From Node	From Node Name	To Node	To Node Name	Time Delay	Weight	Replicated To Node	Divisor Node
150	Medical treatment	141	Intervention health	0	1		
150.1	Medical treatment	150	Medical treatment				TRUE
151	Food importation	136	Intervention food	7	1		
151.1	Food importation	151	Food importation				TRUE
152	Food distribution	136	Intervention food	0	1		
152.1	Food distribution	152	Food distribution				TRUE
153	Water distribution	143	Intervention water	0	1		
153.1	Water distribution	153	Water distribution				TRUE
154	Negotiating bureaucracies to get relief	144	Intervention social services	0	1		
154.1	Negotiating bureaucracies to get relief	154	Negotiating bureaucracies to get relief				TRUE
155	Resettlement processes	132	Intervention displaced pop	84	1		
155.1	Resettlement processes	155	Resettlement processes				TRUE
156	Providing temporary shelter/housing	142	Intervention housing	0	1		
156.1	Providing temporary shelter/housing	156	Providing temporary shelter/housing				TRUE
157	Buy local produce	128	Intervention agriculture	0	1		
157	Buy local produce	147	Intervention jobs	0	0.75		
157.1	Buy local produce	157	Buy local produce				TRUE
158	Support new planting	128	Intervention agriculture	168	1		
158	Support new planting	147	Intervention jobs	0	0.75		
158.1	Support new planting	158	Support new planting				TRUE
159	Education facilities	133	Intervention education	42	1		
159.1	Education facilities	159	Education facilities				TRUE
160	Education supplies	133	Intervention education	42	0.5		
160.1	Education supplies	160	Education supplies				TRUE
161	Train teachers	133	Intervention education	42	1		
161	Train teachers	147	Intervention jobs	0	0.75		
161.1	Train teachers	161	Train teachers				TRUE
162	Create local governments	127	Intervention justice	28	1		
162	Create local governments	129	Intervention central authority	42	1		
162	Create local governments	144	Intervention social services	84	1		
162.1	Create local governments	162	Create local governments				TRUE
163	Educate local governments	127	Intervention justice	0	1		
163	Educate local governments	129	Intervention central authority	14	1		
163	Educate local governments	144	Intervention social services	84	1		
163.1	Educate local governments	163	Educate local governments				TRUE
164	Supply local governments	127	Intervention justice	0	0.5		
164	Supply local governments	129	Intervention central authority	0	0.5		
164	Supply local governments	144	Intervention social services	0	0.5		
164.1	Supply local governments	164	Supply local governments				TRUE
165	Train police forces	139	Intervention police	28	1		
165	Train police forces	130	Intervention LE corruption	28	1		
165	Train police forces	147	Intervention jobs	0	1		
165.1	Train police forces	165	Train police forces				TRUE
166	Train military forces	140	Intervention govt military	28	1		
166	Train military forces	147	Intervention jobs	0	1		
166.1	Train military forces	166	Train military forces				TRUE
167	Electricity production plants	134	Intervention energy	28	1		
167	Electricity production plants	147	Intervention jobs	0	0.75		
167	Electricity production plants	137	Intervention investment	0	1		
167.1	Electricity production plants	167	Electricity production plants				TRUE
168	Electricity distribution	134	Intervention energy	28	1		
168	Electricity distribution	147	Intervention jobs	0	0.75		
168	Electricity distribution	137	Intervention investment	0	1		
168.1	Electricity distribution	168	Electricity distribution				TRUE

From Node	From Node Name	To Node	To Node Name	Time Delay	Weight	Replicated To Node	Divisor Node
169	Rebuild roads	146	Intervention transportation	42	1		
169	Rebuild roads	147	Intervention jobs	0	0.75		
169	Rebuild roads	137	Intervention investment	0	1		
169.1	Rebuild roads	169	Rebuild roads				TRUE
170	Rebuild bridges	146	Intervention transportation	42	1		
170	Rebuild bridges	147	Intervention jobs	0	0.75		
170	Rebuild bridges	137	Intervention investment	0	1		
170.1	Rebuild bridges	170	Rebuild bridges				TRUE
171	Rebuild airports	146	Intervention transportation	49	1		
171	Rebuild airports	147	Intervention jobs	0	0.75		
171	Rebuild airports	137	Intervention investment	0	1		
171.1	Rebuild airports	171	Rebuild airports				TRUE
172	Rebuild seaports	146	Intervention transportation	49	1		
172	Rebuild seaports	147	Intervention jobs	0	0.75		
172	Rebuild seaports	137	Intervention investment	0	1		
172.1	Rebuild seaports	172	Rebuild seaports				TRUE
173	Rebuild oil production	134	Intervention energy	28	1		
173	Rebuild oil production	147	Intervention jobs	0	0.75		
173	Rebuild oil production	137	Intervention investment	0	1		
173.1	Rebuild oil production	173	Rebuild oil production				TRUE
174	Rebuild oil pipelines	134	Intervention energy	28	1		
174	Rebuild oil pipelines	147	Intervention jobs	0	0.75		
174	Rebuild oil pipelines	137	Intervention investment	0	1		
174.1	Rebuild oil pipelines	174	Rebuild oil pipelines				TRUE
175	Rebuild water lines	143	Intervention water	84	1		
175	Rebuild water lines	128	Intervention agriculture	84	1		
175	Rebuild water lines	147	Intervention jobs	0	0.75		
175	Rebuild water lines	137	Intervention investment	0	1		
175.1	Rebuild water lines	175	Rebuild water lines				TRUE
176	Rebuild water & sewage treatment facilities	143	Intervention water	84	1		
176	Rebuild water & sewage treatment facilities	141	Intervention health	84	1		
176	Rebuild water & sewage treatment facilities	147	Intervention jobs	0	0.75		
176	Rebuild water & sewage treatment facilities	137	Intervention investment	0	1		
176.1	Rebuild water & sewage treatment facilities	176	Rebuild water & sewage treatment facilities				TRUE
177	Rebuild telecommunications	145	Intervention telecom	84	1		
177	Rebuild telecommunications	147	Intervention jobs	0	0.75		
177	Rebuild telecommunications	138	Intervention media	14	1		
177.1	Rebuild telecommunications	177	Rebuild telecommunications				TRUE
178	New currency	135	Intervention financial	84	1		
179	Interbanks payment system	135	Intervention financial	7	1		
180	Targeted privatization	131	Intervention critical industries	168	1		
180.1	Targeted privatization	180	Targeted privatization				TRUE
181	Development of microfinance systems	135	Intervention financial	0	1		
181.1	Development of microfinance systems	181	Development of microfinance systems				TRUE
182	Commercial law to improve investment	137	Intervention investment	364	1		
183	Public works programs to generate jobs	147	Intervention jobs	0	1		
183.1	Public works programs to generate jobs	183	Public works programs to generate jobs				TRUE
184	Insurance system	135	Intervention financial	168	1		
185	Mediating & negotiating w/ conflicting parties	230	Intervention peace operations	84	1		
185.1	Mediating & negotiating w/ conflicting parties	185	Mediating & negotiating w/ conflicting parties				TRUE
186	Establishing demilitarized zones, sanctions, and arms embargoes	230	Intervention peace operations	14	1		
186.1	Establishing demilitarized zones,	186	Establishing demilitarized zones,				TRUE

From Node	From Node Name	To Node	To Node Name	Time Delay	Weight	Replicated To Node	Divisor Node
	sanctions, and arms embargoes		sanctions, and arms embargoes				
187	Maintaining compliance with peace accord milestones & conditions	230	Intervention peace operations	28	1		
187.1	Maintaining compliance with peace accord milestones & conditions	187	Maintaining compliance with peace accord milestones & conditions				TRUE
188	Implementing weapons control regimes	230	Intervention peace operations	28	1		
188.1	Implementing weapons control regimes	188	Implementing weapons control regimes				TRUE
189	Demobilizing, reducing, or reintegrating military & paramilitary units	228	Intervention demobilization	84	1		
189.1	Demobilizing, reducing, or reintegrating military & paramilitary units	189	Demobilizing, reducing, or reintegrating military & paramilitary units				TRUE
190	Providing job training and employment for discharged military personnel	229	Intervention military retraining	84	1		
190.1	Providing job training and employment for discharged military personnel	190	Providing job training and employment for discharged military personnel				TRUE
191	Establishing observer missions & interposing forces	230	Intervention peace operations	7	1		
191.1	Establishing observer missions & interposing forces	191	Establishing observer missions & interposing forces				TRUE
192	Reforming government economic policy	135	Intervention financial	168	1		
192	Reforming government economic policy	137	Intervention investment	84	1		
193	Assisting in economic integration & cooperation	135	Intervention financial	364	1		
193	Assisting in economic integration & cooperation	137	Intervention investment	84	1		
194	Managing natural resources	231	Intervention natural resources	28	1		
194.1	Managing natural resources	194	Managing natural resources				TRUE
195	Seeking investment capital	137	Intervention investment	84	1		
195.1	Seeking investment capital	195	Seeking investment capital				TRUE
196	Energy importation	134	Intervention energy	28	1		
196.1	Energy importation	196	Energy importation				TRUE
197	Conducting war crimes investigations, tribunals, etc.	140	Intervention govt military	728	1		
197	Conducting war crimes investigations, tribunals, etc.	227	Intervention govt corruption	168	1		
197.1	Conducting war crimes investigations, tribunals, etc.	197	Conducting war crimes investigations, tribunals, etc.				TRUE
198	Conducting constabulary operations	226	Intervention policing	14	1		
198.1	Conducting constabulary operations	198	Conducting constabulary operations				TRUE
199	Establishing, staffing & funding effective transition national govt	129	Intervention central authority	28	1		
199	Establishing, staffing & funding effective transition national govt	224	Intervention transition	28	1		
200	Establishing a mechanism for constitutional reform	129	Intervention central authority	28	1		
200	Establishing a mechanism for constitutional reform	224	Intervention transition	28	1		
201	Conducting nationwide elections	129	Intervention central authority	42	1		
201	Conducting nationwide elections	224	Intervention transition	42	1		
201.1	Conducting nationwide elections	201	Conducting nationwide elections				TRUE
202	Training newly elected national political leaders	129	Intervention central authority	14	1		
202	Training newly elected national political leaders	224	Intervention transition	14	1		

From Node	From Node Name	To Node	To Node Name	Time Delay	Weight	Replicated To Node	Divisor Node
202.1	Training newly elected national political leaders	202	Training newly elected national political leaders				TRUE
203	Providing advisors to national govt officials	129	Intervention central authority	0	1		
203	Providing advisors to national govt officials	224	Intervention transition	0	1		
203.1	Providing advisors to national govt officials	203	Providing advisors to national govt officials				TRUE
204	Monitoring and reporting on corruption by govt officials	130	Intervention LE corruption	28	1		
204	Monitoring and reporting on corruption by govt officials	227	Intervention govt corruption	168	1		
204	Monitoring and reporting on corruption by govt officials	225	Intervention social services corruption	168	1		
204.1	Monitoring and reporting on corruption by govt officials	204	Monitoring and reporting on corruption by govt officials				TRUE
205	Transferring control of government functions to host nation officials	129	Intervention central authority	0	1		
205	Transferring control of government functions to host nation officials	224	Intervention transition	0	1		
206	Monitoring government powersharing arrangements	129	Intervention central authority	0	1		
206	Monitoring government powersharing arrangements	224	Intervention transition	0	1		
206.1	Monitoring government powersharing arrangements	206	Monitoring government powersharing arrangements				TRUE
207	(Re)building & monitoring new police force	139	Intervention police	42	1		
207.1	(Re)building & monitoring new police force	207	(Re)building & monitoring new police force				TRUE
208	Providing advisors to police & criminal justice organizations & supporting establishment of operations	139	Intervention police	28	0.25		
208.1	Providing advisors to police & criminal justice organizations & supporting establishment of operations	208	Providing advisors to police & criminal justice organizations & supporting establishment of operations				TRUE
209	Creating or reforming & monitoring military	140	Intervention govt military	42	1		
209.1	Creating or reforming & monitoring military	209	Creating or reforming & monitoring military				TRUE
210	Assisting in establishing humane penal systems	127	Intervention justice	168	1		
210.1	Assisting in establishing humane penal systems	210	Assisting in establishing humane penal systems				TRUE
211	Assisting in establishing/reforming legitimate legal system	127	Intervention justice	364	1		
212	Monitoring human rights practices	127	Intervention justice	28	1		
212.1	Monitoring human rights practices	212	Monitoring human rights practices				TRUE
213	Conducting benign public information operations	223	Intervention PR	7	0.8		
214	Promoting civic education	138	Intervention media	28	1		
214.1	Promoting civic education	214	Promoting civic education				TRUE
215	Sponsoring journalist training & professionalization	138	Intervention media	14	1		
215.1	Sponsoring journalist training & professionalization	215	Sponsoring journalist training & professionalization				TRUE
216	Reducing likelihood of population movements	132	Intervention displaced pop	7	1		
217	Coordinating NGO activities	217	Coordinating NGO activities	7	1	TRUE	

From Node	From Node Name	To Node	To Node Name	Time Delay	Weight	Replicated To Node	Divisor Node
218	Prepositioning humanitarian relief stocks	141	Intervention health	0	1		
218	Prepositioning humanitarian relief stocks	143	Intervention water	0	1		
218	Prepositioning humanitarian relief stocks	136	Intervention food	0	1		
218	Prepositioning humanitarian relief stocks	142	Intervention housing	0	1		
218.1	Prepositioning humanitarian relief stocks	218	Prepositioning humanitarian relief stocks				TRUE
219	Establishing confidence-building and security measures	129	Intervention central authority	7	1		
219	Establishing confidence-building and security measures	140	Intervention govt military	7	1		
219	Establishing confidence-building and security measures	230	Intervention peace operations	7	1		
219.1	Establishing confidence-building and security measures	219	Establishing confidence-building and security measures				TRUE
220	Providing security assistance to the host nation	129	Intervention central authority	28	1		
220	Providing security assistance to the host nation	140	Intervention govt military	28	1		
220.1	Providing security assistance to the host nation	220	Providing security assistance to the host nation				TRUE
221	Safeguarding institutions of governance and key officials	129	Intervention central authority	0	1		
221.1	Safeguarding institutions of governance and key officials	221	Safeguarding institutions of governance and key officials				TRUE
222	Negative impact of intervention (rapes, etc.)	236	Intervention negative PR	0	1		
232	Providing security for HA activities	232	Providing security for HA activities	0	1	TRUE	
233	Providing security for PO activities	233	Providing security for PO activities	0	1	TRUE	
234	Providing security for Stability activities	234	Providing security for Stability activities	0	1	TRUE	
235	Providing force security	235	Providing force security	0	1	TRUE	
237	Health infrastructure repair	238	Intervention health infrastructure	56	1		
237	Health infrastructure repair	141	Intervention health	56	1		
237	Health infrastructure repair	147	Intervention jobs	0	0.75		
237	Health infrastructure repair	137	Intervention investment	0	1		
237.1	Health infrastructure repair	237	Health infrastructure repair				TRUE
239	Rebuild railroads	146	Intervention transportation	392	1		
239	Rebuild railroads	147	Intervention jobs	0	0.75		
239	Rebuild railroads	137	Intervention investment	0	1		
239.1	Rebuild railroads	239	Rebuild railroads				TRUE

Table 14-4 repeats most of the data from Table 14-3; however, it is sorted by To Node, rather than From Node. This permits a direct comparison of the Weights for each From Node that contribute to each To Node. This order also permits a direct comparison of the differing Time Delays for each contributing From Node. However, because the Divisor nodes are connected to their To Nodes only through their base nodes, they cannot be shown in this table. The Replicated To Nodes are also omitted, as they have the same names and numbers as To Nodes and as From Nodes.

Table 14-4. Main External Node Connections Sorted by To Node

From Node	From Node Name	To Node	To Node Name	Time Delay	Weight
162	Create local governments	127	Intervention justice	28	1
163	Educate local governments	127	Intervention justice	0	1
164	Supply local governments	127	Intervention justice	0	0.5
210	Assisting in establishing humane penal systems	127	Intervention justice	168	1

From Node	From Node Name	To Node	To Node Name	Time Delay	Weight
211	Assisting in establishing/reforming legitimate legal system	127	Intervention justice	364	1
212	Monitoring human rights practices	127	Intervention justice	28	1
157	Buy local produce	128	Intervention agriculture	0	1
158	Support new planting	128	Intervention agriculture	168	1
175	Rebuild water lines	128	Intervention agriculture	84	1
162	Create local governments	129	Intervention central authority	42	1
163	Educate local governments	129	Intervention central authority	14	1
164	Supply local governments	129	Intervention central authority	0	0.5
199	Establishing, staffing & funding effective transition national govt	129	Intervention central authority	28	1
200	Establishing a mechanism for constitutional reform	129	Intervention central authority	28	1
201	Conducting nationwide elections	129	Intervention central authority	42	1
202	Training newly elected national political leaders	129	Intervention central authority	14	1
203	Providing advisors to national govt officials	129	Intervention central authority	0	1
205	Transferring control of government functions to host nation officials	129	Intervention central authority	0	1
206	Monitoring government powersharing arrangements	129	Intervention central authority	0	1
219	Establishing confidence-building and security measures	129	Intervention central authority	7	1
220	Providing security assistance to the host nation	129	Intervention central authority	28	1
221	Safeguarding institutions of governance and key officials	129	Intervention central authority	0	1
165	Train police forces	130	Intervention LE corruption	28	1
204	Monitoring and reporting on corruption by govt officials	130	Intervention LE corruption	28	1
180	Targeted privatization	131	Intervention critical industries	168	1
155	Resettlement processes	132	Intervention displaced pop	84	1
216	Reducing likelihood of population movements	132	Intervention displaced pop	7	1
159	Education facilities	133	Intervention education	42	1
160	Education supplies	133	Intervention education	42	0.5
161	Train teachers	133	Intervention education	42	1
167	Electricity production plants	134	Intervention energy	28	1
168	Electricity distribution	134	Intervention energy	28	1
173	Rebuild oil production	134	Intervention energy	28	1
174	Rebuild oil pipelines	134	Intervention energy	28	1
196	Energy importation	134	Intervention energy	28	1
178	New currency	135	Intervention financial	84	1
179	Interbanks payment system	135	Intervention financial	7	1
181	Development of microfinance systems	135	Intervention financial	0	1
184	Insurance system	135	Intervention financial	168	1
192	Reforming government economic policy	135	Intervention financial	168	1
193	Assisting in economic integration & cooperation	135	Intervention financial	364	1
151	Food importation	136	Intervention food	7	1
152	Food distribution	136	Intervention food	0	1
218	Prepositioning humanitarian relief stocks	136	Intervention food	0	1
167	Electricity production plants	137	Intervention investment	0	1
168	Electricity distribution	137	Intervention investment	0	1
169	Rebuild roads	137	Intervention investment	0	1
170	Rebuild bridges	137	Intervention investment	0	1
171	Rebuild airports	137	Intervention investment	0	1
172	Rebuild seaports	137	Intervention investment	0	1
173	Rebuild oil production	137	Intervention investment	0	1
174	Rebuild oil pipelines	137	Intervention investment	0	1
175	Rebuild water lines	137	Intervention investment	0	1
176	Rebuild water & sewage treatment facilities	137	Intervention investment	0	1
182	Commercial law to improve investment	137	Intervention investment	364	1
192	Reforming government economic policy	137	Intervention investment	84	1
193	Assisting in economic integration & cooperation	137	Intervention investment	84	1
195	Seeking investment capital	137	Intervention investment	84	1

From Node	From Node Name	To Node	To Node Name	Time Delay	Weight
237	Health infrastructure repair	137	Intervention investment	0	1
239	Rebuild railroads	137	Intervention investment	0	1
177	Rebuild telecommunications	138	Intervention media	14	1
214	Promoting civic education	138	Intervention media	28	1
215	Sponsoring journalist training & professionalization	138	Intervention media	14	1
165	Train police forces	139	Intervention police	28	1
207	(Re)building & monitoring new police force	139	Intervention police	42	1
208	Providing advisors to police & criminal justice organizations & supporting establishment of operations	139	Intervention police	28	0.25
166	Train military forces	140	Intervention govt military	28	1
197	Conducting war crimes investigations, tribunals, etc.	140	Intervention govt military	728	1
209	Creating or reforming & monitoring military	140	Intervention govt military	42	1
219	Establishing confidence-building and security measures	140	Intervention govt military	7	1
220	Providing security assistance to the host nation	140	Intervention govt military	28	1
150	Medical treatment	141	Intervention health	0	1
176	Rebuild water & sewage treatment facilities	141	Intervention health	84	1
218	Prepositioning humanitarian relief stocks	141	Intervention health	0	1
237	Health infrastructure repair	141	Intervention health	56	1
156	Providing temporary shelter/housing	142	Intervention housing	0	1
218	Prepositioning humanitarian relief stocks	142	Intervention housing	0	1
153	Water distribution	143	Intervention water	0	1
175	Rebuild water lines	143	Intervention water	84	1
176	Rebuild water & sewage treatment facilities	143	Intervention water	84	1
218	Prepositioning humanitarian relief stocks	143	Intervention water	0	1
154	Negotiating bureaucracies to get relief	144	Intervention social services	0	1
162	Create local governments	144	Intervention social services	84	1
163	Educate local governments	144	Intervention social services	84	1
164	Supply local governments	144	Intervention social services	0	0.5
177	Rebuild telecommunications	145	Intervention telecom	84	1
169	Rebuild roads	146	Intervention transportation	42	1
170	Rebuild bridges	146	Intervention transportation	42	1
171	Rebuild airports	146	Intervention transportation	49	1
172	Rebuild seaports	146	Intervention transportation	49	1
239	Rebuild railroads	146	Intervention transportation	392	1
157	Buy local produce	147	Intervention jobs	0	0.75
158	Support new planting	147	Intervention jobs	0	0.75
161	Train teachers	147	Intervention jobs	0	0.75
165	Train police forces	147	Intervention jobs	0	1
166	Train military forces	147	Intervention jobs	0	1
167	Electricity production plants	147	Intervention jobs	0	0.75
168	Electricity distribution	147	Intervention jobs	0	0.75
169	Rebuild roads	147	Intervention jobs	0	0.75
170	Rebuild bridges	147	Intervention jobs	0	0.75
171	Rebuild airports	147	Intervention jobs	0	0.75
172	Rebuild seaports	147	Intervention jobs	0	0.75
173	Rebuild oil production	147	Intervention jobs	0	0.75
174	Rebuild oil pipelines	147	Intervention jobs	0	0.75
175	Rebuild water lines	147	Intervention jobs	0	0.75
176	Rebuild water & sewage treatment facilities	147	Intervention jobs	0	0.75
177	Rebuild telecommunications	147	Intervention jobs	0	0.75
183	Public works programs to generate jobs	147	Intervention jobs	0	1
237	Health infrastructure repair	147	Intervention jobs	0	0.75
239	Rebuild railroads	147	Intervention jobs	0	0.75

15. CREATING POSTPROCESSOR V4.0 CUSTOM LOGIC

There are five steps that you will need to perform to set up your logic. The steps may be collected into four groups: preparation, logic node implementation, output implementation, and checking. It is likely that you will find yourself iterating through these groups and their steps. It will probably be easiest to start with a single desired output and create its entire logic before proceeding to another output's logic. You should pick one that you suspect will have no commonalities with any other output's logic. Once you are familiar with the process, you may find it easier to group the outputs that might have common elements, either in their inputs or in some intermediate results. **You should save your work regularly, using the Save control on the Controls sheet of the ISSM Controller.**

Preparation consists of two steps, discussed in Sections 15.1 and 15.2. In the first step of preparation, you design the logic you will be implementing. In the second step, you will register the node numbers that you will use, together with the node names and other pertinent information. See Table 15-1 for restrictions on the node numbers that may be used in the Postprocessor.

Table 15-1. Node Range Restrictions

Program and type	Node Range	Subtype
ISSM Main Input (internal & external)	1-999	Program Defined Inputs
Preprocessor Input	1001-1100	Program Defined Expert Input
Preprocessor Input	1101-1400	Custom Input
Preprocessor Input	1401-1500	Diamond Input
Preprocessor Middle Node	1501-1900	Custom Middle Node
Preprocessor Middle Node	1901-1999	Diamond Middle Node
Postprocessor Output	2001-2400	Custom Output
Postprocessor Output	2401-2500	Standard Output
Postprocessor MOMs	2501-2900	Custom MOMs
Postprocessor MOMs	2901-2999	Standard MOMs

Logic node implementation consists of one step, which is discussed in Sections 15.3.

Output implementation consists of one step, discussed in Section 15.4. In output implementation, you prepare the ScenarioHistory to record the results of your logic for each dated entry.

Checking also consists of one step, discussed in Section 15.5. Checking your logic is difficult; however, it is critical to insure that the Postprocessor produces the results that you mean for it to produce.

Once you are finished with an iteration, you should review the entire set of logic for that iteration and make sure that your diagram reflects any changes you may have made before proceeding to another iteration. Once you are through with all of the iterations, you should review the entire set of logic. At this point you may use the Save Data and Logic control of the Controller workbook to make final checks of your logic and produce an automated logic diagram. You should make sure that all connections reflect what you have implemented because it is likely that you will want to make changes, such as adding inputs later. Having an up-to-date set of diagrams will make these changes much simpler.

15.1 DESIGNING THE LOGIC

The first step is to draw a picture of the desired logic. You may use paper and pencil or any drawing program with which you are comfortable. You will need this to make sure that you have performed all of the steps needed to connect the logic correctly within the Postprocessor. Label each node in the drawing with the name of the node.

Once you are satisfied with the logic drawing, you will need to create node numbers. As listed in Table 15-1, there are restrictions on the numbers that you may use. Custom nodes (the ones you create) should be in the range of 2001 to 2400. You will see some nodes in the range 2401 to 2500 that have already been created. These are Standard nodes that serve as examples and have been found to be useful in the past. Nodes in the range 2001 to 2500 are also referred to as Post-Intermediate nodes. You may use numbers in the range of 2501 to 2900 for your Custom Measure of Merit (MOM) nodes, although this is not required. You will also see some nodes in the range 2901 to 3000 that have already been created. These are the Standard MOM nodes.

15.2 CREATING THE CONSTANTS ENTRIES

When you create a node number, you must enter it on the Constants sheet. If you are building a scenario from a pre-existing scenario or sample, you may simply type your names and other entries over the values for pre-existing nodes, except where there are formulas. Leave the formulas as is. Keep your node numbers in ascending sequence. You may insert rows, using the Excel insert row function as needed; however, remember to copy the formulas, as described below.

Figure 15-1 shows the left hand side of the Constants sheet, where the input nodes begin. As shown, the node numbers are entered into column A. Enter the text you desire to be shown for the node name in column B. Enter "Post-Intermed" or "MOM" (for your outputs) in the Group column and the appropriate sector in its column. Leave the Note column blank or add notes to yourself. The Influence notes column is for information only and is only used for nodes in the Main ISSM that are From Nodes in the pairs of Special Factors with reversible and variable inflation values. You will not be using any of the columns headed by -3 to +3 in the Postprocessor.

Nd#	**NODE Name**	**Group**	**Sector**	**Note**	**Influence notes**	**-3**
238	Intervention health infrastructure	Intervention	Needs			
2001	Factor1	Post-Intermed	Economy			
2401	Economic Infrastructure is good	Post-Intermed	Economy			
2402	Economic sectors are good	Post-Intermed	Economy			
2403	Money is sound	Post-Intermed	Economy			
2404	Industry is in good shape	Post-Intermed	Economy			
2501	Factor2	MOM	Economy			
2901	Economy is sound (alternate)	MOM	Economy			
2902	Economy is sound (combined)	MOM	Economy			
Insert rows before here						

Figure 15-1. Left part of the Postprocessor Constants sheet

However, you will be using the two right-most columns, as shown in Figure 15-2.

			Node	Node
Nd#	NODE Name	3	Row	End Row
238	Intervention health infrastructure		#N/A	#N/A
2001	Factor1		64	70
2401	Economic Infrastructure is good		6	12
2402	Economic sectors are good		13	19
2403	Money is sound		20	42
2404	Industry is in good shape		43	49
2501	Factor2		71	77
2901	Economy is sound (alternate)		50	56
2902	Economy is sound (combined)		57	63
Insert rows before here				

Figure 15-2. Right part of the Postprocessor Constants sheet

It is vital that you enter the correct formulas in the Node Row and Node End Row columns, as the program will not generate your logic without these values. For the Node Row, copy a cell from an existing node's Node Row column and paste it into your node's cell. The formula will look like the following:

=MATCH(A110,Logic!$H$5:$H$56,0)+4 ,

where "A110" represents the cell address of your node's node number and “$H$56” represents the H-column cell in the row labeled “Insert rows above this row”. This formula looks on the Logic sheet and finds the location of your node's first row in the logic. MATCH reports the sequence number of the row. Because the range in which it searches begins at row 5, it adds 4 to the result to obtain the actual row number. You may check to see that the Node Row equals the actual first row of the node in the logic after completing the next section on creating node logic.

The formula for the Node End Row should be copied and entered in the same way. Its formula should look like the following:

=MATCH(0,INDIRECT(CONCATENATE("Logic!H", N110),TRUE):Logic!$H$56,0)+N110-1 ,

where "N110" represents the address of the corresponding Node Row cell and “$H$56” is as above. The Match function in this formula looks for the first 0 in the H column, starting with the location of the first row of the node's logic. You can see that the 0 in the gray cell is critical, as it indicates the end of the logic. Because the range searched starts at the first logic row, the proper actual ending row number is found by adding the row number of the first row for the node and subtracting one.

15.3 CREATING NODE LOGIC ON THE LOGIC SHEET

Once you have completed creating the entries in the Constants, you may create the nodes in the Logic sheet.

You may erase old values of a pre-existing logic; however, you will probably find it easier to simply replace the old data with your entries. If you do this, **make sure you have completed all of the replacement and leave no residue of the previous logic**.

Figure 15-3 shows the center of the Logic sheet. The gray lines bound the top and bottom of a single node's rows of entries, or logic block. Each node will occupy the center of exactly one node logic block. A node has one input cell, shown in red as the first row in the Nd# column.

Nd#	**Raw Val**	**VALUE**	**NODE Name**
0			
2001	-1.03	**-1.03**	**Economic Infrastructure is good**
2001		**-1.03**	
2001		**-1.03**	
2001		**-1.03**	
2001		**-1.03**	
2001		**-1.03**	
0			

Figure 15-3. Center of the Postprocessor Logic sheet

The Nd# entry (for the first row) is where you enter the node number for this logic block. The Nd# entries for the other rows copy the contents of the cell above.

The Raw Val entry is calculated from the following formula:

=SUMPRODUCT(E6:E12,F6:F12)/SUM(F6:F12),

where "E6:E12" represents the Mod Val range of the node and "F6:F12" represents the Mod Weight range. As long as there is at least one From Node with a numeric From Val and Weight, the Excel SUMPRODUCT() and SUM() functions will pass a valid result, the weighted average of the values.

The VALUE entry (for the first row) is calculated using the following formula:

=MIN(4,MAX(-4,G6+I6),

where "I6" is the Raw Val entry. Ignore the "G6" cell, as it isn't used. The VALUE entries for the other rows copy the contents of the cell above.

The NODE Name entry (for the first row) is calculated using the following formula:

=VLOOKUP(H6,NodeNumber,2,FALSE),

where "H6" represents the cell containing the node number.

Assuming you have filled out the Constants sheet, the Node Name will be displayed when you enter its number. A standard node has six rows, as it can receive input from up to six From Nodes and output to six To Nodes (shown in the right side, below). The first row contains the original node information. Data that are needed for the right side are copied by formula to the other rows. You may insert additional rows above the bottom gray line**; however, you must remember to copy all formulas to the new rows**. In most cases, you will find six From Nodes and six To Nodes to be sufficient. **You must also make sure that the gray line at the end of the node logic has a 0 in the Nd# column.**

Figure 15-4 shows the left side of the Postprocessor Logic sheet. For each Node (in the center), you must enter into the From Node column every node that lists the Node as a To Node. Assuming you have filled out the Constants sheet, the From Node Name will be displayed when you enter its number. The various values will be incorrect. However, enter the Weight values for each From Node. Any positive numbers are valid. Equal numbers for all From nodes will generate equal contributions. In the example below, all Weights equal 2.00 would yield the same result as having all Weights equal 1.00.

	Bare Bones	**SCENARIO**				
						2004
From Node	**FROM Node Name**	**From Val**	**Weight**	**Mod Val**	**Mod Weight**	
23	Energy supply and distribution are sufficient	-1.02	1.00	-1.02	1.00	
55	Telecom infrastructure is in place and maintainable	-1.21	1.00	-1.21	1.00	
57	Transportation infrastructure is in place	-0.85	1.00	-0.85	1.00	
	#N/A	#N/A	1.00			
	#N/A	#N/A	1.00			
	#N/A	#N/A	1.00			

Figure 15-4. Left side of the Postprocessor Logic sheet

The calculated value that will be passed to the Node is the weighted average of the displayed From Node values. In this case, the following formula would be accurate:

Raw Val = (1.00 * (-1.02) + 1.00 * (-1.21) + 1.00 * (-.085))/(1.00 + 1.00 + 1.00) = -1.03.

The discussion of Figure 2-2 describes the actual calculations and the use of Mod Val and Mod Weight.

The calculations that produce the From Val entries are complex, but not as complex as those in the Preprocessor. The following formula is an example.

FromVal=IF(ISNA(VLOOKUP(A6,NodeHistory,2,FALSE)),VLOOKUP(H6,INDIRECT(CONCATENATE("P",VLOOKUP(A6,NodeNumber,14,FALSE),":Q",VLOOKUP(A6,NodeNumber,15,FALSE))),2,FALSE),VLOOKUP(A6,NodeHistory,2,FALSE))

The formula looks forbidding; however, it can be understood more easily with some substitutions. The basic structure is an IF test. Part of the formula may be stated as follows:

y=VLOOKUP(A6,NodeHistory,2,FALSE).

Here "A6" is the From Node in question and NodeHistory is a named range in the ScenarioHistory sheet that includes the node numbers in the first column and their current date's values in the second column. However, NodeHistory only includes the nodes from the Main ISSM, not any custom nodes from the Postprocessor. Thus y is the value that is recorded for the From Node in ScenarioHistory if the From Node is a Main ISSM node. Otherwise, y has the value "#N/A."

If y has the value "#N/A", the From Val is x; otherwise the From Val is y, as shown in the reduced formula below.

FromVal=IF(ISNA(y),x,y)

The value of x is based on a vertical lookup function, where "H6" is the node number of the Node (not the From Node whose value is being calculated, but the Node where that value will be sent).

x=VLOOKUP(H6,INDIRECT(a),2,FALSE)

a=CONCATENATE("P",VLOOKUP(A6,NodeNumber,14,FALSE),":Q",VLOOKUP(A6,NodeNumber,15,FALSE))

The INDIRECT function defines a two-column range, using "a" for its range. "x" is the value in the second column, where the value in the first column matches H6. "A6" is the From Node number and NodeNumber is a named range that contains the information on the Constants sheet. The formula VLOOKUP(A6,NodeNumber,14,FALSE) returns the first row of the where "A6" is the Node and the other VLOOKUP returns the last row. The P column of the Logic sheet contains the To Node numbers and the Q column contains the To Node values.

Thus x is the value in column Q of the Logic sheet in the logic block where the current From Node is the Node, where the corresponding cell in column P contains a To Node number that equals the Node number for the current Node. Therefore, if the current From Node is a custom node, we have found the correct value that it produced in its logic block to send to this Node.

The FROM Node Name entry is calculated by the following formula:

=VLOOKUP(A6,NodeNumber,2,FALSE),

where “A6” represents the From Node number.

The Mod Val entry converts the From Val entry to a blank if it doesn’t have a valid numerical entry; otherwise, it repeats the From Val value. It is calculated using the following formula:

=IF(OR(ISNA(C6),ISBLANK(C6),ISERR(C6)),"",C6),

where “C6” represents the From Val cell.

The Mod Weight entry repeats the Weight value unless the Mod Val cell has been set to blank. It is calculated using the following formula:

=IF(E6="","",D6),

where “E6” represents the Mod Val cell and “D6” represents the Weight cell.

The Mod Val and Mod Weight cells are provided to take advantage of the method Excel uses to calculate weighted averages. Blank cells in a range that is used in the Excel SUMPRODUCT() and SUM() functions do not contribute to the results, allowing the use of cells that may or may not represent logical variables.

If you are using a pre-defined scenario and there were more From Nodes or To Nodes in the block than you need now, simply delete the excess From Node and To Node **numbers**. However, if the rows you delete are not final rows in the block, you will have to recopy the formulas (across the block) down to the end of the block.

Additional From Nodes or additional To Nodes (beyond the standard six) can be accommodated by adding rows, **as long as all formulas are copied**. Similarly, additional node blocks can be added above the peach line at the bottom of the page, **as long as all formulas are copied**.

Figure 15-5 shows the right side of the Inputs sheet. From your diagram, fill in each of the To Node numbers in the To Node column. At least one node will be a final MOM and will have no To Nodes. You may have defined logic with multiple final MOMs. You may also have other nodes that are not designated as MOMs, but have no To Nodes. This is allowed, but is bad practice. The numbers do not need to be in any particular order. Assuming you have filled in the Constants data, the node names will be displayed as you enter the node number. The two Val columns will not reflect correct values, yet. If you are using a pre-defined scenario and there were more To Nodes in the block than you need now, simply delete the excess To Node **numbers (not their rows)**.

Inflate	**Center**	**Val**	**TO Node Name:**	**To Node**	**Val**
2.00	0.00	-2.06	Economy is sound (alternate)	2005	-2.06
1.00	0.00	-1.03	#N/A		-1.03
1.00	0.00	-1.03	#N/A		-1.03
1.00	0.00	-1.03	#N/A		-1.03
1.00	0.00	-1.03	#N/A		-1.03
1.00	0.00	-1.03	#N/A		-1.03

Figure 15-5. Right side of the Postprocessor Logic sheet

Now you must fill in Inflate and Center values for each To Node. In the absence of any other information, use 1.00 for Inflate and 0.00 for Center. The discussion concerning Figure 2-5 on the effects of these values are relevant for the Postprocessor, also.

The first Val entry is calculated using the following formula:

=M6+L6*J6,

where "M6" represents the Center value, "L6" represents the Inflate value, and "J6" represents the VALUE value for the To Node in question.

The TO Node Name entry is calculated using the following formula:

=VLOOKUP(P6,NodeNumber,2,FALSE),

where "P6" represents the To Node number in question.

The second Val entry merely repeats the value of the first Val entry in column N.

Figure 15-6 shows the bottom of the Inputs sheet. If you find that there are insufficient pre-defined node logic blocks, you may create more. Simply insert extra rows in groups of seven below the last gray line and before the peach colored line that says to insert rows above that row. Then copy the last node block, beginning below the gray line at its top and including its (bottom) gray line, to the blank area as many times as needed, but not extending to the peach line.

From Node	FROM Node Name	From Val	Weight	Mod Val	Mod Weight		Nd#	Raw Val	VALUE	NODE Name	Inflate	Center	Val	TO Node Name:	To Node	Val
							0									
2005	Economy is sound (alternate)	-1.47	1.00	-1.47	1.00		**2501**	-1.31	**-1.31**	**Economy is sound (combined)**	1.00	0.00	-1.31	#N/A		-1.31
19	Economy is sound	-1.14	1.00	-1.14	1.00		2501		**-1.31**		1.00	0.00	-1.31	#N/A		-1.31
	#N/A	#N/A	1.00				2501		**-1.31**		1.00	0.00	-1.31	#N/A		-1.31
	#N/A	#N/A	1.00				2501		**-1.31**		1.00	0.00	-1.31	#N/A		-1.31
	#N/A	#N/A	1.00				2501		**-1.31**		1.00	0.00	-1.31	#N/A		-1.31
	#N/A	#N/A	1.00				2501		**-1.31**		1.00	0.00	-1.31	#N/A		-1.31
							0									
	Insert rows above this row before copying in new nodes															

Figure 15-6. Bottom of the Postprocessor Logic sheet

15.4 PREPARING THE SCENARIOHISTORY

Figure 15-7 shows the part of the ScenarioHistory worksheet where your custom node values will be recorded. Your nodes will follow the last record labeled "Output" in the Group column, below the peach line that says no inputs above the line and add custom nodes below the line. The records above the peach line are the nodes of the Main ISSM and are the inputs to the Postprocessor. **You must not change any of these rows.**

Keep your entries in sequential order of the node numbers. You will only enter text (numbers) into the Nd# column. The other four left-most columns contain formulas.

					Dates	
					03/20/03	03/27/03
			12/01/06	**Iraq06**	03/20/03	03/27/03
Group	**Sector**	**Nd#**	**VALUE**	**NODE Name**	VALUE	VALUE
Core	Core	52	-0.51	**Safe and secure environment is perceived**	-0.41	-1.73
Output	Output	9	0.64	**Civil stability and durable peace exists**	-0.57	-2.83
No input above this line						
Add custom MOEs and intermediates below this line						
Post-Intermed	Economy	2001	-1.19	**Factor1**	0.02	-2.59
Post-Intermed	Economy	2401	-0.26	**Economic Infrastructure is good**	-0.24	-2.69
Post-Intermed	Economy	2402	-0.52	**Economic sectors are good**	-0.11	-2.39
Post-Intermed	Economy	2403	-0.64	**Money is sound**	-0.33	-1.85
Post-Intermed	Economy	2404	-0.50	**Industry is in good shape**	-0.10	-2.30
MOM	Economy	2501	-0.34	**Factor2**	-0.19	-2.28
MOM	Economy	2901	-0.12	**Economy is sound (alternate)**	-0.09	-3.00
MOM	Economy	2902	-0.10	**Economy is sound (combined)**	-0.17	-3.38
Add custom MOEs above this line						
No input below this line						

Figure 15-7. Postprocessor ScenarioHistory custom logic area

The formulas are as follows:

Group =VLOOKUP(C127,NodeNumber,3,FALSE)

Sector =VLOOKUP(C127,NodeNumber,4,FALSE)

NODE Name =VLOOKUP(C127,NodeNumber,2,FALSE)

where "C127" is the cell address of the Nd# you are dealing with. These formulas look up the node number and display the appropriate results from the Constants worksheet.

The final column, VALUE, requires more care. In the example above, where "C127" contains node number 2001,

VALUE =scenval(C127,NodeNumber,CurrentInputValues).

This formula contains a user-defined function, scenval(), that computes the cell address of the VALUE column (column J) of the node on the Logic sheet that concerns node 2001, found in row 6.

You may enter the formulas by typing right-hand side of the formulas, above **(remember the "=")**. You should check that the correct formula has been entered in the cell.

Note that it is permissible to have unused rows between nodes; however, you should avoid having too many of these, as it slows calculations. In all cases, you do not enter anything into the dated columns following the NODE Name column. When you click on the Recalculate control on the Preprocessor Controls sheet, these columns will be filled in with the appropriate numbers.

The bottom of the history section of the ScenarioHistory sheet is indicated with a peach colored line that says "No input below this line," as in Figure 15-7. If you need more rows for your nodes, insert them using the Excel insert rows menu item **above the peach colored line**.

If you have to insert rows between other rows with data and formulas, you will have to compensate below the peach colored line. The area below the history records contains a specially formatted copy of the names of the nodes that is used by the Custom Series controls. Figure 15-8 contains a schematic of the formatting.

	A	B	C	D
1	Other columns		Node#	
2	x1		2	
3	x2		4	
4	x3		125	
5	x4		34	
6	x5		22	
7	x6		56	
8	x7		43	
9	Other header info	A col formula	Node#	C col formula
10	x1	=A2	2	=C2
11	x2 Values equal	=A3	4	=C3
12	x3 corresponding	=A4	125	=C4
13	x4 values in upper	=A5	34	=C5
14	x5 block because	=A6	22	=C6
15	x6 of the formulas	=A7	56	=C7
16	x7	=A8	43	=C8

	A	B	C	D
1	Other columns		Node#	
2	x1		2	
3	x2		4	
4	x3		125	
5	....	Inserted Row...	....	
6	x4		34	
7	x5		22	
8	x6		56	
9	x7		43	
10	Other header info	A col formula	Node#	C col formula
11	x1 Values equal	=A2 Formulas	2	=C2
12	x2 OLD	=A3 were	4	=C3
13	x3 corresponding	=A4 changed	125	=C4
14	x4 values in upper	=A6 by the	34	=C6
15	x5 block because	=A7 row	22	=C7
16	x6 of the formulas	=A8 insertion	56	=C8
17	x7	=A9	43	=C9

Figure 15-8. Inserting rows

The left hand side of the figure contains the situation before a row is inserted. The top eight rows represent all of the history records that are above the peach colored line. The bottom eight rows represent the data below the peach line. The A column represents the data that precedes the node number in a record and the C column represents the node numbers. Each record above the line has a corresponding record below the line. The B and D columns (below the line) shows the formulas that are contained in the A and C columns, which produce the values shown. The actual formulas are more complex; however, this schematic is sufficient to illustrate the point.

The right hand side of the figure shows what happens when a row is inserted in the top half. The data in the top half is undisturbed (although the row numbers containing some of the data change) and the data in the bottom half is unchanged. Inserting the row causes the formulas to change so that the bottom half rows refer to the same data as before, despite the change in row numbers. Up to this point, the inserted row(s) have caused no damage.

However, the purpose for inserting rows is to add places to record the history of new nodes. Once you have put the correct formulas into the cells in the new row, as described above, the history can be properly recorded. Unfortunately, as can be seen in Figure 15-8, there is no reference to the data in this new row in the bottom half. This means that this new node cannot be selected for graphing by the Custom Series controls.

The compensation mentioned above, starts with inserting the same number of rows into the bottom half as you inserted into the top half. Insert them some place in the middle of the current data in the bottom half. The exact location doesn't matter because you will be replacing most of the formulas anyway. Next, copy the formulas (in columns A - E) immediately below the headers in the bottom half and paste them down to the last entry. This action reestablishes the correspondence between top half rows and bottom half rows.

15.5 CHECKING YOUR LOGIC

There is one pivot table in the Postprocessor workbook that will help you check your logic, the Logic Pivot Table. **First use the Recalculate control on the Postprocessor Controls sheet.**

Figure 15-9 shows a portion of the Logic Pivot Table in the LogicPivot sheet. You should click on the cell in the upper left containing the entry "Max of Val" and then click on the Exclamation point on the tool bar to refresh the pivot table. If this toolbar is not showing, you may right click on the "Max of Val" cell and click on the "Refresh Data" entry on the popup menu.

Logic Pivot Table

Max of Val	To Node		
Nd#	2004	2005	2501
2001		-1.03	
2002	-0.88		
2003	-1.28		
2004		-1.16	
2005			-1.13

Figure 15-9. Postprocessor Logic Pivot Table

Check this pivot table. It should have all of your custom nodes that output to other nodes on the left, all of their To Nodes on the top, and no additional nodes.

The other logic checking is more difficult. You will have to manually look at all of the logic. Make sure that you understand all of the values, especially any "#N/A" values.

Then, check the values in the ScenarioHistory sheet. The values (including the date) in the VALUE column should correspond to the node values in the Outputs sheet and these should also be the same as those of the last column to the right on the sheet (see Figure 15-7).

Finally, you should use the custom series controls (Figure 15-10) on the Preprocessor Controls sheet to create TimeChart (Figure 15-11) series that contain all of your custom logic to look for anomalies. You should also select entries that should have similar results to compare the results with each other.

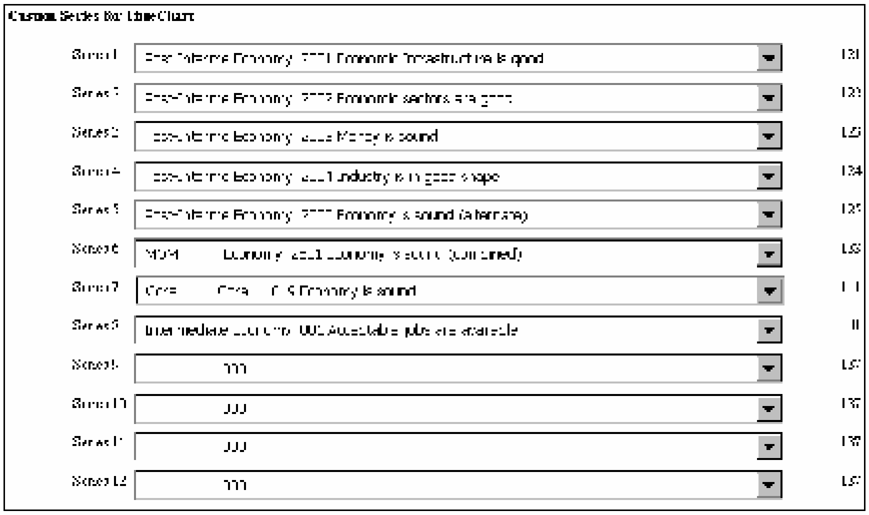


Figure 15-10. Postprocessor custom series controls

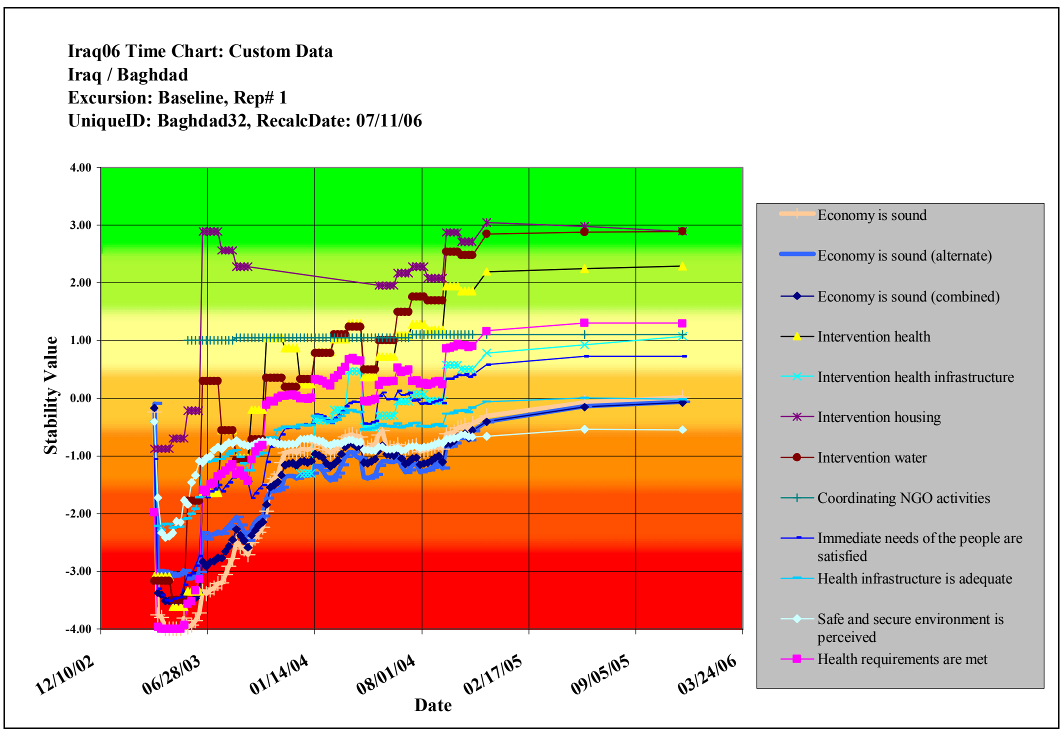


Figure 15-11. Postprocessor TimeChart

This figure show the TimeChart with the Value Axis (Y-Axis) Display turned on (on the Controls sheet). Turning the display off simply removes the scale values from the left-hand side of the chart.

After you have added all of you Postprocessor custom logic, you may perform an additional, more thorough check of your logic by using the Save Data and Logic control on the Controller's Controls worksheet. This process will institute several logic checks and draw the logic that you have defined.

16. UPGRADE PROCESS AND OUTPUT WORKBOOK

This section provides the details on the upgrade process and the "Output" workbook that is used to mediate the process.

16.1 PREPARING TO UPGRADE TO A NEW VERSION

When a new version of the ISSM is distributed, you will want to convert any models you have built to the new version. This can be done manually; however, it is very difficult and subject to error. You use the Save Data & Logic button to save all of the information from a current set of workbooks into a special "Output" workbook. This workbook will have the name "ISSMOutputxxxx.xls," where "xxxx" is the common part of the file names of the workbooks of your model. You will then use the Import Data & Logic button to copy this information into a blank set of new-version workbooks.

Prior to saving the information, you should check the Diamond- and UserWorksheets in the ISSM Main and the Preprocessor to make sure the sliders are pushed to their full left and up positions. If one of these sheets has the Excel "Freeze Panes" unfrozen and the upper left corner is not visible, the save process will create the Freeze Panes in the wrong positions.

Table 16-1 contains the error messages that may be generated by the Save Data & Logic button, both messages that show on the screen and messages in the Errata worksheet of the "Output" workbook.

Table 16-1. Controller Save Data & Logic Error Messages

Message	What it means	What to do
A logical loop in the node structure has been detected in (a Nodesheet). Check the nodes in (the Nodesheet) with unassigned Calculation Sequence values. A complete circular reference will cause this; however, it can also be caused by a set of 'FromNode' references that imply the cycle, even without the corresponding 'ToNode' references.	A node that passes its value to itself or a sequence of nodes that eventually pass a value back to an earlier node constitutes a logical loop, which is not permitted. A properly defined loop would have all of the FromNode and ToNode references filled out. However, even if the loop is not properly defined, the set of FromNode references imply a loop.	Look at the sheet named (Nodesheet) in the Output workbook for nodes that don't have entries in the Calculation Sequence column. Then check these nodes in the correct Scenario workbook for incorrect connections. Correct them all and re-run save data & logic.
Messages have been added to the Errata sheet in the Output workbook.	Error or information messages were generated and placed on the Errata sheet.	Look at the Errata sheet (in the Output workbook) to find out what the messages say. Then correct any errors and re-run save data & logic.
To save data, you must have opened a complete set of three workbooks.	You do not have all three workbooks (Preprocessor, Main, & Postprocessor) open.	Before you save the data and logic, open whichever workbooks that are missing.
You have a problem with node nnn. It may be missing a NodeName and thus partially eliminated. You need to correct this problem in the workbook.	Node nnn appears in some places but not everywhere it needs to be for complete definition. The node may be listed in the Constants sheet without a Node name.	Either eliminate the node number from the Constants sheet or give it a Node name then re-run save data & logic.
You have a problem with node nnn. It may be missing a NodeName and thus partially eliminated. You need to correct this problem in the workbook.	Node nnn appears in some places but not everywhere it needs to be for complete definition. The node may be listed in the Constants sheet without a Node name.	Either eliminate the node number from the Constants sheet or give it a Node name then re-run save data & logic.
You have a problem with node nnn. It may be missing and thus partially eliminated. You need to correct this problem in the workbook.	Somewhere there is a reference to a node numbered nnn; however, at least one of the corresponding references that are needed to fully define this node is missing. This is almost certainly a custom logic node, either Preprocessor or Postprocessor.	From the node number, you can tell whether the node is in the Preprocessor, Main or Postprocessor. Look for this node and either add the missing references or delete the existing references.

Table 16-2 contains the error messages that may be generated by the Save Data & Logic button that are placed within certain sheets in the "Output" workbook. The sheet names are preceded by a reference to the Preprocessor, Main, or Postprocessor, indicated by the ellipsis in the Sheet with msg column. The ellipsis in the Message column indicates that there may be a preceding part of the message, found in another row.

Table 16-2. Controller In-Sheet Messages

Sheet with msg	Message	What it means	What to do
...FromNodes Sheet	...; FromNode missing from Node sheet	The node in column B is not in the Node sheet.	Either this node doesn't appear as a "Hero" node or it isn't in the Constants sheet.
...FromNodes Sheet	...; Node missing from Node sheet	The node in column A is not in the Node sheet.	Either this node doesn't appear as a "Hero" node or it isn't in the Constants sheet.
...FromNodes Sheet	Missing from ToNode sheet	The link from the node in column B to the node in column A is not in the ToNode sheet as a link from a node in column A to a node in column B.	The logic on the right side of the "Hero" node is missing this connection. Either add the logic or remove the logic on the left side.
...FromNodes Sheet	OK	Part or all of tests were successful.	
...ToNodes Sheet	...; Node missing from Node sheet	The node in column A is not in the Node sheet.	Either this node doesn't appear as a "Hero" node or it isn't in the Constants sheet.
...ToNodes Sheet	...; ToNode missing from Node sheet	The node in column B is not in the Node sheet.	Either this node doesn't appear as a "Hero" node or it isn't in the Constants sheet.
...ToNodes Sheet	Missing from ToNode sheet (message should actually say "FromNode" sheet)	The link from the node in column A to the node in column B is not in the FromNode sheet as a link from a node in column B to a node in column A.	The logic on the left side of the "Hero" node is missing this connection. Either add the logic or remove the logic on the right side.
...ToNodes Sheet	OK	Part or all of tests were successful.	
…NodeConnections	…; ToNode missing from Node sheet	The node in column B is not in the Node sheet.	Probably this node isn't in the Constants sheet.
…NodeConnections	FromNode missing from Node sheet	The node in column A is not in the Node sheet.	Probably this node isn't in the Constants sheet.
…NodeConnections	OK	Part or all of tests were successful.	

16.1.1 Structure of the Output Workbook.

The Output workbook contains a large number of worksheets, which are briefly described below. The Analysts' Guide provides more detailed information.

16.1.2 Errata Worksheet

Figure 16-1 shows a part of the Errata worksheet. In this case, the messages are that the dates in the DiamondWorksheet do not match the corresponding columns in the ExternalInputs worksheet. If you have data in the DiamondWorksheet, these are serious messages; however, if the data you have entered are in the UserWorksheet, you will not have bothered to make the DiamondWorksheet dates correspond and these messages may be disregarded. Naturally, there may be other messages in the worksheet that require attention.

Date # 1 in DiamondWorksheet = 03/29/03; however, the corresponding date in ExternalInputs = 03/20/03.
Date # 2 in DiamondWorksheet = 04/26/03; however, the corresponding date in ExternalInputs = 03/27/03.
Date # 3 in DiamondWorksheet = 05/24/03; however, the corresponding date in ExternalInputs = 04/03/03.
Date # 4 in DiamondWorksheet = 06/21/03; however, the corresponding date in ExternalInputs = 04/10/03.
Date # 5 in DiamondWorksheet = 07/19/03; however, the corresponding date in ExternalInputs = 04/17/03.
Date # 6 in DiamondWorksheet = 08/16/03; however, the corresponding date in ExternalInputs = 04/24/03.
Date # 7 in DiamondWorksheet = 09/13/03; however, the corresponding date in ExternalInputs = 05/01/03.

Figure 16-1. Section of Errata worksheet

16.1.3 GeneralData Worksheet

Figure 16-2 shows the GeneralData worksheet, where the file identification data is captured for each of the workbooks that are to be upgraded.

	ISSM File	Scenario	Min Manual Date	Max Manual Date	External Date interval	Region /Country	Sub-Region Name	Excursion Name	Replication Number	Recalculation Date	Common Part of File Name
Controller	ISSMControl4_00.xls	Iraq				Iraq			0	6/7/2006 12:08	Iraq60
Main	ISSM4_02Iraq60.xls	Iraq	5/1/2012	11/1/2013	7	Iraq			0	10/9/2006 11:11	Iraq60
Preprocessor	Preprocessor4_01Iraq60.xls	Iraq	5/1/2012	11/1/2013		Iraq			0	10/9/2006 11:09	Iraq60
Postprocessor	Postprocessor4_01Iraq60.xls	Iraq	5/1/2012	12/1/2013		Iraq			0	10/9/2006 11:33	Iraq60

Figure 16-2. GeneralData worksheet

16.1.4 Sector Worksheet

Figure 16-3 shows the Sector worksheet where the names of the sectors are matched to the SectorID values and information is collected on the numbers of nodes in each sector in each workbook and the topological connectivity of the nodes. This information is used in processing the logic of each workbook and in building the logic diagrams. The "Other" sector should have no entries, so a value other than zero indicates an error.

SectorID	Sector	Max Nodes per SeqNo in	Neighbors 0	1	2	3	4	5	6	7	8	9	10
0	Other	0	0	0	0	0	0	0	0	0	0	0	0
1	Conflict	22	0	82	4	10	0	8	0	0	14	24	0
2	Economy	24	0	0	130	20	2	10	18	68	18	10	0
3	Govt	55	0	0	0	180	6	2	4	0	24	22	0
4	Misc	12	0	0	0	0	20	0	0	2	4	20	0
5	Movement	6	0	0	0	0	0	32	12	0	2	12	0
6	Needs	21	0	0	0	0	0	0	72	6	10	10	0
7	Physical	24	0	0	0	0	0	0	0	24	0	0	0
8	Security	7	0	0	0	0	0	0	0	0	20	0	0
9	Core	2	0	0	0	0	0	0	0	0	0	12	14
10	Output	1	0	0	0	0	0	0	0	0	0	0	0

SectorID	Sector	Max Nodes per SeqNo in Preproc	Neighbors 0	1	2	3	4	5	6	7	8	9	10
0	Other	0	0	0	0	0	0	0	0	0	0	0	0
1	Conflict	39	0	82	0	0	0	2	6	0	0	0	0
2	Economy	6	0	0	12	0	0	0	0	0	0	0	0
3	Govt	17	0	0	0	46	0	0	0	0	0	0	0
4	Misc	16	0	0	0	0	38	0	0	0	0	0	0
5	Movement	9	0	0	0	0	0	22	0	0	0	0	0
6	Needs	4	0	0	0	0	0	0	8	0	0	0	0
7	Physical	0	0	0	0	0	0	0	0	0	0	0	0
8	Security	0	0	0	0	0	0	0	0	0	0	0	0
9	Core	0	0	0	0	0	0	0	0	0	0	0	0
10	Output	0	0	0	0	0	0	0	0	0	0	0	0

SectorID	Sector	Max Nodes per SeqNo in	Neighbors 0	1	2	3	4	5	6
0	Other	0	0	0	0	0	0	0	0
1	Conflict	18	0	0	0	0	0	0	0
2	Economy	22	0	0	45	0	0	0	0
3	Govt	29	0	0	0	0	0	0	0
4	Misc	12	0	0	0	0	0	0	0
5	Movement	12	0	0	0	0	0	0	0
6	Needs	12	0	0	0	0	0	0	0
7	Physical	0	0	0	0	0	0	0	0
8	Security	0	0	0	0	0	0	0	0
9	Core	7	0	0	0	0	0	0	0
10	Output	1	0	0	0	0	0	0	0

Figure 16-3. Sector worksheet

16.1.5 Group Worksheet

Figure 16-4 shows the Group worksheet where the names of the groups (of variables) are matched to the GroupID values. This information is used in processing the logic of each workbook and in building the logic diagrams. The "Other" group should have no entries, so a value other than zero indicates an error.

GroupID	Group
0	Other
1	Pre-Input
2	Pre-Intermed
3	Input
4	Intervention
5	Intermediate
6	Core
7	Output
8	Post-Intermed
9	MOM

Figure 16-4. Group worksheet

16.1.6 MainNodes Worksheet

Figure 16-5 shows a section of the MainNodes worksheet where information on each of the nodes in ISSM Main (internal input, external input, intermediate, and output) is collected. The Analysts' Guide contains more detail on this worksheet.

NodeID	NodeName	CalcSeq	NodeCalcType	SectorID	GroupID	Sheet	Notes	InfluenceNotes
1	Acceptable jobs are available	14		2	5	Economy		
2	Administration of justice is effective and fair	9		3	5	Govt		
3	Agricultural system is productive	11		2	5	Economy		
4	Armed forces are well structured	4		1	3	Conflict		
5	Basic natural resource management is in place	4		6	3	Needs	two parts: infrastructure & govt/private management system; missing=-3, bad=-2, moderately bad=-1, fair=0, moderately good=1, good=2, excellent=3	

Figure 16-5. Section of the MainNodes worksheet

16.1.7 MainFromNodes Worksheet

Figure 16-6 shows a section of the MainFromNodes worksheet. Each node that passes values to another node is a FromNode (except for external input nodes) and information about the node in this role is collected here. If there is a problem with the connection, it is described in the ConnectionProblem column. The Analysts' Guide contains more detail on this worksheet.

Nd#	From Node	From Val	Weight	WeightIsVariable	ValueIsMultiplier	ConnectionProblem
1	10	-1.49859	1			OK
1	15	-2.47975	1			OK
1	25	-0.22875	1			OK
1	56	-1.44028	1			OK
1	21	3.208824	1			OK
1	147	1.197348	1			OK
1	19	-1.36153	1			OK

Figure 16-6. Section of the MainFromNodes worksheet

16.1.8 MainToNodes Worksheet

Figure 16-7 shows a section of the MainToNodes worksheet. Each node that receives values from another node is a ToNode and information about the node in this role is collected here. If there is a problem with the connection, it is described in the ConnectionProblem column. The Analysts' Guide contains more detail on this worksheet.

Nd#	To Node	Inflate	Center	Val	InflateIsVariable	ConnectionProblem
1	18	1.5	0	-0.5577292		OK
1	42	1	-0.5	-0.8718195		OK
2	37	2	0	-1.0758457		OK
2	52	1.5	0	-0.8068843		OK
3	10	1	0	-0.2729082		OK
3	26	1.5	0	-0.4093622		OK
4	16	1	0	-1.3076923		OK

Figure 16-7. Section of the MainToNodes worksheet

16.1.9 MainExternalNodeConnections Worksheet

Figure 16-8 shows a section of the MainExternalNodeConnections worksheet. Information on each of the external inputs (in the role of passing data) is collected here. If there is a problem with the connection, it is described in the ConnectionProblem column. The Analysts' Guide contains more detail on this worksheet.

FromNode	ToNode	TimeDelay	Weight	ReplicatedToNode	DivisorNode	ConnectionProblem
150	141	0	1			OK
150.1	150				TRUE	OK
151	136	7	1			OK
151.1	151				TRUE	OK
152	136	0	1			OK
152.1	152				TRUE	OK
153	143	0	1			OK
153.1	153				TRUE	OK

Figure 16-8. Section of the MainExternalNodeConnections worksheet

16.1.10 MainInputData Worksheet

Figure 16-9 shows a section of the MainInputData worksheet. All of the internal inputs data is collected in this worksheet.

	Dates							
Nd#	3/20/2003	3/27/2003	4/3/2003	4/10/2003	4/17/2003	4/24/2003	5/1/2003	5/8/2003
4	2.096154	-0.6	-2.90769	-3	-3	-3	-3	-3
11	-1	-2	-3	-3	-3	-3	-3	-3
59	-0.9375	-1.0625	-2.875	-2.875	-2.875	-2.875	-2.8125	-2.875
60	-0.75	-1.25	-3	-3	-2.875	-2.875	-2.25	-2.25
61	-3	-3	-3	-3	-3	-3	-2	-1
74	-1.83333	-1.875	-3	-3	-3	-2.58333	-2.08333	-2.33333

Figure 16-9. Section of the MainInputData worksheet

16.1.11 MainExternalInputsData Worksheet

Figure 16-10 shows a section of the MainExternalInputsData worksheet. All of the external inputs data is collected in this worksheet.

			Date							
Node #	Activity	Units	3/20/2003	3/27/2003	4/3/2003	4/10/2003	4/17/2003	4/24/2003	5/1/2003	5/8/2003
150	Coalition Forces		0							
150	Other US Depts & Agencies		1000	500	500	200	0	0	0	0
150	UN Depts & Agencies									
150	NGOs & PVOs		0	100	100	0	0	0	0	100
150	From UserWorksheet									
150	Medical treatment	People	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
150.1	Medical treatment	People	5000	10000	10000	15000	20000	20000	20000	20000
151	Coalition Forces									
151	Other US Depts & Agencies		500	4000	4000	4000	4000	4000	4000	7500
151	UN Depts & Agencies									
151	NGOs & PVOs									
151	From UserWorksheet									
151	Food importation	Tons	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
151.1	Food importation	Tons	10000	10000	10000	10000	10000	10000	10000	10000

Figure 16-10. Section of the MainExternalInputsData worksheet

16.1.12 MainVariableInflateData Worksheet

Figure 16-11 shows a section of the MainVariableInflateData worksheet. All of the user's overrides of the standard inflate values are collected here.

			Date							
Node #	ToNode	StdInflate	03/20/03	03/27/03	04/03/03	04/10/03	04/17/03	04/24/03	05/01/03	05/08/03
18	7	1	1	1	1	1	1	1		
24	7	0.8	0.8	0.8	0.8	0.8	0.8	0.8		
24	10	0.8	0.8	0.8	0.8	0.8	0.8	0.8		
24	29	1	1	1	1	1	1	1		
24	41	0.5	0.5	0.5	0.5	0.5	0.5	0.5		
24	46	0.25	0.25	0.25	0.25	0.25	0.25	0.25		
24	52	0.5	0.5	0.5	0.5	0.5	0.5	0.5		
28	8	0.5	0.5	0.5	0.5	0.5	0.5	0.5		
39	7	1	1	1	1	1	1	1		
44	42	0.25	0.25	0.25	0.25	0.25	0.25	0.25		
50	24	1	1	1	1	1	1	1		

Figure 16-11. Section of the MainVariableInflateData worksheet

16.1.13 MainDiamondWorksheet Worksheet

Figure 16-12 shows the top part and Figure 16-13 shows the bottom part of the MainDiamondWorksheet worksheet. This worksheet is a direct copy of the DiamondWorksheet from the ISSM Main.

If you cannot view the top of the worksheet, the probable cause is that the Freeze Panes are in the wrong position. You may either delete this "Output" workbook and reposition the DiamondWorksheet to the top left before re-saving the data or you may manually correct the Freeze Panes. To manually correct the Freeze Panes, use the Excel "Window" toolbar menu to find and activate the "Unfreeze Panes" command. Move the horizontal pane divider to a position between row 2 and row 3 and the vertical pane divider between column E and column F. Then activate the "Freeze Panes" command on the "Window" menu.

ISSM Main DiamondWorksheet			Use the area below for data input and calculations. Insert as many rows as desired. You may not insert columns. Use the shaded area below the input and calculation area to copy final results for transfer to the External Inputs worksheet.										
				03/29/03	04/26/03	05/24/03	06/21/03	07/19/03	08/16/03	09/13/03	10/11/03	11/08/03	12/06/03
		1st date should correspond to							Initial	Month 1	Month 2	Month 3	Month 4
Node	Formulas												
	Needs Intervention Calculations												
	FoodD(i,AOj)=food delive	FoodD(i,AO1)							100	33600000	33600000	33600000	33600000
	FoodN(i,AOj)=food neede	FoodN(i,AO1)		100	100	100	100	100	100	8502732	5097552	3716277	2340996
		FoodD(i,AO2)											
		FoodN(i,AO2)											
		FoodD(i,AO3)											
		FoodN(i,AO3)											
		FoodD(i,AO4)											
		FoodN(i,AO4)											
		FoodD(i,AO5)											
		FoodN(i,AO5)											
152	sum over j {FoodD(i,AOj)	FoodD(i)	pounds						100	33600000	33600000	33600000	33600000
152.1	sum over j {FoodN(i,AOj)	FoodN(i)	pounds	100	100	100	100	100	100	8502732	5097552	3716277	2340996

Figure 16-12. Section of the top part of the MainDiamondWorksheet worksheet

Use this block for memo items, such as date offset. No links allowed.	You must identify the Node #	Units	03/29/03	04/26/03	05/24/03	06/21/03	07/19/03	08/16/03	09/13/03	10/11/03	11/08/03	12/06/03
		Insert as many rows as desired in the shaded area below the double line and above the last shaded row. You may not insert columns. Put dates in box below - Column positions **MUST CORRESPOND** with dates in ExternalInputs, with dated data in the area below										
	152	pounds						100	33600000	33600000	33600000	33600000
	152.1	pounds	100	100	100	100	100	100	8502732	5097552	3716277	2340996
	188							0.375	0.9	1.35	2.25	2.625
	188.1							6	6	6	6	6
	218	trips						0	0	0	0	0
	218.1	trips	40	40	75	100	100	0	0	0	0	0

Figure 16-13. Section of the bottom part of the MainDiamondWorksheet worksheet

16.1.14 MainUserWorksheet Worksheet

Figure 16-14 shows the top part and Figure 16-15 shows the bottom part of the MainUserWorksheet worksheet. This worksheet is a direct copy of the UserWorksheet from the ISSM Main.

If you cannot view the top of the worksheet, the probable cause is that the Freeze Panes are in the wrong position. You may either delete this "Output" workbook and reposition the UserWorksheet to the top left before re-saving the data or you may manually correct the Freeze Panes. To manually correct the Freeze Panes, use the Excel "Window" toolbar menu to find and activate the "Unfreeze Panes" command. Move the horizontal pane divider to a position between row 2 and row 3 and the vertical pane divider between column E and column F. Then activate the "Freeze Panes" command on the "Window" menu.

ISSM Main UserWorksheet					Use the area below for data input and calculations. Insert as many rows as desired. You may not insert columns. Use the shaded area below the input and calculation area to copy final results for transfer to the External Inputs worksheet.										
node						3/20/03	3/27/03	4/3/03	4/10/03	4/17/03	4/24/03	5/1/03	5/8/03	5/15/03	5/22/03
				avg US combat killed		23.5	23.5	11.75	11.75	11.75	11.75	1.4	1.4	1.4	1.4
				US combat killed		**23**	**24**	**12**	**11**	**12**	**11**	**2**	**1**	**2**	**1**
			70	**Opposition**		**0.67**	**0.66**	**0.83**	**0.84**	**0.83**	**0.84**	**0.97**	**0.99**	**0.97**	**0.99**
	235	**0.86**	**250**	**Force Security**	**rating**	**0.91**	**0.90**	**0.95**	**0.96**	**0.95**	**0.96**	**0.99**	**1.00**	**0.99**	**1.00**
				US troops killed											
				bad guys killed											
				bad guys captured											
				notable		war starts 3/19/03				Mosul falls to Kurds			end of major combat		

Figure 16-14. Section of the top part of the MainUserWorksheet worksheet

Use this block for memo items, such as date offset. No links allowed.	You must identify the Node #	Insert as many rows as desired in the shaded area below the double line and above the last shaded row. You may not insert columns. Put dates in box below - Column positions **MUST CORRESPOND** with dates in ExternalInputs, with dated data in the area below										
		Units	03/20/03	03/27/03	04/03/03	04/10/03	04/17/03	04/24/03	05/01/03	05/08/03	05/15/03	05/22/03
	158	fraction										
	158.1	whole							1	1	1	1
	159	schools										
	159.1	schools								4400	4400	4400
	160	units										
	160.1	units										33.2815
	161	teachers										
	161.1	teachers										
	162	fraction										
	162.1	whole								1	1	1
	163	fraction										
	163.1	whole								1	1	1
	164	units										
	164.1	units					800	800	800	800	800	800
	165	people								500	500	500
	165.1	people								10000	20000	20000

Figure 16-15. Section of the bottom part of the MainUserWorksheet worksheet

16.1.15 MainDiagram Worksheet

Figure 16-16 shows the diagram that is created for the ISSM Main logic. It is located on the MainDiagram worksheet. The figure below has been rotated and reduced in size for display in the Users' Guide.

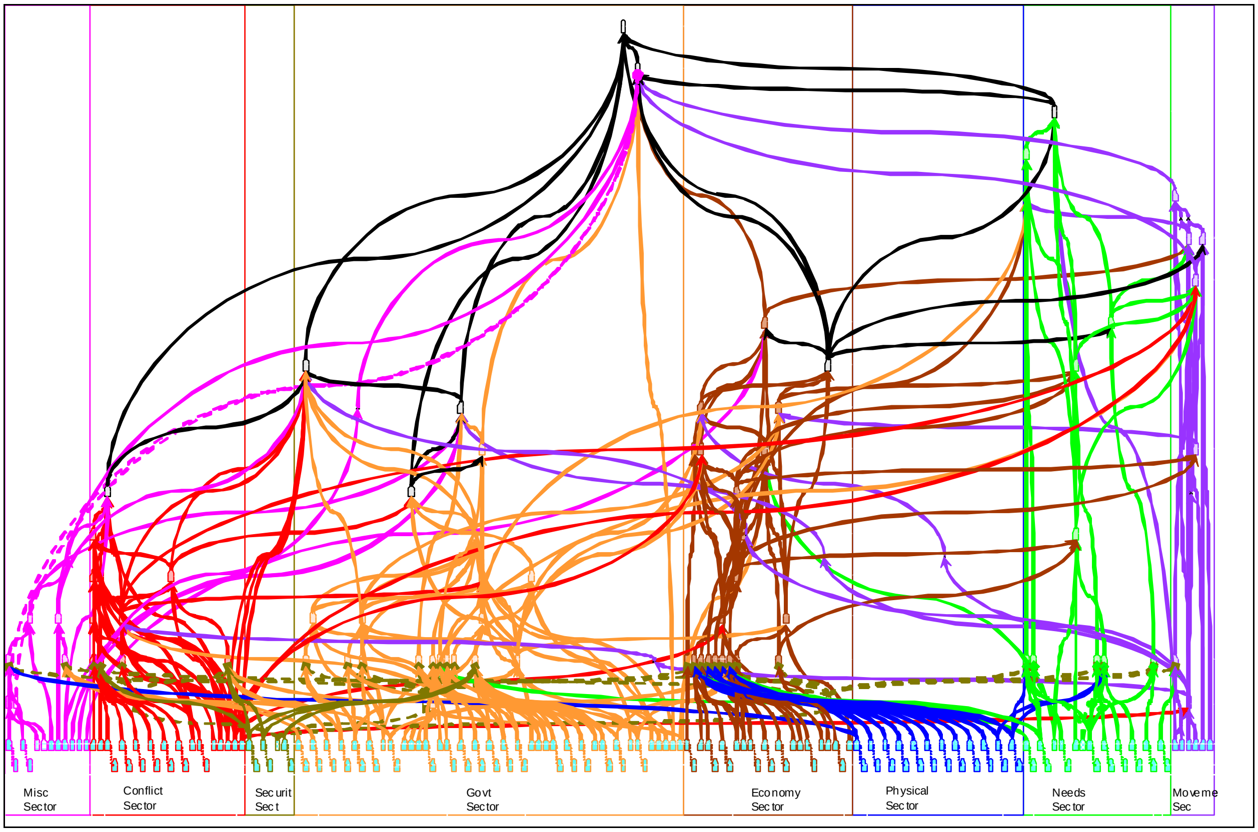


Figure 16-16. ISSM Main logic diagram

16.1.16 PreprocessorNodes Worksheet

Figure 16-17 shows a section of the PreprocessorNodes worksheet where information on each of the nodes in the Preprocessor is collected. The Analysts' Guide contains more detail on this worksheet.

NodeID	NodeName	CalcSeq	NodeCalcType	SectorID	GroupID	Sheet	Notes	InfluenceNotes
4	Armed forces are well structured	2		1	3			
5	Basic natural resource management is in place	2		6	3		two parts: infrastructure & govt/private management system; missing=-3, bad=-2, moderately bad=-1, fair=0, moderately good=1, good=2, excellent=3	
11	Competing groups resolve differences	2		1	3			
21	Educational system is tailored toward jobs	3		4	3			

Figure 16-17. Section of the PreprocessorNodes worksheet

16.1.17 PreprocessorFromNodes Worksheet

Figure 16-18 shows a section of the PreprocessorFromNodes worksheet. Each node that passes values to another node is a FromNode and information about the node in this role is collected here. If there is a problem with the connection, it is described in the ConnectionProblem column. The Analysts' Guide contains more detail on this worksheet.

Nd#	From Node	From Val	Weight	WeightIsVariable	ValueIsMultiplier	ConnectionProblem
4	1001	-1	1			OK
4	1401	#VALUE!	1			OK
4	1101	-2.97	1			OK
4	1102	-1.8	0.25			OK
4	1103	0.17	1			OK
5	1033	1.75	1			OK
5	1408	#VALUE!	1			OK
5	1104	0	1			OK

Figure 16-18. Section of the PreprocessorFromNodes worksheet

16.1.18 PreprocessorToNodes Worksheet

Figure 16-19 shows a section of the PreprocessorToNodes worksheet. Each node that receives values from another node is a ToNode and information about the node in this role is collected here. If there is a problem with the connection, it is described in the ConnectionProblem column. The Analysts' Guide contains more detail on this worksheet.

Nd#	To Node	Inflate	Center	Val	InflateIsVariable	ConnectionProblem
1001	4	1	0	-1		OK
1002	11	1	0	-0.5		OK
1003	59	1	0	0		OK
1004	60	1	0	-1.5		OK
1005	61	1	0	2.25		OK
1006	74	1	0	-1.5		OK

Figure 16-19. Section of the PreprocessorToNodes worksheet

16.1.19 PreprocRawDataNodeConnections Worksheet

Figure 16-20 shows a section of the PreprocRawDataNodeConnections worksheet. The nodes that originate on the RawData worksheet require specification as to which nodes are divisor nodes. That data is collected here. If there is a problem with the connection, it is described in the ConnectionProblem column. The Analysts' Guide contains more detail on this worksheet.

FromNode	ToNode	TimeDelay	Weight	ReplicatedToNode	DivisorNode	ConnectionProblem
1101.1	1101				TRUE	OK
1102.1	1102				TRUE	OK
1120.1	1120				TRUE	OK
1401.1	1401				TRUE	OK
1402.1	1402				TRUE	OK

Figure 16-20. Section of the PreprocRawDataNodeConnections worksheet

16.1.20 PreprocessorRawInputsData Worksheet

Figure 16-21 shows a section of the PreprocessorRawInputsData worksheet. All of the input data is collected here.

Node #	Activity	Units	Date 03/20/03	03/27/03	04/03/03	04/10/03	04/17/03	04/24/03	05/01/03	05/08/03	05/15/03	05/22/03	05/29/03
1001	Expert: Armed forces are well structured	rating	2	0	-3	-3	-3	-3	-3	-3	-3	-3	-3
1002	Expert: Competing groups resolve differences	rating	-1	-2	-3	-3	-3	-3	-3	-3	-2	-3	-2
1003	Expert: Opposition party does not espouse force	rating	-1	-1	-3	-3	-3	-3	-3	-3	-3	-3	-3
1004	Expert: There haven't been any paramilitary forces	rating	-1	-2	-3	-3	-3	-3	-2	-2	-2	-2	-2
1005	Expert: There haven't been any regime-sponsored non-military armed forces	rating	-3	-3	-3	-3	-3	-3	-2	-2	0	0	0

Figure 16-21. Section of the PreprocessorRawInputsData worksheet

16.1.21 PreprocDiamondWorksheet Worksheet

Figure 16-22 shows the top part and Figure 16-23 shows the bottom part of the PreprocDiamondWorksheet worksheet. This worksheet is a direct copy of the DiamondWorksheet from the Preprocessor.

If you cannot view the top of the worksheet, the probable cause is that the Freeze Panes are in the wrong position. You may either delete this "Output" workbook and reposition the DiamondWorksheet to the top left before re-saving the data or you may manually correct the Freeze Panes. To manually correct the Freeze Panes, use the Excel "Window" toolbar menu to find and activate the "Unfreeze Panes" command. Move the horizontal pane divider to a position between row 2 and row 3 and the vertical pane divider between column E and column F. Then activate the "Freeze Panes" command on the "Window" menu.

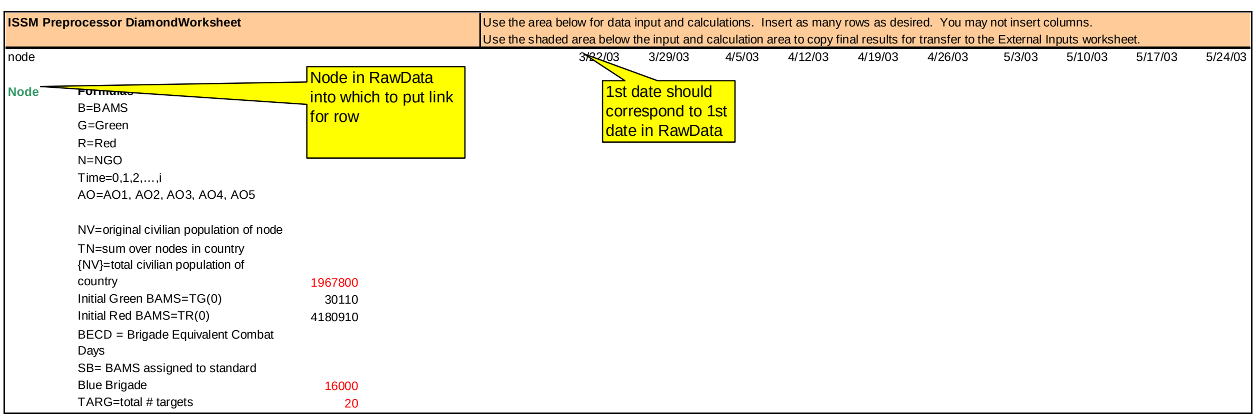


Figure 16-22. Section of the top part of the PreprocDiamondWorksheet worksheet

Use this block for memo	You must	Insert as many rows as desired in the shaded area below the double line and above the last shaded row. You may not insert columns.										
items	identify the		Put dates in box below - Column positions **MUST CORRESPOND** with dates in RawData, with dated data in the area below the do									
No links allowed.	Node #	Units	03/22/03	03/29/03	04/05/03	04/12/03	04/19/03	04/26/03	05/03/03	05/10/03	05/17/03	05/24/03
	1401											
	1401.1											
	1402											
	1403											
	1404											
	1405											
	1406											
	1407											
	1408											
	1409											

Figure 16-23. Section of the bottom part of the PreprocDiamondWorksheet worksheet

16.1.22 PreprocessorUserWorksheet Worksheet

Figure 16-24 shows the top part and Figure 16-25 shows the bottom part of the PreprocesorUserWorksheet worksheet. This worksheet is a direct copy of the UserWorksheet from the Preprocessor.

If you cannot view the top of the worksheet, the probable cause is that the Freeze Panes are in the wrong position. You may either delete this "Output" workbook and reposition the UserWorksheet to the top left before re-saving the data or you may manually correct the Freeze Panes. To manually correct the Freeze Panes, use the Excel "Window" toolbar menu to find and activate the "Unfreeze Panes" command. Move the horizontal pane divider to a position between row 2 and row 3 and the vertical pane divider between column E and column F. Then activate the "Freeze Panes" command on the "Window" menu.

ISSM Preprocessor UserWorksheet					Use the area below for data input and calculations. Insert as many rows as desired. You may not insert columns.									
					Use the shaded area below the input and calculation area to copy final results for transfer to the External Inputs worksheet.									
node					3/20/03	3/27/03	4/3/03	4/10/03	4/17/03	4/24/03	5/1/03	5/8/03	5/15/03	5/22/03
				Displaced		300.00	246.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00
	1130			**Displaced s rating**	**2.55**	**-2.50**	**-2.05**	**-0.11**	**-0.11**	**-0.11**	**-0.11**	**-0.11**	**-0.11**	**-0.11**
		max=0	Invest $											
	4560													
			Invest scaled											
	1126			**Invest scal rating**	**0.00**	**-3.00**	**-3.00**	**-3.00**	**-3.00**	**-3.00**	**-2.88**	**-2.76**	**-2.64**	**-2.52**
(178)		**Economy**	**1.00**	**currency conversion 6 wks**										
				Strong Currency										
	1127			**Strong Cur rating**	**-1.00**	**-3.00**	**-3.00**	**-3.00**	**-3.00**	**-3.00**	**-3.00**	**-3.00**	**-3.00**	**-2.75**

Figure 16-24. Section of the top part of the PreprocessorUserWorksheet worksheet

Use this block for memo	You must	Insert as many rows as desired in the shaded area below the double line and above the last shaded row. You may not insert columns.										
items	identify the		Put dates in box below - Column positions **MUST CORRESPOND** with dates in RawData, with dated data in the area below the do									
No links allowed.	Node #	Units	03/20/03	03/27/03	04/03/03	04/10/03	04/17/03	04/24/03	05/01/03	05/08/03	05/15/03	05/22/03
	1101	EffBatallions	175	50	10	0	0	0	0	0	0	0
	1101.1	EffBatallions	200	200	200	200	200	200	200	200	200	200
	1102	EffBatallions	175	40	0	0	0	0	0	0	0	0
	1102.1	EffBatallions	200	200	200	200	200	200	200	200	200	200
	1104	rating	-1.00	-1.00	-1.50	-2.00	-2.50	-2.50	-2.00	-1.50	-1.50	-1.50
	1105	rating	-1.00	-1.00	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00	-2.75
	1106	rating	-1.00	-2.00	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00	-2.33	-2.67
	1107	rating	-0.88	-1.13	-2.75	-2.75	-2.75	-2.75	-2.63	-2.75	-2.58	-2.58
	1108	rating	-1.67	-1.75	-3.00	-3.00	-3.00	-2.17	-2.17	-2.67	-2.17	-2.17
	1109	rating	2.00	-3.00	-3.00	-3.00	-2.50	-2.00	-1.50	-1.50	-0.50	-0.50
	1120	people	83300.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1120.1	people	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00

Figure 16-25. Section of the bottom part of the PreprocessorUserWorksheet worksheet

16.1.23 PreprocessorDiagram Worksheet

Figure 16-26 shows the diagram that is created for sample Preprocessor logic. It is located on the PreprocessorDiagram worksheet. The figure below has been rotated and reduced in size for display in the Users' Guide.

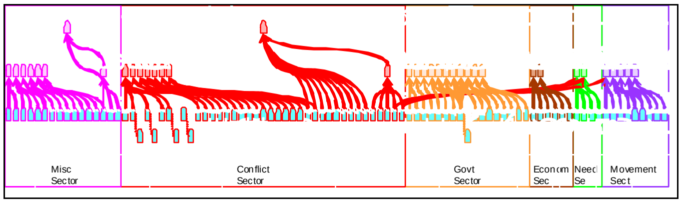


Figure 16-26. Sample Preprocessor logic diagram

16.1.24 PostprocessorNodes Worksheet

Figure 16-27 shows a section of the PostprocessorNodes worksheet where information on each of the nodes in the Postprocessor is collected. The Analysts' Guide contains more detail on this worksheet.

NodeID	NodeName	CalcSeq	NodeCalcType	SectorID	GroupID	Sheet	Notes	InfluenceNotes
1	Acceptable jobs are available	22		2	5			
2	Administration of justice is effective and fair	22		3	5			
3	Agricultural system is productive	22		2	5			
4	Armed forces are well structured	22		1	3			
5	Basic natural resource management is in place	22		6	3		two parts: infrastructure & govt/private management system; missing=-3, bad=-2, moderately bad=-1, fair=0, moderately good=1, good=2, excellent=3	

Figure 16-27. Section of the PostprocessorNodes worksheet

16.1.25 PostprocessorFromNodes Worksheet

Figure 16-28 shows a section of the PostprocessorFromNodes worksheet. Each node that passes values to another node is a FromNode and information about the node in this role is collected here. If there is a problem with the connection, it is described in the ConnectionProblem column. The Analysts' Guide contains more detail on this worksheet.

Nd#	From Node	From Val	Weight	WeightIsVariable	ValueIsMultiplier	ConnectionProblem
2001	56	-1.29352	1			OK
2001	2403	#N/A	1			Missing from ToNode sheet
2401	23	-0.43394	1			OK
2401	55	-0.42416	1			OK
2401	57	-0.33597	1			OK
2402	3	-0.27291	1			OK
2402	10	-0.7493	1			OK
2402	56	-1.29352	1			OK

Figure 16-28. Section of the PostprocessorFromNodes worksheet

16.1.26 PostprocessorToNodes Worksheet

Figure 16-29 shows a section of the PostprocessorToNodes worksheet. Each node that receives values from another node is a ToNode and information about the node in this role is collected here. If there is a problem with the connection, it is described in the ConnectionProblem column. The Analysts' Guide contains more detail on this worksheet.

Nd#	To Node	Inflate	Center	Val	InflateIsVariable	ConnectionProblem
2001	2501	1	0	-1.2935214		OK
2401	2901	1	0	-0.3980246		OK
2402	2404	1	0	-0.7719086		OK
2403	2404	1	0	-0.9454087		OK
2403	2404	1	0	-0.9454087		OK
2403	2404	1	0	-0.9454087		OK

Figure 16-29. Section of the PostprocessorToNodes worksheet

16.1.27 PostprocessorDiagram Worksheet

Figure 16-30 shows the diagram that is created for sample Postprocessor logic. It is located on the PostprocessorDiagram worksheet. The figure below has been rotated and reduced in size for display in the Users' Guide.

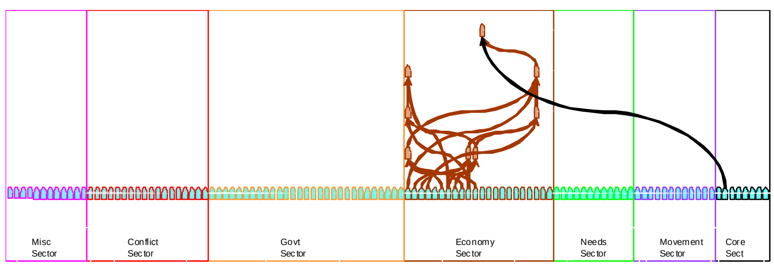


Figure 16-30. Sample Postprocessor logic diagram

16.2 PERFORMING THE UPGRADE

After you have saved the data and logic from an old set of workbooks and corrected any errors (re-saving, if necessary), you are ready to perform the upgrade. You will need to Close the ISSM Programs and restart the Controller. At this point, open Blank new-version Main, Preprocessor and Postprocessor workbooks. Click on the Import Data and Logic button. After the are-you-sure message, you will have to read the warning that you must select a file containing saved ISSM data – as opposed to some other type of ISSM file (Figure 16-31). This workbook will have the name "ISSMOutputxxxx.xls," where "xxxx" is the common part of the file names of the workbooks of your model. It should be in the same directory as the other workbooks of your model; however, if you did any directory changing (e.g., looking at other Excel files) prior to or during its creation, Excel may have saved it somewhere else.

Figure 16-31. File type warning

16.2.1 Import Use Cases

After you have found and selected the proper file, you must select among a set of options to control the import process. There are three use cases.

- Use Case 1: No Diamond related data or logic will be imported. The DiamondWorksheets will contain (possibly new) logic from the new version and the Preprocessor will contain the corresponding (possibly new) logic for all Diamond related variables. Non-Diamond related data and logic will be imported.
- Use Case 2: If possible, Diamond related data will be imported (other than the Diamond worksheets). The new versions of the Diamond worksheets will be retained and the new version of the Diamond logic and Diamond related variables will be retained. The user may have to perform several manual operations to relate his old data to the new logic. Non-Diamond related data and logic will be imported.
- Use Case 3: All Diamond related data and logic will be imported (including the Diamond worksheets). This will maintain all of the old data and logic as it was and will contain no new-version Diamond related variables or logic. Non-Diamond related data and logic will be imported.

The first question is whether you have Diamond related data and logic that you want to import (Figure 16-32). If you answer "No" the import process will proceed with no further questions.

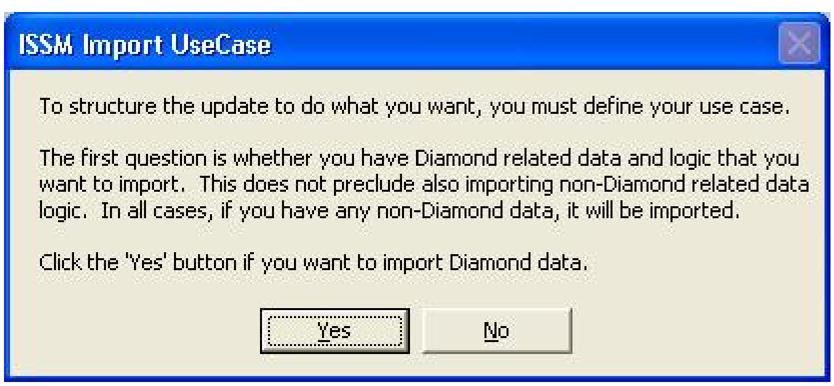


Figure 16-32. Use case first question

If you answer "Yes" the second question is whether you want to use the (possibly) new Diamond related logic or use your old Diamond related logic (Figure 16-33). In either case the import process will proceed with no further questions.

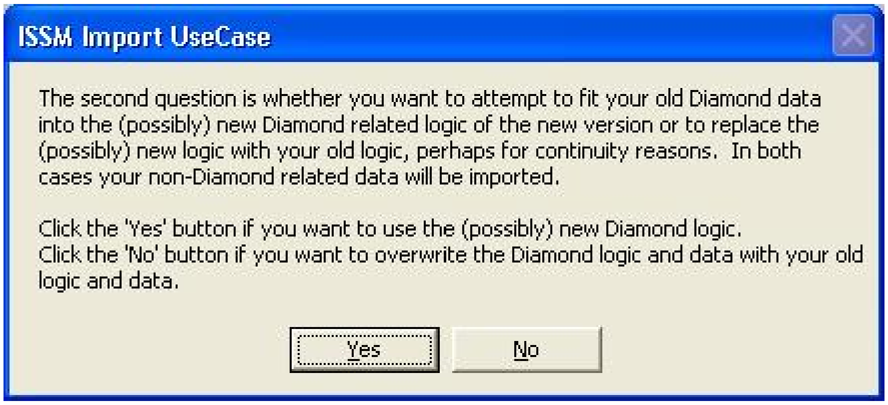


Figure 16-33. Use case second question

When the importing process is finished (with no errors), you will have a set of [Read-Only] workbooks with prefaces indicating the type and version number and the suffix “Blank.” You will have the proper data in the User- and DiamondWorksheets in the Preprocessor and ISSM Main; however, the data are not connected to RawData and ExternalInputs, respectively. Use the Save ISSM Programs button to rename the workbooks and save them to the desired directory. This will allow you to recover from any errors without having to re-import the data.

16.2.2 Error Messages

If errors were found during the import process, an on-screen message will be shown (Figure 16-34) to that effect.

Figure 16-34. Errors have been found message

Table 16-3 - Table 16-6 contain the error messages that may be generated by the Import Data & Logic button, both messages that show on the screen and messages in the Errata worksheet of the “Output” workbook.

Table 16-3. Controller Import Data & Logic Error Messages (part 1)

Message	What it means	What to do
Messages have been added to the Errata sheet in the Output workbook.	Error or information messages were generated and placed on the Errata sheet.	Look at the Errata sheet (in the Output workbook) to find out what the messages say. Then correct any errors and re-run save data & logic.
No file was opened.	You did not select a file designated (by naming convention) as an ISSM save data & logic output file.	Try it again.
Not all of your workbooks are shown as blank. Normally, you will only want to import data into blank workbooks. Importing data into populated workbooks will have unpredictable results. Do you wish to import data into the workbooks you have open?	At least one of your three workbooks doesn't have "Blank" as part of its name.	Use the cancel button; close your current workbooks; open blank workbooks; and import your data & logic.
Of the 18 required worksheets in an ISSMOutput file, only nn were found. Either the worksheet names have been changed or this is not a proper ISSMOutput file.	The file you selected does not have the sheets with the proper names for an ISSM save data & logic output file.	Try it again with a different file.
The Main DiamondWorksheet was not copied to the new workbook. You will need to manually copy the data from the MainDiamondWorksheet to the new DiamondWorksheet in Main.	The use case you selected prevents copying the old Main DiamondWorksheet into the new set of workbooks. Normally this will be done to prevent the loss of new logic in the DiamondWorksheet.	If you want to preserve your old data, use the Excel copy sheet method to place a copy of the old worksheet in the new workbook. Copy the relevant data, then delete the extra worksheet.
The new Scale Factor for node nnn is (newvalue) and the old model has a value of (oldvalue).	The new version has a default Scale Factor value that is different from the value you had in the old version.	Either use the new version Scale Factor value (generating different results from your old model) or replace the new value with your old value.
The new Standard VariableInflate model has nnn lines and the old model has mmm lines.	This may mean that the new ISSM version has additional reversible and variable inflator connections.	You may have additional inputs that were not previously available to consider with the new version.
The new Standard VariableInflate value for node (FromNode) to node (ToNode) is (newvalue) and the one you have been using is (oldvalue). To continue using the old value, you must manually put it into all of the dated columns as VariableInflate values for this node pair.	The default variable inflator value has been changed.	You may use the new default value (which will generate different results from those of your old model) or you may use the old default value by specifically setting that value for all dates.
The new Start Point for node nnn is (newvalue) and the old model has a value of (oldvalue).	The new version has a default Start Point value that is different from the value you had in the old version.	Either use the new version Start Point value (generating different results from your old model) or replace the new value with your old value.
The old node number, nnn, has been converted to mmm on worksheet (sheet). This may affect either the UserWorksheet or the DiamondWorksheet.	Node numbers are changed for several reasons; however, all occurrences should be changed, except any on the UserWorksheet or DiamondWorksheet.	Manually change all occurrences of nnn to mmm on the UserWorksheet and DiamondWorksheet.
The Preprocessor DiamondWorksheet was not copied to the new workbook. You will need to manually copy the data from the PreprocDiamondWorksheet to the new DiamondWorksheet in Main (should be Preprocessor).	The use case you selected prevents copying the old Preprocessor DiamondWorksheet into the new set of workbooks. Normally this will be done to prevent the loss of new logic in the DiamondWorksheet.	If you want to preserve your old data, use the Excel copy sheet method to place a copy of the old worksheet in the new workbook. Copy the relevant data, then delete the extra worksheet.
There are two nodes in the Postprocessor Custom MOM range (2501-2900) with the same NodeID. This is a fatal error. Processing will stop.	The program has found two nodes with the same node number, but different node names.	Look in the Errata sheet to find the node number. You will have to check your logic to see what the problem is.
There are two nodes in the Postprocessor Custom Output range (2001-2400) with the same NodeID. This is a fatal error. Processing will stop.	The program has found two nodes with the same node number, but different node names.	Look in the Errata sheet to find the node number. You will have to check your logic to see what the problem is.

Table 16-4. Controller Import Data & Logic Error Messages (part 2)

Message	What it means	What to do
There are two nodes in the Postprocessor Input range (1-1000) with the same NodeID. If this is due to changing the wording in the new version, you do not need to do anything. Otherwise, you have a problem that needs manual attention.	The program has found two nodes with the same node number, but different node names. The new node name will be used.	Look in the Errata sheet to find the node number. Check to see if the new node name is just a variant of the old name. If it is not, then you will have to check your logic to see what the problem is.
There are two nodes in the Postprocessor standard MOM range (2901-2999) with the same NodeID. This is a fatal error. Processing will stop.	The program has found two nodes with the same node number, but different node names.	Look in the Errata sheet to find the node number. You will have to check your logic to see what the problem is.
There are two nodes in the Postprocessor standard output range (2401-2500) with the same NodeID. This is a fatal error. Processing will stop.	The program has found two nodes with the same node number, but different node names.	Look in the Errata sheet to find the node number. You will have to check your logic to see what the problem is.
There are two nodes in the Preprocessor Custom Input range (1101-1400) with the same NodeID. This is a fatal error. Processing will stop.	The program has found two nodes with the same node number, but different node names.	Look in the Errata sheet to find the node number. You will have to check your logic to see what the problem is.
There are two nodes in the Preprocessor Custom Middle range (1501-1900) with the same NodeID. This is a fatal error. Processing will stop.	The program has found two nodes with the same node number, but different node names.	Look in the Errata sheet to find the node number. You will have to check your logic to see what the problem is.
There are two nodes in the Preprocessor Diamond Input range (1401-1500) with the same NodeID. This is a fatal error. Processing will stop.	The program has found two nodes with the same node number, but different node names. These both are in your old workbook.	Look in the Errata sheet to find the node number. You will have to check your logic to see what the problem is.
There are two nodes in the Preprocessor Diamond Middle range (1901-1999) with the same NodeID. This is a fatal error. Processing will stop.	The program has found two nodes with the same node number, but different node names. These both are in your old workbook.	Look in the Errata sheet to find the node number. You will have to check your logic to see what the problem is.
There are two nodes in the Preprocessor Expert Input range (1001-1100) with the same NodeID. If this is due to changing the wording in the new version, you do not need to do anything. Otherwise, you have a problem that needs manual attention.	The program has found two nodes with the same node number, but different node names. The new node name will be used.	Look in the Errata sheet to find the node number. Check to see if the new node name is just a variant of the old name. If it is not, then you will have to check your logic to see what the problem is.
There are two nodes in the Preprocessor Output range (1-1000) with the same NodeID. If this is due to changing the wording in the new version, you do not need to do anything. Otherwise, you have a problem that needs manual attention.	The program has found two nodes with the same node number, but different node names. The new node name will be used.	Look in the Errata sheet to find the node number. Check to see if the new node name is just a variant of the old name. If it is not, then you will have to check your logic to see what the problem is.
There is a new Postprocessor input node with NodeID nnn. You may want to consider it.	The new version has a new variable that is available from ISSM Main.	You may want to use this new variable in some custom logic.
There is a new Postprocessor standard MOM node with NodeID nnn. It is not allowed and will not be added.	Your old data has a node with a node number that isn't allowed.	You may want to use a different node number.
There is a new Postprocessor standard output node with NodeID nnn. It is not allowed and will not be added.	Your old data has a node with a node number that isn't allowed.	You may want to use a different node number.
There is a new Preprocessor Diamond input node with NodeID nnn. You will have to create new data to feed it.	The new version probably has a new DIAMOND input node.	You will have to create new data to address the new node.
There is a new Preprocessor Diamond middle node with NodeID nnn. You will have to create new data to feed it.	The new version has a new DIAMOND middle node.	The new middle node may also have new input nodes that require data not in your old scenario.
There is a new Preprocessor expert input node with NodeID nnn. You will have to create new data to feed it.	The new version probably has a new output node (based on a new input node in the ISSM Main) and thus a new expert opinion node to feed it.	You will have to create new data to address the new expert opinion node.

Table 16-5. Controller Import Data & Logic Error Messages (part 3)

Message	What it means	What to do
There is a new Preprocessor output node with NodeID nnn. You will have to create new data to feed it.	The new version has a new output node (based on a new input node in the ISSM Main).	You will have to create new logic and data to address the new output node.
There is a node with NodeID > 1999. These numbers are reserved for the Postprocessor. This node will not be used. You must correct any problems manually.	You have created a node in the Preprocessor that has a node number larger than 1999.	You will have to renumber this node in your old workbook and rerun the save and the import processes.
There is a node with NodeID > 2999. These numbers are forbidden. This node will not be used. You must correct any problems manually.	You have created a node in the Postprocessor that has a node number larger than 2999.	You will have to renumber this node in your old workbook and rerun the save and the import processes.
To save data, you must have opened a complete set of three workbooks.	You do not have all three workbooks (Preprocessor, Main, & Postprocessor) open.	Before you import the data and logic, open whichever workbooks that are missing.
You are trying to add a new expert opinion node, NodeID nnn. This is not allowed.	You are not allowed to add a new expert opinion node.	Delete the offending logic.
You are trying to add a new output node, NodeID nnn. This is not allowed.	You are not allowed to add new output nodes because you cannot add the corresponding input nodes to ISSM Main.	Delete the offending logic.
You had a Postprocessor input node with NodeID nnn. It is no longer produced by ISSM Main.	The new version no longer has this variable.	If you use this variable in your custom logic, you will have to remove it.
You have an invalid NodeID, nnn.	You have created a node in the Preprocessor that has a node number larger than 1999 or in the Postprocessor with a node number larger than 2999.	You will have to renumber this node in your old workbook and rerun the save and the import processes.
You have introduced a new Preprocessor Diamond input node with NodeID nnn. It may not be automatically added; you may have to do this manually.	This DIAMOND input node is not in the new version.	Check to see if it was automatically added. If not, you will have to add it manually.
You have introduced a new Preprocessor Diamond middle node with NodeID nnn. It may not be automatically added; you may have to do this manually.	This DIAMOND middle node is not in the new version.	Check to see if it was automatically added. If not, you will have to add it manually.
You have introduced a new Preprocessor expert input node with NodeID nnn. It will not be automatically added; you must do this manually.	If an old Preprocessor output was deleted in the new version, the expert input node would also have been deleted. Alternatively, you may have created an additional expert input node for an existing output that is not included in the new version.	If you created an additional expert input node, you will have to add it to the new version manually.
You have introduced a new Preprocessor output node with NodeID nnn. It will not be automatically added; you must do this manually.	The new version does not have an output node corresponding to one in your old data. This may be an error in numbering or the new version may have removed an old output.	This has an indeterminate solution.
You have two nodes with NodeID nnn.	The program has found two nodes with the same node number, but different node names. The new node name will be used.	Look in the Errata sheet to find the node number. Check to see if the new node name is just a variant of the old name. If it is not, then you will have to check your logic to see what the problem is.
You will have to manually import the Preprocessor Diamond logic. There are nodes or connections in the old file that do not exist in the new version. This situation is too complex for automatic processing.	You selected automatic processing; however, the program can't handle the situation.	You are going to have to manually create the logic in the new workbook.

Table 16-6. Controller Import Data & Logic Error Messages (part 4)

Message	What it means	What to do
Your old Preprocessor had the center value to ToNode nnn from Node mmm on worksheet (logicsheet) set at (oldvalue), but the corresponding weight (should be center value) in the new model is (newvalue).	The center value in the new version is different from the center value in the old version.	Either use the new version center value (generating different results from your old model) or replace the new center with your old center.
Your old Preprocessor had the inflate value to ToNode nnn from Node mmm on worksheet (logicsheet) set at (oldvalue), but the corresponding weight (should be inflate value) in the new model is (newvalue).	The inflate value in the new version is different from the inflate value in the old version.	Either use the new version inflate value (generating different results from your old model) or replace the new inflate with your old inflate.
Your old Preprocessor had the weight value from FromNode nnn to Node mmm on worksheet (logicsheet) set at (oldvalue), but the corresponding weight in the new model is (newvalue).	The weight in the new version is different from the weight in the old version.	Either use the new version weight (generating different results from your old model) or replace the new weight with your old weight.
Your old Preprocessor has a node that is not in the Preprocessor, nnn.	This node (may be a fromnode or a tonode) is not present where it should be.	Search your logic.
Your old workbook had the center value from ToNode nnn from Node mmm on worksheet (LogicSheet) set at (oldvalue), but the corresponding weight (should be center value) in the new model is (newvalue).	The new version has a center inflate value from that of the old version. This will cause different results to be calculated.	You may use the new center value or replace it with your old value.
Your old workbook had the inflate value from ToNode nnn from Node mmm on worksheet (LogicSheet) set at (oldvalue), but the corresponding weight (should be inflate value) in the new model is (newvalue).	The new version has a different inflate value from that of the old version. This will cause different results to be calculated.	You may use the new inflate value or replace it with your old value.
Your old workbook had the weight value from FromNode nnn to Node mmm on worksheet (LogicSheet) set at (oldvalue), but the corresponding weight in the new model is (newvalue).	The new version has a different weight value from that of the old version. This will cause different results to be calculated.	You may use the new weight value or replace it with your old value.

16.2.3 Cleaning Up the Imported Workbooks

In use cases 1 and 3, once any errors have been corrected, the user should only have to use the Connect/Disconnect control to reset the connections between the User- or Diamond- worksheets in the Preprocessor and ISSM Main, reset the date and axis controls in each of the workbooks, and make sure the desired use of interventions is correctly selected. Then each workbook should be recalculated.

For Use Case 2 some manual operations on the DiamondWorksheets will be required prior to performing the steps of the paragraph above. In this case, the user's original model has potentially different logic and data from that in the new version that the user wishes to retain, but must manually transfer to the new version. The operations with respect to the DiamondWorksheet of the ISSM Main are relatively straightforward, as compared to those for the Preprocessor. This is because the nodes that will be output from the DiamondWorksheet of the ISSM Main are constrained to be only the ExternalInputs. In the ISSM Main's DiamondWorksheet, the user simply adds the rows from the top half of his old worksheet and decides which connections to make in the lower half of the worksheet and what to do about any new ExternalInputs nodes.

In the Preprocessor's DiamondWorksheet, the problem is more difficult as the outputs from the DiamondWorksheet are variable, depending on the logic implemented in the preprocessor. The user will have to create for himself an understanding of the complete new logic and his old logic. Then the user must create a plan to merge the two sets of logic. Once this plan is complete, the user should use the process described in Section 7 to implement the changes.

17. VALIDATION TEST RESULTS

17.1 VALIDATION DEFINITIONS

The Military Operations Research Society (MORS) developed definitions which are incorporated into DODI 5000.61, DoD Modeling and Simulation (M&S) for verification, validation and accreditation (VV&A):

Verification is the process of determining that a model implementation accurately represents the developer's conceptual description and specifications.

Validation is the process of determining the degree to which a model is an accurate representation of the real world from the perspective of the intended uses of the model.

Traditionally verification and validation are considered separate processes. However, many verification tests will shed light on the validity of a model and many validation procedures will verify (or not) some part of the model. Further, there are some elements for which the line between the two is not very clear. The following information is presented in the spirit of disclosure of V&V, rather than slavish adherence to precise demarcation.

17.2 INTENDED USES

Notice that the definition of validation includes the phrase, "from the perspective of the intended uses of the model." Thus, the ISSM must be "validated" for a use or set of uses. As a practical matter, complete validation is impossible for most military and OOTW models. However, implementing a validation process is possible.

The purpose of the ISSM is given in the Users' Guide as follows:

The ISSM is

- a political, military, economic, societal, information, & infrastructure (PMESII) model
- that supports measuring, tracking, projecting and understanding the status of Diplomatic, Information, Military, and Economic (DIME) interventions
- in any phase of conflict and throughout the transitions of the phases.

While the ISSM can track situations through a combat phase, its principal utility lies during the non-combat phases, particularly in the area of Operations Other Than War. The OOTW taxonomy shown in Figure 17-1 is useful in further defining the intended uses of the ISSM. Because OOTWs are conflicts (sometimes against nature) that are not combat driven, the central feature of combat models, i.e., attrition, must assume a minor role in any simulation of OOTW. Certainly, the other features of combat models, logistics, command and control, and transportation, fill relatively more important roles, with the decline of attrition; however, there are other features that are often much more significant. Even where the conflicts are against nature, human nature may impede the mechanical delivery of relief (transportation and logistics). In peace operations, human nature, in the form of factional dislikes, hatreds, etc., is the battleground. Most OOTWs are combinations of the types shown in the taxonomy in Figure 17-1. An OOTW model must represent some of the impacts of human nature on operations.

Another useful dimension of "use" examines the set of uses for modeling and simulation: acquisition, analysis, planning, testing, training, and experimentation. A straightforward reading of the purpose above clearly states a use in the planning of actual operations. By substituting some simulation of reality for the progression of events in the real world, the purpose also states a use in analysis. This same simulation plus ISSM pairing can also be used in some parts of experimentation and in the training of senior leaders.

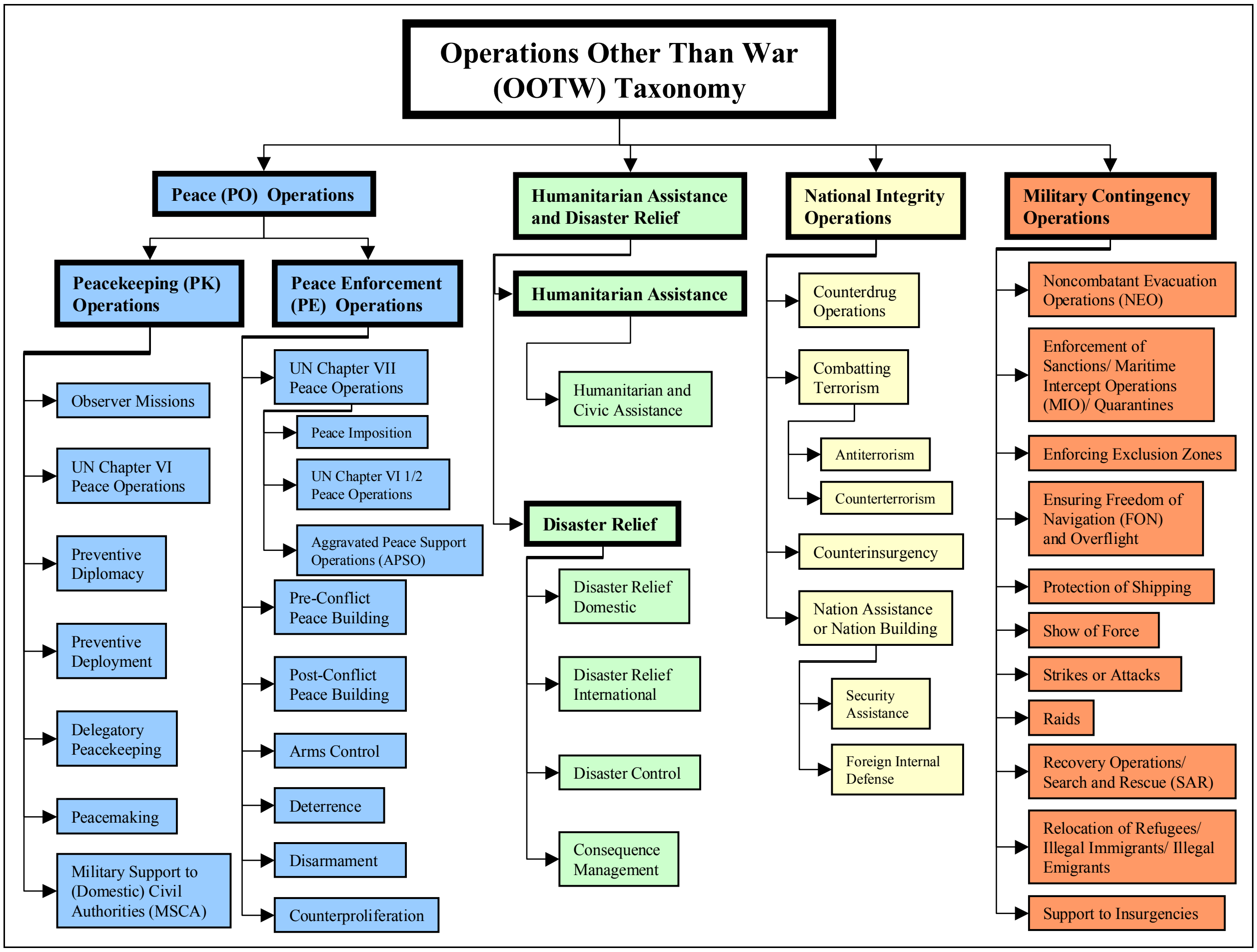


Figure 17-1. OOTW taxonomy

17.2.1 OOTW Elements

As an initial step in evaluating the situations that an OOTW model could or should handle, four categories containing a total of 29 elements were defined.

The first category consists of Humanitarian Assistance (HA) Actions:

- Care for refugees
- Handle medical problems
- Move refugees to camps
- Perform engineering functions
- Resettle refugees
- Set up refugee camps

The second category consists of Information Actions

- Collect & assess refugee information

- Gather general information
- Report on refugee issues

The third category consists of Military Actions:
- Deal with roadblocks
- Find & collect or canton weapons
- Interpose forces between factions
- Perform policing actions
- Provide area security

The fourth category consists of Model Elements:
- Represents economy
- Represents factions
- Represents human needs
- Represents justice system
- Represents local forces
- Represents local government
- Represents man-made environment
- Represents media
- Represents multi-national forces
- Represents natural environment
- Represents NGO/PVO/IO
- Represents opinions of population
- Represents plans/intentions/missions/orders
- Represents refugees
- Represents relationships among actors

17.2.2 Scenarios

A second step in evaluating an OOTW model consists of determining the richness of the scenario that the model can instantiate. Instantiating a scenario includes the following:

- successful incorporation of the appropriate OOTW elements,
- successful interactions among the elements,
- adequate definition (detail),
- adequate scope (size),
- reasonable data requirements, and
- reasonable run-time.

The first two requirements relate to the technical ability to actually model an OOTW scenario. The second two relate to potential restrictions on which OOTWs that can be modeled, due to either inadequate granularity or inability to model large operations. The final two requirements belong in validation because of the phrase, "from the perspective of the intended uses of the model," in the definition of "validation."

17.3 ISSM VALIDATION RESULTS

The ISSM is not a simulation. It is basically an inference model, in which inferences on the current status of a region are calculated based on the input of certain observable factors. Version 1.6 of the ISSM was the primary version examined. Version 2.0 was used for some of the SME validation work. Version 3.0 had not yet been introduced.

17.3.1 Methodologies

The basic methodologies of the ISSM are straight forward and present no validation problems. The questions that have to be answered concern the validity of the inference connections that are contained in the model.

17.3.1.1 Mathematical Precision

It must be assumed that a user will make errors in choosing input values. The topic of precision addresses the amount of output error that would be expected for a given amount of input error. Thus, if the amount of input error can be bounded, then the output error can be bounded. Then any change in output that is greater than the expected output error can be attributed to a real change in conditions.

Simplified Calculations: Mathematically, the ISSM is a modified weighted average of its inputs. Therefore, we begin the precision analysis with the simplest case, that of an equal-weighted average of 34 inputs, representing the 34 Internal Input variables. Suppose that the situation is such that the correct inputs are all zero, then the correct (output) average would also be zero. If the user makes an error of size 1.0 in one of the inputs (selecting either a 1.0 or a -1.0 for that input), then the output would be either 0.029 or -0.029. The output error would be the absolute value, since the direction is immaterial, or 0.029.

In general, we would expect some error in each input, with a random direction of the errors (some inputs too large and some too small). The mathematics for computing a bound for the output error involve the computation for all of the combinations of ways that errors can be made. For example, if all but two inputs have a -1.0 error and the other two have a +1.0 error, there are 561 different sets of inputs that could show this pattern, whereas there are 5984 combinations with three +1.0 errors and 31 -1.0 errors.

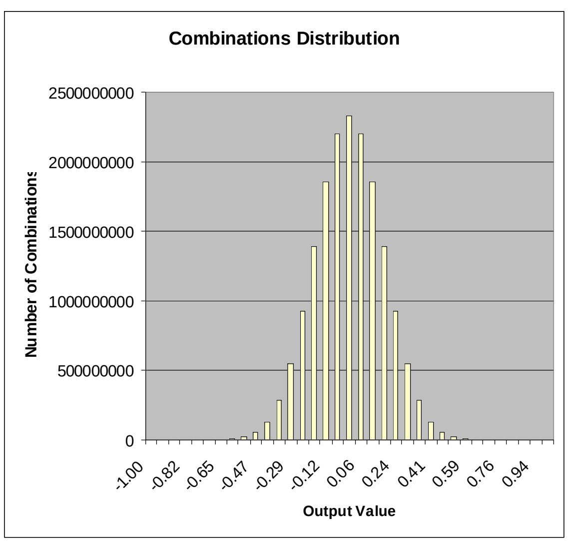


Figure 17-2. Distribution of combinations of errors

Figure 17-2 shows the results of this computation. Each bar represents the number of combinations for a particular number of positive errors, ranging from zero to 34. In this case, it is assumed that all of the other inputs have negative errors, ranging from 34 to zero in number. In the figure, the number of reversed negative errors is replaced by the output average that will result from the appropriate combination of positive and negative errors. For example, two positive errors and 32 negative errors sums to -30.0, which when divided by 34 yields the average (output value) of -.88.

The standard deviation of the output results is computed by summing the squares of each possible output, dividing by the total number of possible outputs, and taking the square root. In this case, the word "possible" means that the number of combinations for each of the values that the average can achieve is the number of "possible" outputs with that value. For an input error bound of 1.0, the standard deviation is 0.171. Twice the standard deviation (0.343) gives a bound, within which 95% of all results should fall. Given the anchoring values, it is likely that an experienced user should be able to achieve correct results within ±0.5. In this case, the 95% output band would be ±0.171. This means that any change in the output results larger than this, e.g., 0.2, should be considered a real change in the output variable results.

Figure 17-3 illustrates this concept. In this example, five inputs have values that are +1.0 higher than all the others. This is just barely sufficient to raise the average 0.171 higher than it would be if all the inputs were zero. The significance is two-fold. First, the outputs are not so sensitive to exact input values that a few errors would make the output unusable. Second, the visual cues that indicate changes in the output give a fair representation of the underlying situation.

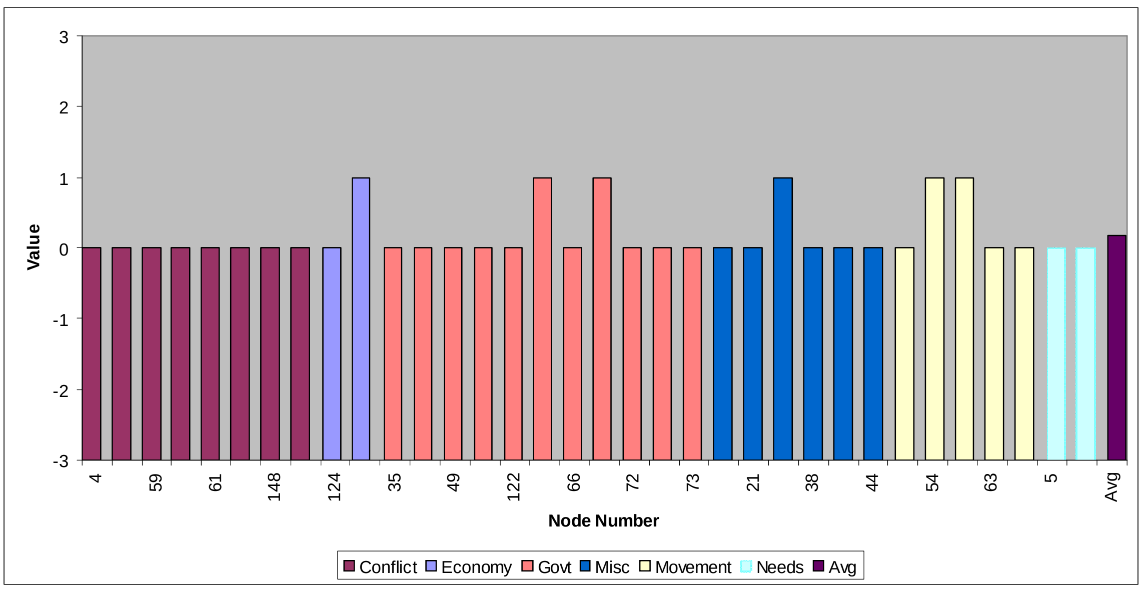


Figure 17-3. Example of simplified (unweighted average) impact of input differences

It should be noted that this computation yields an outside bound for the output because actual errors should have a range within the input error bounds and not always result in the maximum absolute value. Taking this factor into account yields a 95% output error bound of ±0.086 for an input error bound of ±0.5.

More Complex Calculations: The ISSM is not an unweighted average, but more nearly a weighted average. Some input differences have more impact than others because some inputs are more important than others. Figure 17-4 charts the values for the ISSM output when all input nodes are set at zero except for the node being charted, which is set at +1.0. External inputs are not used in this situation and the values have been adjusted for the output value of the zero point (all inputs set at zero).

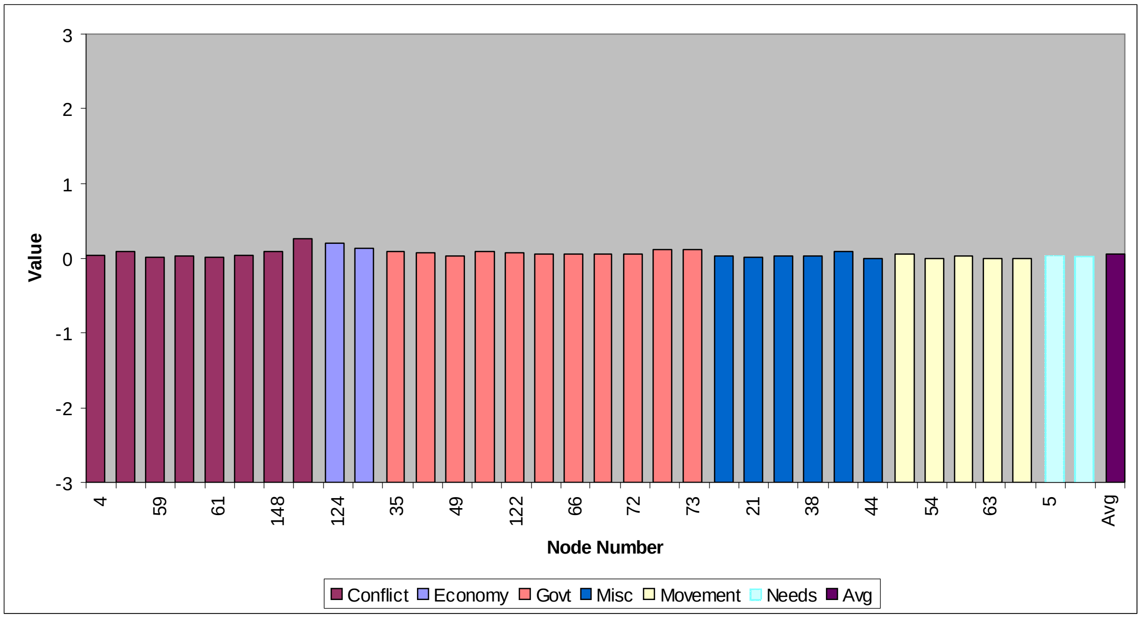


Figure 17-4. ISSM output variation for unit input variation

The average change in the output value is 0.061, as compared to the average change of 0.0294 in the unweighted average model above. Creating an exact calculation in the manner that was done for the simple model would be exceedingly complex. However, an approximate result can be obtained by dividing the standard deviation by the simple model average and multiplying by the actual ISSM average. This yields an expected 95% output bound of ±0.178 for an input error of ±0.5.

When we use the external inputs, the sheer number of inputs dilutes the impact of errors in precisely the same way the 34 inputs did for the internal inputs. It is much more difficult to quantify the error when the external inputs are included because the number that are actually used will be scenario dependent. However, as the total number of inputs approaches 100 (about 90% of the possible inputs) the 95% output bound will drop to about ±0.10.

17.3.1.2 Initial validity

The basic methodology for the ISSM is taken from the result of a series of workshops by people knowledgeable in the area of OOTWs. This fact supplies a base level validity to the methodology and the model parameters.

Unfortunately, several changes from the original assumptions reduce the applicability of this validation:

- the original model was built on a particular scenario, not a generalized OOTW representation;
- the original model was built as a set of inferences built from observables, creating a potential difference with the current interpretation;
- the original model could not be precisely replicated in Excel;
- the conversion itself to Excel may have introduced errors;
- new factors were introduced into the model to handle situations not present in the original model;

- a new mode, consisting of external intervention factors, was added to the model;
- new logic, in the form of pre-processing of new observables, was added to the model; and
- new logic, in the form of post-processing of new outputs, was added to the model.

17.3.1.3 Mathematical Accuracy

Precision corresponds to correctness in measuring whatever is being measured. We have seen that whatever it is that the ISSM measures, it does it fairly precisely. Accuracy corresponds to measuring the right thing. A priori, we have no way of knowing what it is that the ISSM measures. The previous section, Initial Validity, discusses reasons for believing that the ISSM measures what it purports to measure. This section is concerned with estimating how closely the ISSM actually comes to measuring this ideal value.

It helps to start with the presumption that the ISSM approximates the desired measurement. This means that we assume that some error exists and that we want to quantify that error, rather than show that there is no error at all.

The first approximation to the correct formulation is the identification of the factors that are relevant to the desired ISSM output. If we start with the 34 internal inputs, using an unweighted average as the first approximation, we can compare this to a second approximation, which consists of the ISSM internal inputs with the ISSM logic. We will assume that the second approximation is an improvement and examine the amount of difference between predictions by these two approximations.

Figure 17-5 is a graph of the difference between the two approximations. For each set of input values, the horizontal coordinate of the point in the graph is the average of the input values and the vertical coordinate is the ISSM output (with external inputs turned off). The difference between the Output values and the regression line varies between zero and 1.06 in absolute value, with a 95% confidence level at ±0.51. We read this as meaning that the first approximation has an error of ±0.51, as compared to the second approximation. We would expect a third approximation to have a smaller error.

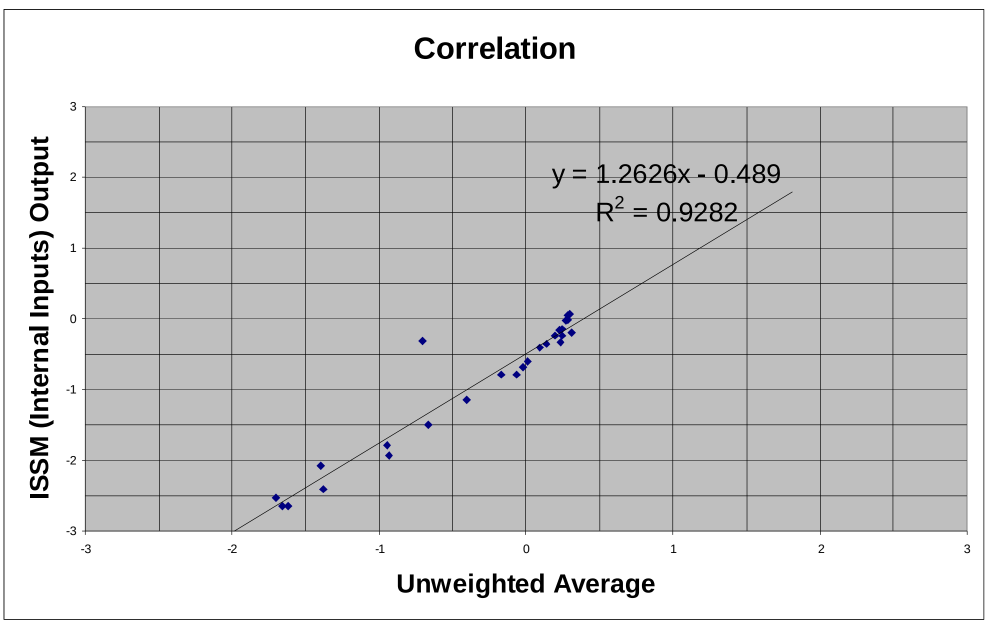


Figure 17-5. Comparing first and second approximations

The third approximation consists of adding the external input variables. Figure 17-6 shows the comparison between the second and third approximations. The difference between the Output with Interventions values and the regression line varies between zero and 0.61 in absolute value, with a 95% confidence level at ±0.37. We read this as meaning that the second approximation has an error of ±0.37, as compared to the third approximation.

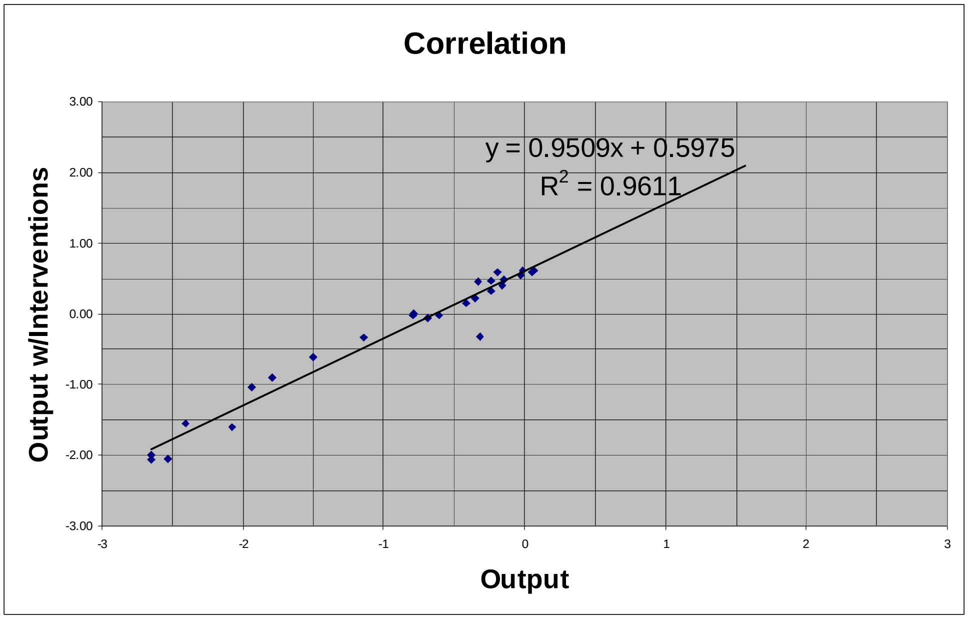


Figure 17-6. Comparing second and third approximations

From this improvement in approximations, we would project that any further improvement in the approximation would only yield an error for the third approximation of ±0.27. Thus, our estimate is that the ISSM, with external inputs, yields an error of about ±0.3, when compared to the ideal measure of Civil Stability and Durable Peace.

17.3.1.4 SME verification & validation of logic

The plan was for the SMEs to chase through the logic of the model, sector by sector, drawing out the logic connections. As each sector was completed, the SMEs would compare it to the picture of the network to see if it follows. Then the SMEs would discuss the logic of the connections. This plan was overtaken by events. Instead, the SMEs concentrated on the use of the ISSM to support a mock analysis in concert with DIAMOND.

17.3.2 Representation

The ISSM was specifically designed to represent the relevant factors of an OOTW. However, because it is basically static in nature, it cannot fully represent the dynamic nature of OOTWs. Also, it was designed to show the situation at a fairly high level, it does not represent many details of OOTWs.

17.3.2.1 OOTW Elements

Table 17-1 summarizes those factors that have been identified as relevant to OOTW **and for which it was thought that DIAMOND or the ISSM had some possible capability of representing**. As the table shows, the ISSM does have capabilities in many of the areas. However, it also does not represent those that involve details, such as road blocks, nor does it represent dynamic aspects, e.g., any of the factors beginning with verbs. The ISSM does represent many of the factors that DIAMOND does not handle well.

A newer version of the ISSM is being delivered that will increase the coverage of the factors, such as refugee care, medical problems, engineering projects, and weapons cantonment; however, it has not yet been tested.

Table 17-1. Representation of OOTW Elements by the ISSM

OOTW Representation	Category	ISSM
Care for refugees	Action HA	no
Handle medical problems	Action HA	no
Move refugees to camps	Action HA	no
Perform engineering functions	Action HA	no
Resettle refugees	Action HA	no
Set up refugee camps	Action HA	no
Collect & assess refugee information	Action Information	no
Gather general information	Action Information	no
Report on refugee issues	Action Information	no
Deal with roadblocks	Action Military	no
Find & collect or canton weapons	Action Military	no
Interpose forces between factions	Action Military	no
Perform policing actions	Action Military	no
Provide area security	Action Military	no
Represents economy	Model Elements	yes
Represents factions	Model Elements	yes
Represents human needs	Model Elements	yes
Represents justice system	Model Elements	yes
Represents local forces	Model Elements	yes
Represents local government	Model Elements	yes
Represents man made environment	Model Elements	represents infrastructure for economy and human needs
Represents media	Model Elements	represents unbiased media
Represents multi-national forces	Model Elements	only represents results of their actions
Represents natural environment	Model Elements	no
Represents NGOs/PVOs/IOs	Model Elements	only represents results of their actions
Represents conditions of population	Model Elements	yes
Represents plans/intentions/missions/orders	Model Elements	represents campaign plan of aid
Represents refugees	Model Elements	yes
Represents relationships among actors	Model Elements	no

17.3.2.2 Scenario

The ISSM has shown its ability to represent several OOTW scenarios, including ones set in Afghanistan and Iraq. In the Iraq scenario, the food delivery/non-delivery data from DIAMOND were used as inputs in creating ISSM scenario variants. The combination of the two models proved very successful. Overall, the requirements were met in that there was

- successful incorporation of the appropriate OOTW elements,
- successful interactions among the elements,
- adequate definition (detail),
- adequate scope (size),
- reasonable data requirements, and
- reasonable run-time.

17.4 CONCLUSIONS

The main conclusion was that the ISSM has not exhibited any validity problems that would preclude its use in analysis, planning, experimentation, or training. Its uses for acquisition and testing were not investigated. This should be regarded as a weak conclusion, as the examination should be characterized as "initial," not "thorough," and certainly not "definitive."

A secondary conclusion was that the ISSM and DIAMOND models showed some complementarity in their strengths and weaknesses. As a result, together they provide a more comprehensive representation of OOTW factors than either does alone.[4, 5]

[4] Senko, Robert M, *Military Operations Other Than War (MOOTW): Flexible Asymmetric Simulation Technologies (FAST) Prototype Toolbox: Verification Strategy and Plan*, Dynamics Research Corporation, Vienna, VA, August 2005.

[5] Hartley, Dean S., III, *Military Operations Other Than War (MOOTW): Flexible Asymmetric Simulation Technologies (FAST) Prototype Toolbox: FY05 Validation Strategy and Plan*, Dynamics Research Corporation, Vienna, VA, December 2005.

INDEX