

Appendices

1. Software used

ArcGIS

ArcGIS is a geographic information system (GIS) used for creating and using maps, compiling geographic data, analyzing mapped information, sharing and discovering geographic information, using maps and geographic information in a range of applications, and managing geographic information in a database. The system provides an infrastructure for making maps and geographic information available throughout an organization, across a community, and openly on the Web. In the model, ArcGIS is used for pre-processing of the DEM, land cover data, hydrology data and industrial data. Moreover, it is used for post-processing all the results, i.e. hazard maps, risk maps.

TUFLOW

TUFLOW is a computer program for simulating depth-averaged, two and one-dimensional free-surface flows such as those that occur from floods and tides. TUFLOW was originally developed for modelling two-dimensional (2D) flows and stands for Two-dimensional Unsteady FLOW. However, it incorporates the full functionality of the ESTRY 1D network or quasi-2D modelling system based on the full one-dimensional (1D) free-surface St. Venant flow equations. TUFLOW incorporates two grid-based solvers; a CPU based second order semi-implicit solution often referred to as TUFLOW Classic, and a heavily parallelized first order explicit solver built for speed referred to as TUFLOW GPU.

For the purposes of the model, the 64-bit version of the single precision TUFLOW was used with a flow regime of non-uniform steady flows. Flood extents in the model were simulated using pure 2D simulation.

ELEMENTS

ELEMENTS is a standalone software application fully developed in-house by Aon's Impact Forecasting team. ELEMENTS is created in the C# programming language with SQL database support. ELEMENTS engine calculates potential losses using a Monte Carlo simulation approach combining exposure information, hazard information and vulnerability data. Regardless of the model, the primary level of results is losses per event, aggregated from sampled losses calculated

for individual risks. The event losses and even the samples forming them can be then processed and reported depending on the model type. There are scenario (historical) models dealing with individual events or their groups and probabilistic (stochastic) models concerned with the possible distribution of losses. Probabilistic models are either year-based models – assume clustering of events in predefined years – or event-based models – assume independence of events.

In the ELEMENTS interface various results are accessible. For probabilistic models these are the exceedance probability curves of loss distributions of the biggest loss in a year (OEP) and annual aggregate (AEP) loss. The average annual loss (AAL) and the standard deviation of the annual loss distribution are available as well. All these descriptors are based on the individual event losses, which are usually reported only for the scenario models.

2. Settings of flood risk analysis in ELEMENTS

The screenshot shows the 'Peril Details' step of the 'New Analysis Wizard'. The interface includes a breadcrumb trail at the top: 'Peril Details' (selected), 'Advanced Settings', 'Loss Computation', 'Return Period Settings', and 'Treaty Details'. Below the breadcrumb, there are three main selection areas: 'Select a Region' with a dropdown menu set to 'Thailand', 'Select a Peril' with a dropdown menu set to 'Flood', and 'Select a Model Suite' with a dropdown menu set to 'Impact Forecasting'. To the right of these dropdowns, there is a radio button labeled 'Flood Only' which is selected, and a small icon of a house with a blue wave below it. At the bottom of the window, there are 'Save' and 'Cancel' buttons.

Figure 1: Selection options in "Peril details"

The screenshot shows the 'Advanced Settings' step of the 'New Analysis Wizard'. The breadcrumb trail is: 'Peril Details', 'Advanced Settings' (selected), 'Loss Computation', 'Return Period Settings', and 'Treaty Details'. The 'Loss Computation Method' section has a dropdown menu set to 'Loss Cases' and a checked checkbox for 'Flood Only'. The 'Model Uncertainty' section includes a 'Number of Samples' input field set to '250', and three checked checkboxes: 'Include Damage Uncertainty', 'Generate Uncertainty report for samples', and 'Save sample records to database'. The 'Breakouts' section is a table with two columns: 'Breakouts' and 'PML/EL AAL'. The 'Breakouts' column lists various categories with checkboxes, and the 'PML/EL AAL' column has two columns of checkboxes. The categories listed are: State/Province, County, District, CRESTA, Postal Code, Location, Line of Business, Coverage, Account, User Defined Coverage, and Treaty. Below this table is the 'Optional Settings for Breakouts' section with a checked checkbox for 'Calculate AEP'. 'Save' and 'Cancel' buttons are at the bottom.

Figure 2 Advanced settings

The screenshot shows the 'Loss Computation' step of the 'New Analysis Wizard'. The breadcrumb trail is: 'Peril Details', 'Advanced Settings', 'Loss Computation' (selected), 'Return Period Settings', and 'Treaty Details'. The 'User Custom Damage Functions' section has a dropdown menu set to 'Custom Damage Functions', a 'Group:' input field, and a 'Set:' input field with a 'View Custom Damage Function Info' button. The 'Parameter Adjustment' section has two columns: 'Primary Peril' and 'Secondary Peril'. Each column has a 'Group:' input field, a 'Set:' input field, and a 'View [Primary/Secondary] Parameter Adjustment Info' button. 'Save' and 'Cancel' buttons are at the bottom.

Figure 3: Selection options in "Loss computation"

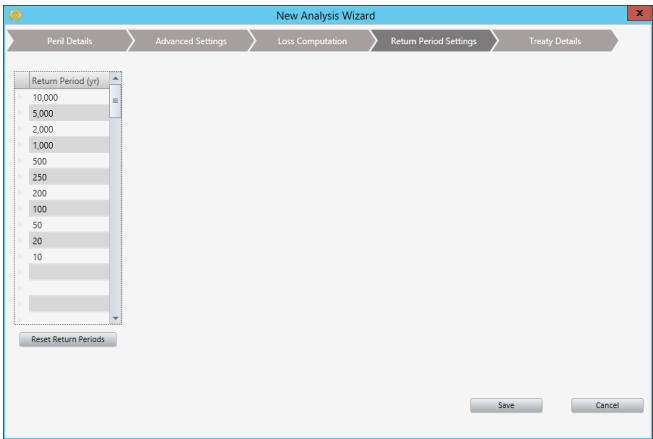


Figure 4: Return period settings

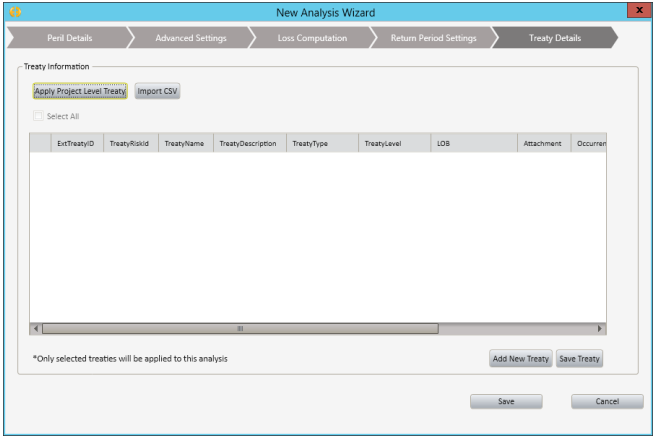


Figure 5: Treaty Details