Instructions for setting-up and running an ASMITA model of Southampton Water

Getting ready

If you have not already installed ASMITA:

The ASMITA code can be downloaded from *Blackboard* or www.coastalsea.uk and the zip file includes installation instruction.

In addition, you should download the 'ASMITA training pack' and unzip to your working folder.

Exercise materials

The ASMITA_assignment.zip file contains some background notes on Southampton Water, some slides on the exercise and the data needed to setup the model, as follows:

- ASMITA exercise instructions.pdf – this file.
- ASMITA Soton exercise slides.pdf – slides used to explain the exercise.
- Note on Southampton Water.pdf – a background description of the estuary.
- SW4e model parameters.xlsx – spreadsheet with element properties and historic changes.
- SW4e element properties.txt – text file of the element properties.
- Inner Channel Interventions.txt – text file of the historic interventions.

The slides (ASMITA exercise slides.pdf) provide some additional guidance on how to develop the model schematisation and construct the model using the data provided.

Exercise

Problem: To assess the morphological impact of a dredge of the main channel in 2020 and a reclamation of an area of the R. Test tidal flats in 2030. This will require you to assess how sediment import/export has changed and what impact this has had on the morphology of Southampton Water and the R. Test.

[Note: within SOES6011 you have learned how to use ASMITA. You will, therefore, use this model to address the problem. However, this is not the only way of addressing the problem, as there are many possible approaches using various combinations of data and models. However, when you write your report you should focus on the problem, not the application of ASMITA *per se*].

Model setup

The data provided in 'SW4e model parameters.xls' has the required information for a 4-element model of Southampton Water and the R. Test. Using the background information provided, develop a conceptual model for Southampton Water and the R. Test and satisfy yourself that the subdivision into the 4-elements provided is a suitable representation. Set out your findings in your write-up.

Set the start year to 1800 and run the model for 300 years.

[*Tip: You may need to do some trials to find a time step that does not give spurious results*.]

Interventions

The historic interventions for the 4 elements are provided on the Change tab of the 'SW4e model parameters.xls' file. These can be used to construct the base case. Maintenance dredging predominantly takes place in the Inner channel but there are infrequent changes in the other elements. A text file is provided which includes historic maintenance dredging and an assumed rate of maintenance dredging for the duration of the simulation (to 2100). This can be loaded from the Setup menu. The other changes need to be entered manually using the Setup>Interventions menu.

Cases to be examined

Construct a model using the parameters provided, including the historic changes and river input.

Then examine the following scenarios:

1. With sea level rise of 2mm/year with no interventions (uncheck option in Run Parameters>Conditions).

2. As case 1 with sea level rise of 2mm/year, and a nodal cycle of amplitude 0.15m.

3. As case 1, but now with the historic changes included (check option in Run Parameters>Conditions).

4. As case 3, with the introduction of a dredged channel in the year 2020. The channel is to be 200m wide and 2m deeper than existing bed, along the full length of the channel.

5. As case 4, with the introduction of a reclamation on the R. Test tidal flat element in the year 2030. The reclamation occupies 20ha of the tidal flat and reduce the tidal prism by 0.5Mm3.

What are the changes in volume of the estuary over the period from 1900 to 2100.

      a) Morphological changes (fixed surface); and

      b) Combined morphological and water level changes (moving surface).

Considering the historical changes and the proposed developments (cases 4 and 5), which has the biggest impact? Why do you think this is? How do the proposed changes compare with the impact of historic interventions? What are the assumptions and limitations of the model being used? What other modelling approaches could be used and how are they likely to compare with the approach adopted for this exercise (strengths and weaknesses)?

Appendix – Installation of ASMITA

ASMITA is installed as an App and requires muitoolbox and dstoolbox to be installed. The download for each of these includes the code, documentation and example files. The files required are:

dstoolbox: dstoolbox.mltbx

muitoolbox: muitoolbox.mltbx

The App file: Asmita.mlappinstall

Installing the toolboxes

The two toolboxes can be installed using the *Add-Ons>Manage Add-Ons* option on the Home tab of Matlab™. Alternatively, right-click the mouse on the 'mltbx' files and select install. All the folder paths are initialised upon installation and the location of the code is also handled by Matlab™. The location of the code can be accessed using the options in the *Manage Add-Ons* UI.

Installing the App

The App is installed using the Install Apps button on the APPS tab in Matlab™. Alternatively, right-click the mouse on the 'mlappinstall' file and select install. Again all the folder paths are initialised upon installation and the location of the code is handled by Matlab™.

The App file contains the code for the three models. Once installed, the model can be run from the Command Window using:

>> Asmita;

Documentation can be viewed from the Supplementary Software in the Matlab™ documentation. The location of the code can be accessed by hovering over the App icon and then finding the link in the pop-up window.

Opening ASMITA

A graphical user interface (GUI) is used to set-up, run scenarios, plot results and export model output.

With the Matlab working directory (folder) pointing to the folder containing the ASMITA code, the GUI is run from the command prompt by typing:

>> Asmita;

A splash screen crediting the developers appears for a few seconds before being replaced by the ASMITA interface.