Technical Guide

for

Climate Change Impact Modeling Tool

Version 1.0

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Introduction

Climate Change Impact Modeling Tool (CCIMT) is a browser based application software which is used to do mathematical calculations in order to forecast the climate change impact on different materials used for port structures under different climate models.

The key input variables the system accepts are the Location, Carbon Emission Scenario, Climate Futures Model, Year and the properties of the construction material, which are specific for each construction material type. The system generates a number of graphs as the main output according to the input variables provided.

Architectural/Technical Design Overview

CCIMT is developed based on Microsoft.NET platform using ASP.NET web technologies. The application consists of a single presentation layer. There is no business layer or a data access layer as a database is not involved for the application.

Several Microsoft Office Excel documents are used to process the mathematical calculations and logics. Inputs captured through the presentation layer are organized and passed to the Microsoft Office Excel document. The Excel document processes these data and output results. Excel handles this process by using pre-defined formulas and macros. The application reads the outputs from the Excel worksheets and displays the results by plotting the graphs in the user interface. There is a special JavaScript library that is used to plot these graphs.

The user interfaces and the input data capturing process workflow are designed as a wizard. The application requests inputs from the user and navigates to the next section. Finally, it renders the graph outputs and also allows the user to download the results in Microsoft Excel format.

Excel Templates

There are 3 port locations (Gladstone, Port Kembla and Sydney) referenced in the system and 3 material types used - Concrete, Timber and Steel. Thus, there are 9 separate Excel Templates used in the system to support all the Location-Material combinations (i.e. for each material type, there is a separate Excel template corresponding to each location).

The formats of these templates differ across the material types, but do not differ across the locations in relation to a specific material type. Only the data in the coefficients tabs are different. In order to reduce complexity, the system maintains different templates for different locations corresponding to a material type.
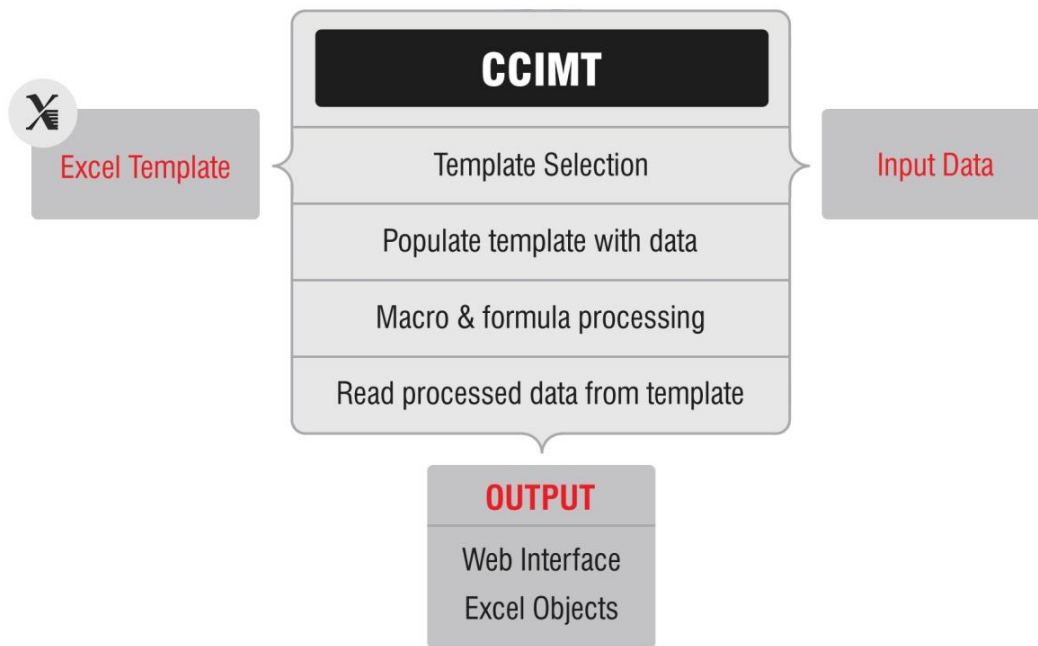
Data Operations with Excel Templates

The system never updates these Excel templates. It always takes a copy from the relevant template, reads the data, updates the copy and reads the output from the updated copy of the template. As a result the original templates remain unchanged. The relevant template to use is decided according to the material type and location combination selected by the user.

All the data loaded to the tables in the material properties screen are directly referenced from the coefficients tab in the Excel template. When the data in the tables of this material properties screen are edited and saved, the changes will be updated to the copy of the template. These changes will only be reflected in the current session. During subsequent sessions, the data is read from the original templates so any changes done to property values during previous sessions will not be applicable.

The structure definitions page is the main data input section in the system. The output is created against the input (structure) records entered through this section. Separate copies of the updated template are generated as per the number of records entered through this section. The physical Excel files and the graph tabs are named by the asset code of each record.

When generating the output, the system creates a directory in *<application folder>\content\objects* named under a unique ID and copy the relevant template into that directory. A separate file is created for each record entered through the structure definitions section and named by the asset code.

Technology Overview

- Application is developed on **Microsoft.NET** platform using **ASP.NET**.
- **Microsoft.Office.Interop.Excel.dll** is used to develop the interactions with Excel files/templates.
- **Jqplot** JavaScript library is used for graph plotting.

Source Code Structure
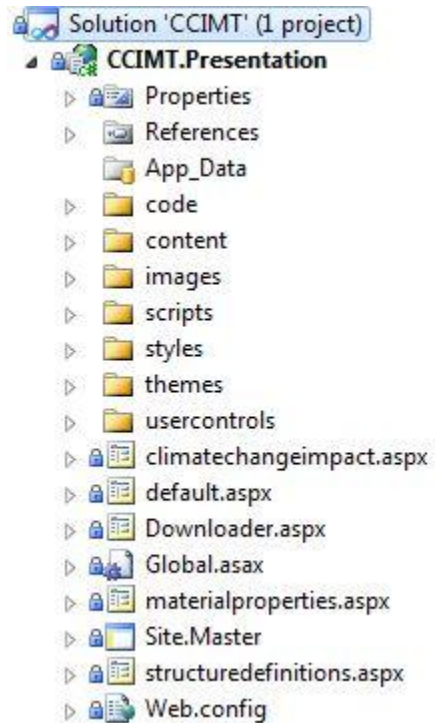
Deployment/Hosting

The application should be hosted in a web server having the following pre-requisites:

Software

- Operation System : Windows Server (Tested on Windows Web Server 2008 R2)
- Microsoft .Net Framework 4.0
- Internet Information Services 7.5
- Microsoft Excel 2010

Hardware

- Intel Core 2 Duo 2.3 GHz Processor or higher
- 4 GB of RAM or more

Build/Installation Steps

1. Build and publish the project using Visual Studio 2010 or 2012.
2. Create a Virtual Directory in IIS.
3. Copy the published files into the Virtual Directory's physical folder.
4. Browse the application and the CCIMT home page will be displayed.