

## SHORT COURSE: DELFT-FEWS CUSTOMISATION FOR RAINGAIN PROJECT PILOT LOCATIONS

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### 1. FILES PROVIDED

You will be provided with a zip folder containing the following files/folders:

- **bin (folder):** contains the actual Delft-FEWS software
- **FEWS\_SA (folder):** contains files corresponding to a specific application (or customisation) of the FEWS platform
- **jre-6u33-windows-i586.exe:** executable file to install the Java Runtime Environment
- **Files\_Shortcourse (folder):** contains XML files and shapefiles specific to the Cranbrook catchment, which will be used during the tutorial.

### 2. SOFTWARE INSTALLATION AND FOLDER STRUCTURE (for standalone version)

Delft-FEWS is based on the Java software platform. Because of this, **Delft-FEWS is operating system independent and can be deployed without installer and registering code libraries**. The user only has to keep in mind some simple rules. One of them is the **folder structure**. Normally, the folder structure of Delft-FEWS looks like this:

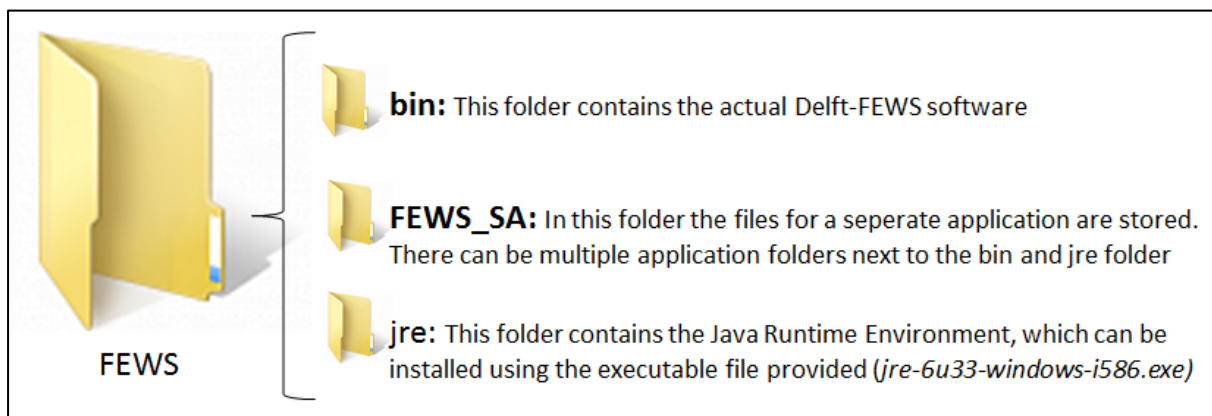


Figure 1: Required folder structure

The FEWS folder can be stored on any drive (except for a network drive).

To achieve the described folder structure and install the Java Runtime Environment, follow these steps:

- a) Create a folder called '**FEWS**' on any drive of your computer (you can give a different name to this folder if you wish)
- b) Within the '**FEWS**' folder, copy the following files/folders (which were provided): '**bin**' folder '**FEWS\_SA**' folder, '*jre-6u33-windows-i586.exe*' executable file

- c) Within the 'FEWS' folder, create a new folder called 'jre'
- d) Your 'FEWS' folder should look like this (but your 'jre' folder is empty at this point):

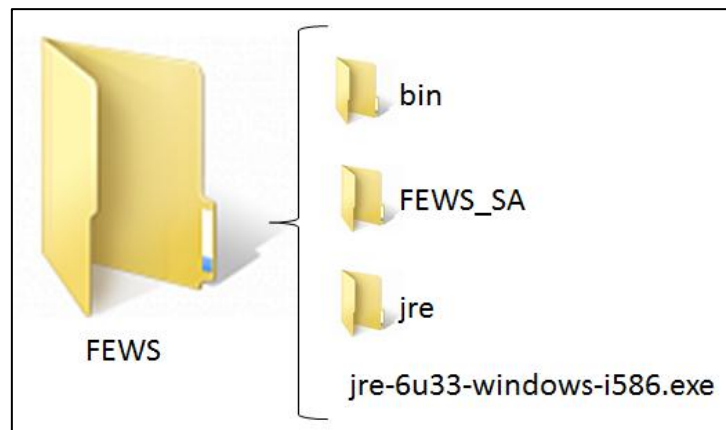


Figure 2: Installation files and folders

- e) Run the executable file 'jre-6u33-windows-i586.exe' in order to install the Java Runtime Environment (JRE). MAC users must download and install JRE for MAC and everything else from here onwards should work fine and in the same way as for Windows users.
- f) When asked (during the installation of the JRE), tick the 'Change destination folder' option and then click on 'Install':

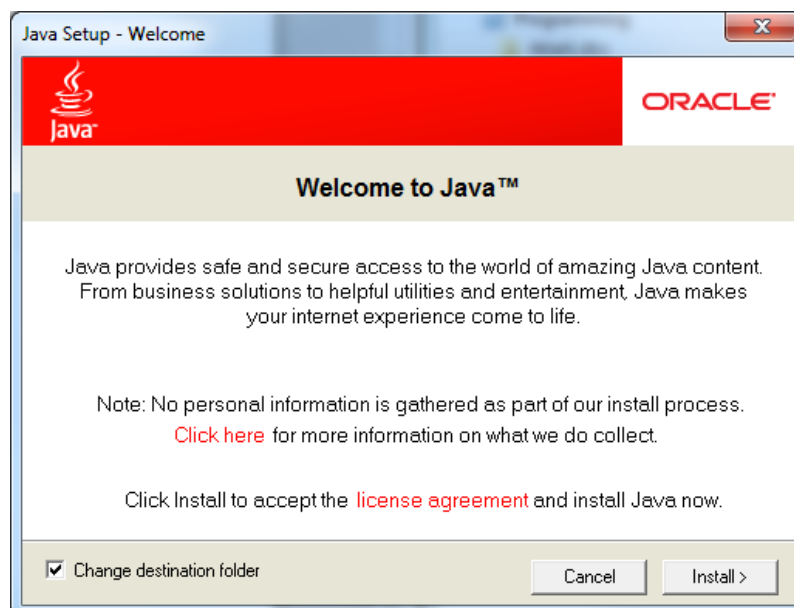


Figure 3: Installation of Java Runtime Environment

- g) Afterwards, select the folder where you wish to install the JRE. This must correspond to the 'jre' folder previously created
- h) After installing the JRE and achieving a folder structure as that illustrated in Figure 1, you are ready to start customising your Delft-FEWS platform for your own pilot location!
- i) **Note:** besides the 'bin', 'FEWS\_SA' and 'jre' folders, you can have any other folders and files you wish within the main 'FEWS' folder (as long as these have names different from the 3 required folders).

### 3. RUNNING DELFT-FEWS FOR THE FIRST TIME

The files provided include a default setup of the Delft-FEWS platform.

To run it, go to the folder '**FEWS\bin**' and double click on the executable file '**Fews\_sa.exe**', which has the following icon:

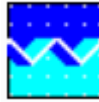


Figure 4: Fews\_sa.exe icon

Afterwards the following screen should be displayed, which corresponds to the Delft-FEWS explorer:

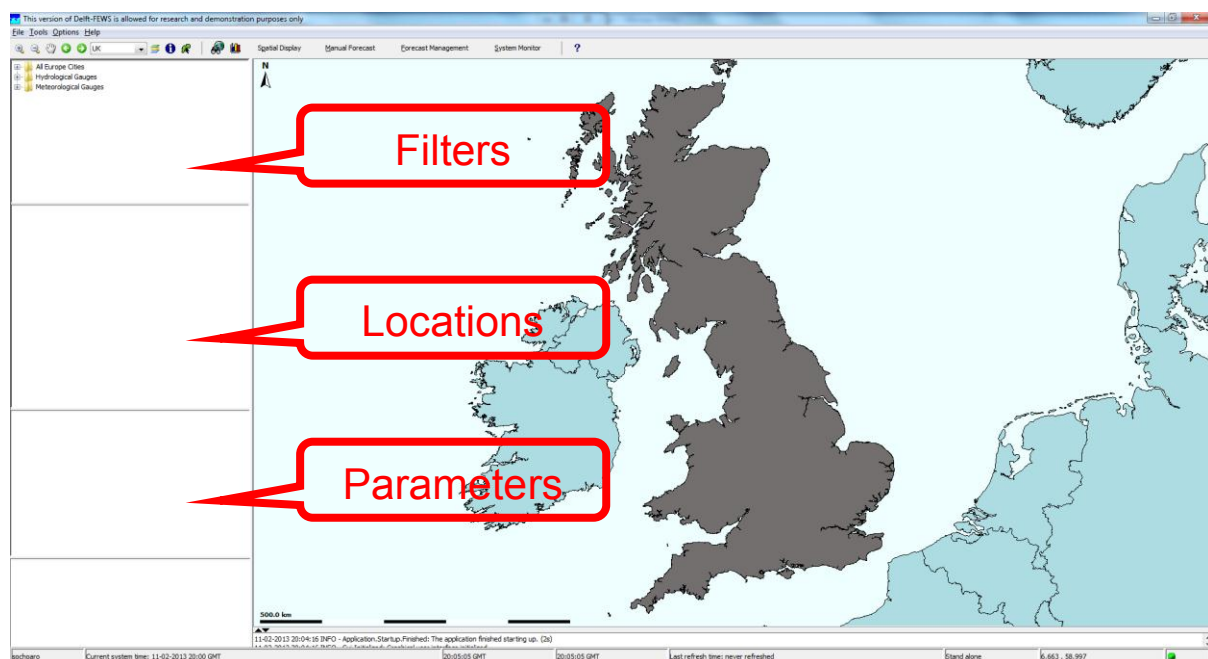


Figure 5: Delft-FEWS explorer window

You can play within this window, explore the filters on the panel, look at the options in each menu, amongst others things.

### 4. GENERAL NOTES / RECOMMENDATIONS FOR CUSTOMISATION OF THE DELFT-FEWS PLATFORM (please read them carefully!)

- The Delft-FEWS system was developed using Java (thus the need of installing the JRE), but is **fully configurable through open XML** (Extensible Markup Language) formatted configuration files.
- The Schemas (.xsd) corresponding to each XML file can be found in:  
[FEWS\Fews\\_customised\bin\ Delft\\_FEWS\\_schemas.jar](#)  
This folder can be opened using a zip-software
- In XML files, **tags** are used to mark the start and end of **elements**, which are the logical units of information in an XML document. The tags begin with the less-than character (<) and end with the greater-than character (>) and the name of the element is contained within these two characters. An element consists of a **start tag**, followed by the **actual content of the element**,

followed by an **end tag**. The end tags include a solidus (/) before the element's name. For example:

$$\underbrace{< \text{geoDatum} >}_{\text{start tag}} \underbrace{\text{WGS 1984}}_{\text{actual content}} \underbrace{< / \text{geoDatum} >}_{\text{end tag}}$$

- Comments in XML files can be included as follows: `<!--COMMENTS-->`
- Users are advised to install **Notepad++** and use it **for modifying the XML** configuration files (<http://notepad-plus-plus.org/>)
- The **files you will normally work on** when customising the Delft-FEWS platform are located in the following folder: [FEWS\FEWS\\_SA\Config](#)
- Anytime you modify an XML file, it is advisable to **save it with a higher version** (in case you do something wrong, you can still keep the previous working version). By default, FEWS will read and use the latest version of a given file.
- Comprehensive documentation of DELFT-FEWS is available in Deltares' **public wiki**: <http://publicwiki.deltares.nl/display/FEWSDOC/Home>  
You can easily find answers to your questions here.

## 5. CUSTOMISATION OF THE EXPLORER WINDOW (20 min)

The first thing we will do is to customise the geographic boundaries and other background layers that will be used in the Explorer window of the platform implemented for each pilot location. Map layers can be added using **shapefiles or DBF (dbase Table) files**.

In the case of the Cranbrook catchment, the following maps will be used:

- **Default maps of Europe included in the original [FEWS\FEWS\\_SA\Config\MapLayerFiles](#) folder:**
  - Coastline polygon (corresponds to the UK coastline)
  - Europe (corresponds to the whole of Europe, except the UK)
  - Countries
- **Additional maps, specific to the Cranbrook catchment pilot site** (*shapefiles of these maps have been provided to participants in the '[Files\\_Shortcourse\MapLayers](#)' folder*):
  - Cranbrook
  - GLA\_Boroughs
  - Links\_Cranbrook
  - RodingRiver
  - ThamesRiver

Follow the next steps in order to add new map layers to your Explorer window and to modify some of its settings:

- a) Copy the '[Cranbrook](#)' and '[GLA\\_Boroughs](#)' shapefiles provided into the folder [FEWS\FEWS\\_SA\Config\MapLayerFiles](#)
- b) Open the Explorer configuration XML file (the Explorer corresponds to the very first screen that is displayed when FEWS is installed):

FEWS\FEWS\_SA\Config\SystemConfigFiles\ Explorer 1.00 default.xml

- c) Open the 'Explorer 1.01 default.xml' file included in the 'Files\_Shortcourse\XML' folder
- d) Compare the two Explorer files:
- Note how a new coordinate system or geoDatum was defined in the 'Explorer 1.01 default.xml file' (WGS 1984 was replaced by a UK coordinate system). More information about the coordinate systems supported by Delft-FEWS is provided in the Appendix.
  - Note how new default and extra extents were defined. These allow controlling the area of the map that is displayed.
  - Note that new map layers were added and their colours were customised
  - Look at the Explorer Tasks. The default settings for these have been preserved.
  - Look at the panel header labels at the end of the file
- e) Copy the file provided (i.e. Explorer 1.01 default.xml) into the folder  
FEWS\FEWS\_SA\Config\SystemConfigFiles
- You can see that this file has a higher version than the original one contained in this folder. Therefore, when running Delft-FEWS, the new file (the one with higher version) will be used and the new maps and settings should be displayed.
- f) If the Delft-FEWS explorer is open, press F5 in order to reload the new configuration. If the explorer is not open, run again the executable file FEWS\bin\Fews\_sa.exe
- g) The Delft-FEWS explorer will be displayed again and you should now see the new maps and changes implemented in the Explorer XML file.

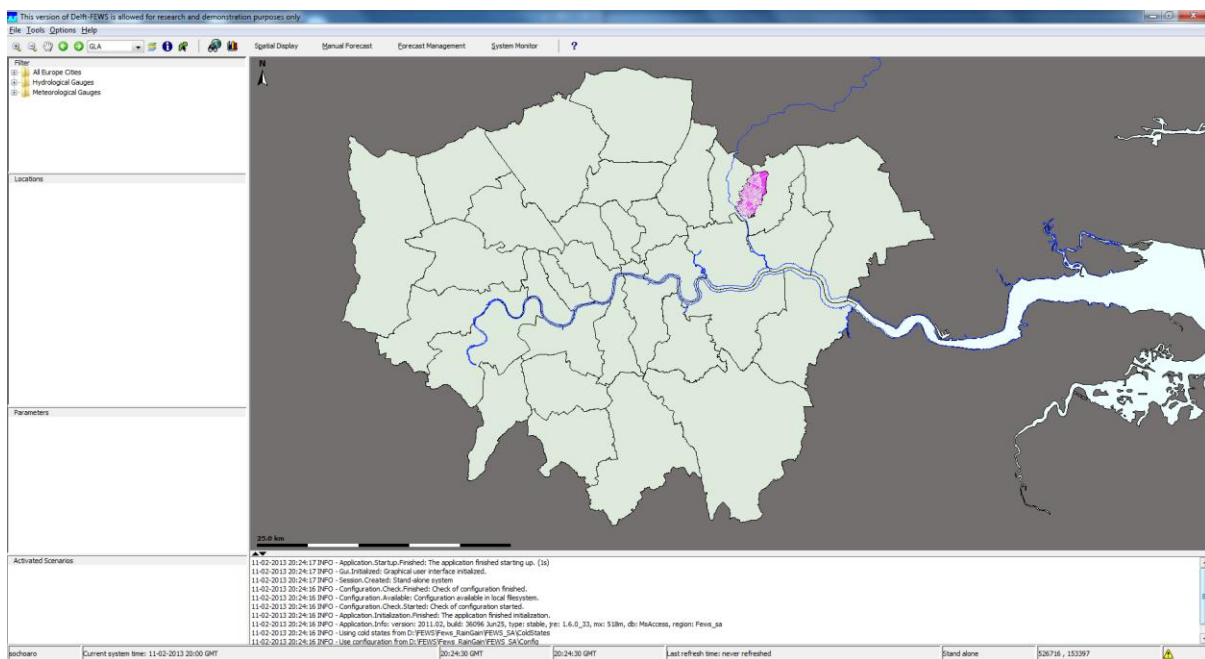


Figure 6: Delft-FEWS new explorer window, customised for the Cranbrook catchment

- h) Play around with the new explorer window, try the different map extents, zoom in and out, etc.
- i) Add a new zoom level (or extent):
- In the explorer display, zoom to the London Borough of Redbridge using the scroll wheel or the zoom button from the FEWS menu bar.
  - Press F12 and select option R from the list ('copy current map extent to clipboard')
  - Open the new file Explorer 1.01 default.xml

- Go to the 'map' group in the Explorer XML file
- Create a new 'extraExtent' element
- Give the new element id "Redbridge"
- Paste the coordinates you had copied from the display (ctrl+v)
- Save the file with a higher version number (1.02) and refresh the configuration (press F5)
- Check the changes in the available zoom extents

## 6. CUSTOMISATION OF THE SPATIAL DISPLAY WINDOW

*(this part is for those who finish the previous step earlier – others may do it later on, on their own)*

The Spatial Display window can be accessed from the buttons located in the toolbar of the Explorer window. The Spatial Display window is used to display spatial (2D) data (e.g. radar data, flood extents), whereas the Explorer window can only be used to display time series at point locations.

The customisation of the Spatial Display window can be done in the same way as was done for the Explorer window.

The file that must be modified is the following:

[FEWS\FEWS\\_SA\Config\DisplayConfigFiles\SpatialDisplay 1.00 Default.xml](#)

A new file with customised settings can be found in the 'Files\_Shortcourse\XML' folder (the file name is [SpatialDisplay 1.01 Default.xml](#)).

## 7. CUSTOMISATION OF POINT LOCATIONS AND LOCATIONSETS (20 min)

Point locations (e.g. gauging stations) can be defined in two ways:

- Using **shapefiles**, which must be included in the [FEWS\FEWS\\_SA\Config\MapLayerFiles](#) folder. In this case locations must be specified as a location set in the following file:  
[FEWS\FEWS\\_SA\Config\RegionConfigFiles\LocationSets.xml](#)  
This is because a shapefile commonly contains more than one point location (i.e. it contains a location set).
- Providing the **XY coordinates** of each location. In this case locations must be specified in the following file:  
[FEWS\\_SA\Config\RegionConfigFiles\Locations.xml](#)

Examples of the two ways in which locations can be defined can be found in the two files mentioned above (open these files and take a quick look). When multiple locations need to be defined, using shapefiles may turn out to be more convenient. It can be noted that once point locations have been defined using XY coordinates, these can be used to create new location sets defined in the 'FEWS\FEWS\_SA\Config\RegionConfigFiles\LocationSets.xml' file.

Follow the next steps in order to add new locations related to the Cranbrook catchment pilot location (for this purpose shapefiles will be used):

- a) Look at the attribute table of the 'All\_Sensors' shapefile provided. Those who have ArcGIS can open the shapefile and look at the attribute table. For those who don't have ArcGIS, the attribute table has been provided in a separate Excel file located in the 'Files\_Shortcourse' folder. Take a look at the **fields** of this shapefile (e.g. 'Type', 'System', 'Cranbrook'); these will be used later on for **grouping and filtering locations**.
- b) Copy the 'All\_Sensors' shapefile into the [FEWS\FEWS\\_SA\Config\MapLayerFiles](#) folder.
- c) Open the LocationSets configuration (XML) file of the current FEWS application:  
[FEWS\FEWS\\_SA\Config\RegionConfigFiles\LocationSets 1.00 default.xml](#)
- d) Open the 'LocationSets 1.01 default.xml' file included in the 'Files\_Shortcourse\XML' folder
- e) Compare the two LocationSets files:
  - Note that in the 'LocationSets 1.01 default.xml' file a new location set called "Total Sensors" was defined, which makes use of the "All\_Sensors" shapefile. A number of attributes are defined for this new location set, based on the fields of the shapefile.
  - Note how new location sets are created based on the "Total Sensors" location set by applying restrictions using the attributes previously defined.
  - Note how it is possible to create new location sets by grouping several location sets previously defined.
- f) Copy the file provided (i.e. [LocationSets 1.01 default.xml](#)) into the folder [FEWS\FEWS\\_SA\Config\RegionConfigFiles](#)  
Again, note that this file has a higher version than the original one contained in this folder. Therefore, when running Delft-FEWS, the new file (the one with higher version) will be used
- g) If the Delft-FEWS explorer is open, press F5 in order to reload the new configuration. If the explorer is not open, run again the executable file [FEWS\bin\Fews\\_sa.exe](#)
- h) When re-running/re-loading Delft-FEWS, you won't notice any change in the display. This is because **we have not yet told Delft-FEWS which of the new location sets must be displayed**. This can be done through filters, as will be explained next (Section 8). In fact, you can define as many location sets as you wish in the [LocationSets](#) configuration file and then use filters to display only some of these sets.
- i) **Note:** when re-running or re-loading Delft-FEWS (step 'h'), you may get an error message saying that some location sets are empty. This is because the sensors corresponding to those location sets have not yet been included in the shapefile 'All\_Sensors'.

## 8. CUSOMISATION OF FILTERS

Filters allow choosing the locations you want to display, how you want to group them in the display windows and which parameters will be associated to each location (e.g. rainfall intensity, water depth). As was mentioned before, some location sets may be defined in the LocationSets configuration file, but through filters you choose if you want to display them or not.

In order to learn how filters work and to customise the new location sets to be displayed (those corresponding to the Cranbrook catchment), follow these steps:

- a) Open the current Filters configuration file:  
[FEWS\FEWS\\_SA\Config\RegionConfigFiles\Filters 1.00 default.xml](#)



- b) Look at how filters are first declared and then implemented; look at the attributes of the filter elements, for example:
- *id*: ID of the filter
  - *name*: optional name for the filter. For reference purposes only.
  - *child*: reference to another filter. The child element refers to the ID of the other filter as a foreign key.
  - *foreignKey*: Reference to ID of another filter, that is displayed as child filter
  - *moduleInstanceId*: instance ('process') from which the data associated to the specified locations will come from
- c) Note that each filter comprises one or more time series sets. These are used to specify the parameters or variables associated to the locations within a given filter (e.g. rainfall rate, rainfall depth).
- d) Open the 'Filters 1.01 default.xml' file included in the 'Files\_Shortcourse\XML' folder
- e) Compare the two Filters files:
- Note how a new filter was created for the Cranbrook catchment
  - Note that, although locations associated to other UK case studies (Purley and Torquay) were previously defined, filters for including them in the display have not yet been created. Therefore, only locations associated to the Cranbrook catchment will be displayed.
- j) Copy the file provided (i.e. [Filters 1.01 default.xml](#)) into the folder [FEWS\FEWS\\_SA\Config\RegionConfigFiles](#)
- Again, note that this file has a higher version than the original one contained in this folder. Therefore, when running Delft-FEWS, the new file (the one with higher version) will be used
- k) Re-load or re-run Delft-FEWS, as appropriate.

## 9. IMPORTING TELEMETRY DATA (example: importing time series in CSV format)

We will use the CSV standard format supported by Delft-FEWS. See example:

```
Location Names,Beal_HS_RG,Ursuline_HS_RG,Chadwell_HS_RG
Location Ids,Beal_HS_RG,Ursuline_HS_RG,Chadwell_HS_RG
Time,Rain Rate[mm/h],Rain Rate[mm/h],Rain Rate[mm/h]
2010-08-22 18:00:00,0,0,0
2010-08-22 18:05:00,0,0,0
2010-08-22 18:10:00,0,0,0
2010-08-22 18:15:00,0,0,0
2010-08-22 18:20:00,0,0,0
2010-08-22 18:25:00,0,0,0
2010-08-22 18:30:00,0,0,0
2010-08-22 18:35:00,0,0,0
2010-08-22 18:40:00,0,0,0
```

Figure 7: CSV standard format file supported by Delft-FEWS



The fact that the import of this standard CSV format is supported by Delft-FEWS means that there is already a module which can be used for it. However, we first need to tell our customised platform that this module will be used. Afterwards, we need to create an instance of this module...

Follow the next steps:

**a) Create a new instance of a module:**

- Open the file 'ImportCSV 1.00 default.xml' located in the folder 'Files\_Shortcourse\XML\New\_Modules'
- This corresponds to a new instance of the Import CVS module, which already exists in Delft-FEWS
- Look at the general properties of this instance (e.g. folders from where it will look for the data to be imported)
- Look at the time series which will be imported using this instance
- Copy this file into the folder 'FEWS\FEWS\_SA\Config\ModuleConfigFiles'.

**b) Register the new instance in the Module Instance Descriptors file:**

- Open the file 'ModuleInstanceDescriptors 1.00 default.xml' from the folder 'FEWS\FEWS\_SA\Config\RegionConfigFiles'
- Open the file 'ModuleInstanceDescriptors 1.01 default.xml' from the folder 'Files\_Shortcourse\XML'.
- Compare the two files: note how the file provided includes a new Module Instance Descriptor for the Import CSV task.
- Copy the file provided into the folder 'FEWS\FEWS\_SA\Config\RegionConfigFiles'.

**c) Create and set folders to be used by new instance ImportCSV:**

- Create a new folder called 'CSV' within the folder 'FEWS\FEWS\_SA\Import'
- Create a new folder called 'CSV' within the folder 'FEWS\FEWS\_SA\ImportBackup'.
- Open the file 'sa\_global.properties' from the folder 'FEWS\FEWS\_SA'.
- You can see how the full location of different folders (each of which has a short name) is specified
- The location %REGION\_HOME% corresponds to the FEWS\_SA folder
- Add the following lines to this file in order to specify the location of the folders that will be used by the new instance we created:

```
IMPORT_CSV_FOLDER=%REGION_HOME%/Import/CSV
```

```
BACKUP_CSV_FOLDER=%REGION_HOME%/ImportBackup/CSV
```

**d) Map external data and locations to internal parameters and locations:**

- Go to the folder 'FEWS\_SA\Config\IdMapFiles'
- Note how there is one IdMapFile per module instance
- Open the 'Telemetry 1.00 default.xml' file and take a look at the structure
- Note how the parameter names used in the external files being imported are mapped against their corresponding internal parameter. The same happens with the locations

- Open the file 'IdImportCSV 1.00 default.xml' from the folder 'Files\_Shortcourse\XML'.
- Take a look at the mapping done in this file of external (observed) variables against internal ones and of external location names to internal ones (defined in Section 7).
- Copy the 'IdImportCSV 1.00 default.xml' file into the folder 'FEWS\_SA\Config\IdMapFiles'
- The internal names of the different parameters used in Delft-FEWS in the following file: [FEWS\FEWS\\_SA\Config\RegionConfigFiles\Parameters 1.00 default.xml](#)
- In my case, I wanted to import rainfall rate (mm/h) and this parameter did not exist in the default setup of Delft-FEWS. Therefore, I added a new parameter in the Parameters configuration file. The updated file can be found in the 'Files\_Shortcourse\XML' folder.
- Copy this Parameters file into your [FEWS\FEWS\\_SA\Config\RegionConfigFiles\](#) folder.

**e) Create a new work flow which allows executing the new ImportCSV instance:**

- In order for a routine/process to be executed, it must be part of a work flow. You can define as many workflows as you wish and each work flow may contain several sub-routines.
- In this case, we will simply create a work flow for importing CSV observed data.
- Work flows are individual files in which the sub-routines that need to be executed are listed. These files must be placed in a special folder: ['FEWS\FEWS\\_SA\Config\WorkflowFiles'](#)
- Open the file provided ['Files\\_Shortcourse\XML\ImportCSVTelemetry 1.00 default.xml'](#)
- Note how it simply includes one routine: ImportCSV
- Copy this file into the folder ['FEWS\FEWS\\_SA\Config\WorkflowFiles'](#)
- You now need to register this new workflow. This must be done in the following file: ['FEWS\\_SA\Config\RegionConfigFiles\WorkflowDescriptors 1.01 default.xml'](#)
- An updated WorkflowDescriptors file can be found in the ['Files\\_Shortcourse\XML'](#) folder. Copy this file into the ['FEWS\\_SA\Config\RegionConfigFiles'](#) folder

**f) Setup a temporary display to view the imported data:**

- There is a special file named 'DisplayGroups' (in the ['FEWS\FEWS\\_SA\Config\SystemConfigFiles'](#) folder), which can be used for customising the display of your time series
- Take a quick look at this file
- Note that there is only one display group within this file, which contains only one subplot. This display group was made for one of the instances included by default in the files I gave you.
- A new display group file is provided in the ['Files\\_Shortcourse\XML'](#) folder. Open it and note how different display groups were created, each of which may have one or several subplots
- Copy this new file into the ['FEWS\FEWS\\_SA\Config\SystemConfigFiles'](#) folder

**g) Testing the new ImportCSV routine:**

- Standard CSV files containing observed rainfall and water depths in the Cranbrook catchment have been provided in the following folder: [Files\\_Shortcourse\CSV\\_Observed\\_Data](#)

- Copy these files into the folder you had previously created for this purpose: 'FEWS\FEWS\_SA\Import\CSV'
- You are finally ready to go! Reload Delft-FEWS or re-run it, as appropriate
- You will now see your new filters on the panel on the right hand side – explore these.
- Click on the 'Manual Forecast' button on the tool bar. The window shown in Figure 8 will be displayed. Select 'ImportCSVTelemetry' and run it.
- We will look at the results together!

The screenshot shows the 'Manual Forecast' dialog box. The 'Workflow' section has a dropdown menu with 'ImportCSVTelemetry' selected. Below it is a 'Forecast description' text box. The 'Scheduler options' section has two radio buttons: 'Single forecast (dd-MM-yyyy HH:mm:ss GMT)' and 'Batch forecast (dd-MM-yyyy HH:mm:ss GMT)'. The 'Single forecast' option is selected, and its 'T0' field is set to '14-02-2013 22:00:00'. The 'Batch forecast' option has fields for 'Start T0', 'End T0', and 'Interval'. The 'State selection' section has two radio buttons: 'Cold state' and 'Warm state'. The 'Warm state' option is selected. Below it is a 'Search interval' section with 'Start time' and 'End time' fields. The 'Priority' section has two radio buttons: 'High' and 'Normal'. The 'Forecasting shells' section has two radio buttons: 'Single' and 'Parallel'. The 'Forecast length' section has two radio buttons: 'Default' and 'User defined'. At the bottom are 'Run', 'Close', and 'Help' buttons.

Figure 8: Manual forecast window

## APPENDIX - ADDITIONAL INFORMATION

### A.1. GeoDatum

DELFT-FEWS may use a number of national coordinate system as geo-datum. These are referenced by all configurations requiring a definition of geodatum.

All coordinates are handled internally as WGS 1984 (longitude-latitude). To add a new coordinate system to DELFT-FEWS, the transformation between WGS-1984 and that system will need to added as Java class to DELFT-FEWS

The lists of GeoDatum supported are:

- **WGS 1984** (Geographic projection; longitude-latitude)
- **SVY21** (Singapore)
- **Ordnance Survey Great Britain 1936** (Great Britain)
- **CH1903** (Switzerland)
- **Rijks Driehoekstelsel** (The Netherlands)
- **Gauss Krueger Austria M34** (Austria)
- **Gauss Krueger Austria M31** (Austria)
- **Gauss Krueger Meridian3** (Germany)
- **TWD 1967** (Taiwan)