# Data Input Module

## Overview

This chapter describes the module for inputting data into the SDSS. The data is organized into Study Areas that consist of one or more Projects. All the spatial data concerning a study area is uploaded under the Study Area. This data is about Hazard maps and Elements-at-Risk (EaR) maps. Within a Project one or more Scenarios, Alternatives and Future Years can be defined. Vulnerability Curves link the Hazard with EaR. The vulnerability curves in the current SDSS express the probability of loss per EaR element type given a certain Hazard type. This means that in order to calculate the loss every possible combination of Hazard, EaR and EaR type, Vulnerability, Scenario and Future Year, Alternative must be defined before any loss calculation can be performed. One such combination in the system is called a Loss Parameter Set. This chapter describes how to set up a study area, enter all the data, and make all the combinations. Doing the loss calculation itself is the subject of the next chapter.

The Data Input module is able to handle hazard intensity and spatial probability data (rasters) and element at risk (buildings, land parcels, linear features etc.), risk-reduction measures - alternatives (vectors). Furthermore, it has sufficient flexibility to support adding user-defined hazard types (floods, snow avalanches, debris flows, etc.), hazard intensity types, intensity maps of different return periods, economic and population vulnerability information dependent on the hazard type and the type of the element at risk, in the form of vulnerability curves, user-defined vulnerability types and subtypes and afterwards preparing the necessary loss parameters used later on for loss calculation in the loss map module. On top of that we offer the possibility to handle data defined for different study areas.

The module name is *Input Data* and is divided into several main sections:

- Study Area Management
- Project Management
    - Alternative Management
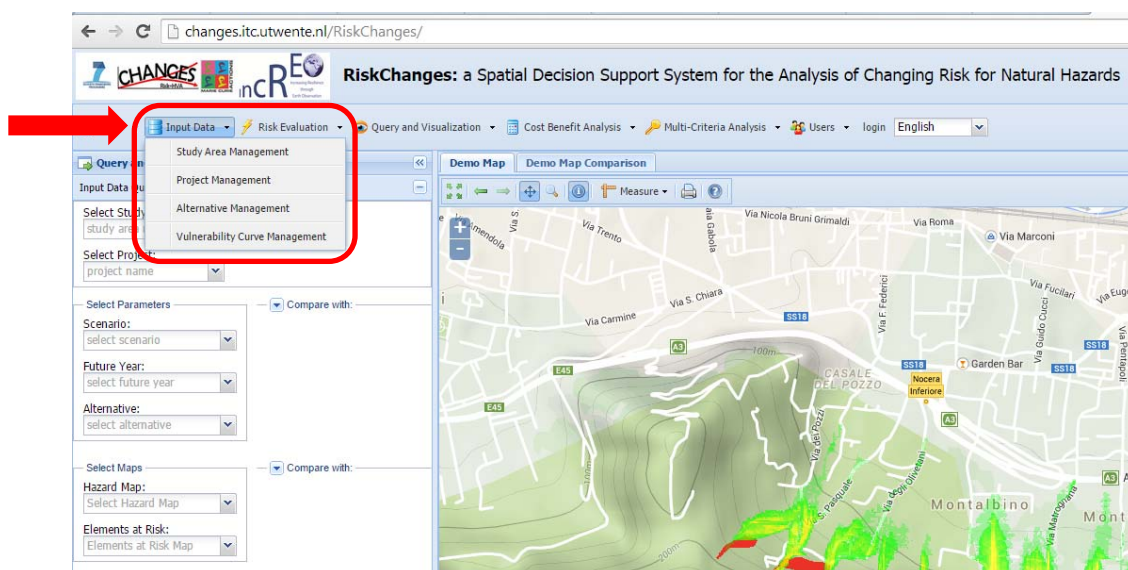- Vulnerability Curve Management



**Figure 1 Data Input module**

## Study Area

The Study Area management section contains the hazard and element at risk (EaR) maps. The first thing we need to do is to create this study area:



Figure 2 adding a new study area

As you can see, information related to the study area, such as the name of the area, the projection (EPSG) code and additional descriptions can be entered here in the Figure below.
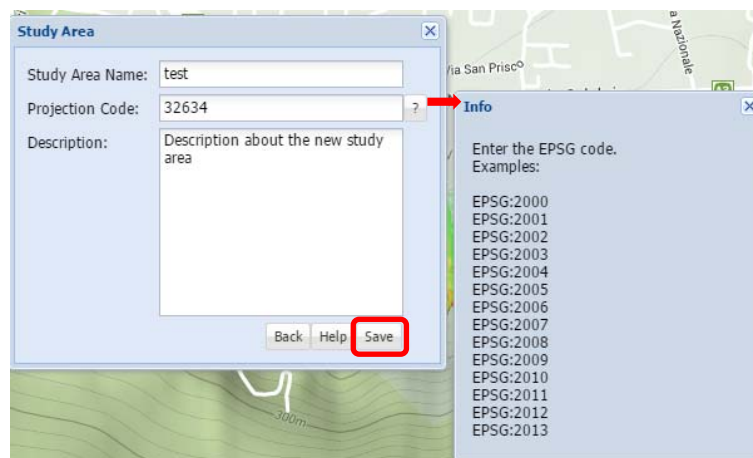


Figure 3 Saving information for the study area

The question mark(s) in the user interfaces will give you additional explanation for the fields they are associated with. In this case we have additional explanation for the Projection code field. At the end if everything is entered correctly without skipping/leaving blank fields, a message saying: *You have successfully created your study area!* will appear.

After creating the new study area the UI extends itself and the (*Current Situation) Maps* section appear. From here we start the uploading process of the hazard maps and element at Risk maps for our new study area.
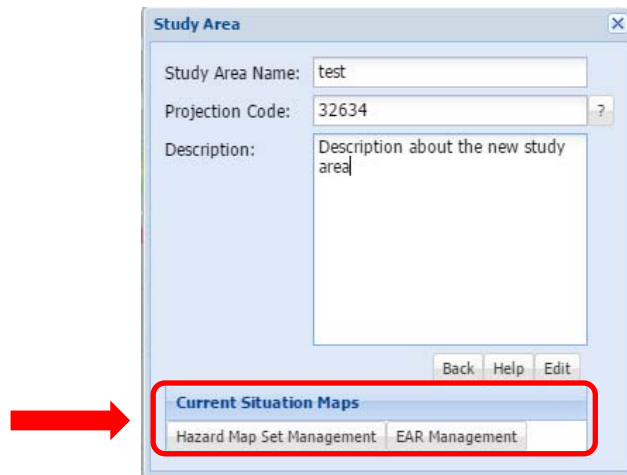
**Figure 4 Hazard Map Set and EaR Management**

### Editing Study area

If you like to change the basic information about the study area, you can do that by clicking the *Back* button which will lead you to the Study Area Management UI:
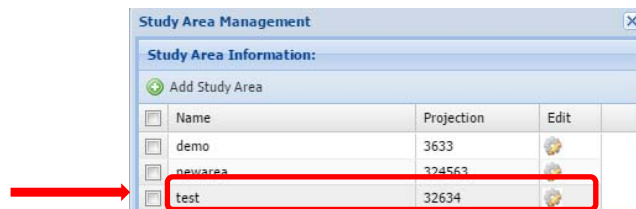


**Figure 5 Editing information about the study area**

Make a selection of your study area record an press the *Edit* icon. It will lead you to the same Study Area UI as above, where you have the option of modifying the Projection Code and Description fields.

### Hazard Map Set
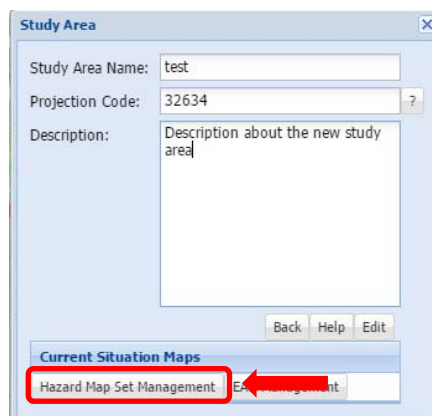


**Figure 6 Hazard Map Set Management**

After creating or selecting your study area, you can start uploading your set of hazard maps. In order to do so you have to go to the Hazard Map Set Management. On the beginning the hazard map set UI looks like in the figure below, the available hazard map set is empty. In order to add a new set of hazard maps you enter and select the:

- Hazard Map Set Name
- Return Period
- Check if it's a set for the current situation or not

- Click Add new
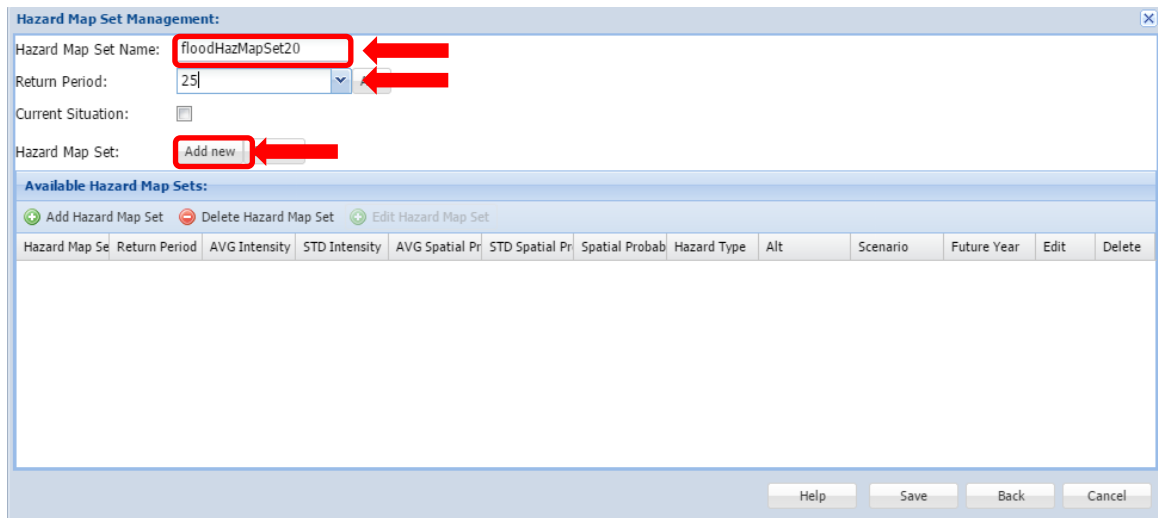


**Figure 7 Adding new hazard map set**

In case the required return period is not in the list, you have the option of adding your own defined return period:
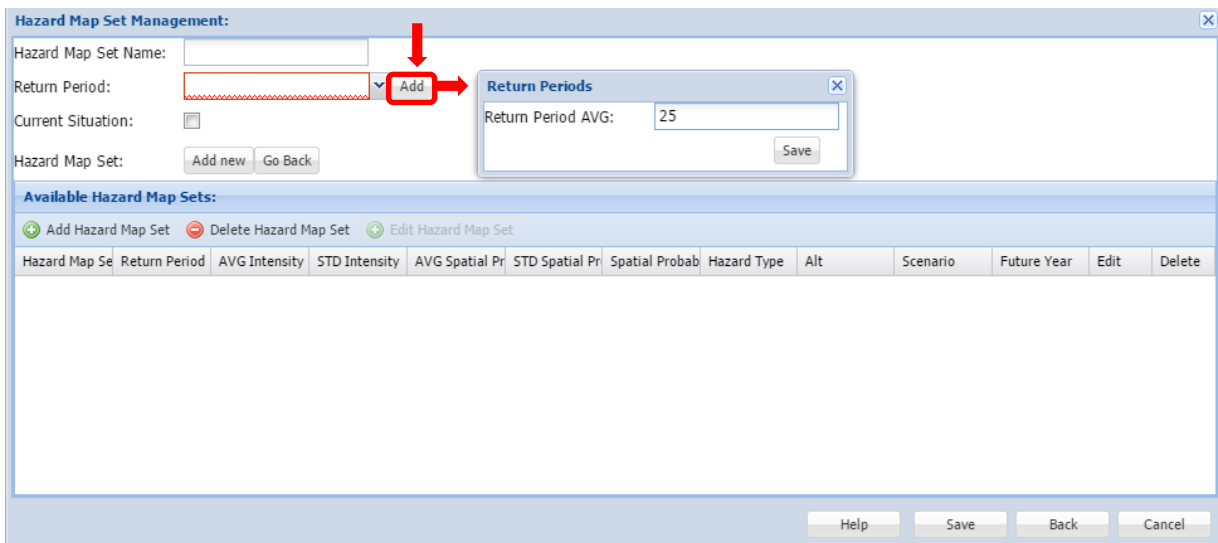


**Figure 8 Adding new user defined return period**

The new return period will be added in the list and you can now select it.

After clicking the *Add New* button next to the Hazard Map Set field, the UI for entering additional general information for your set of hazard maps appears:. See figure below.
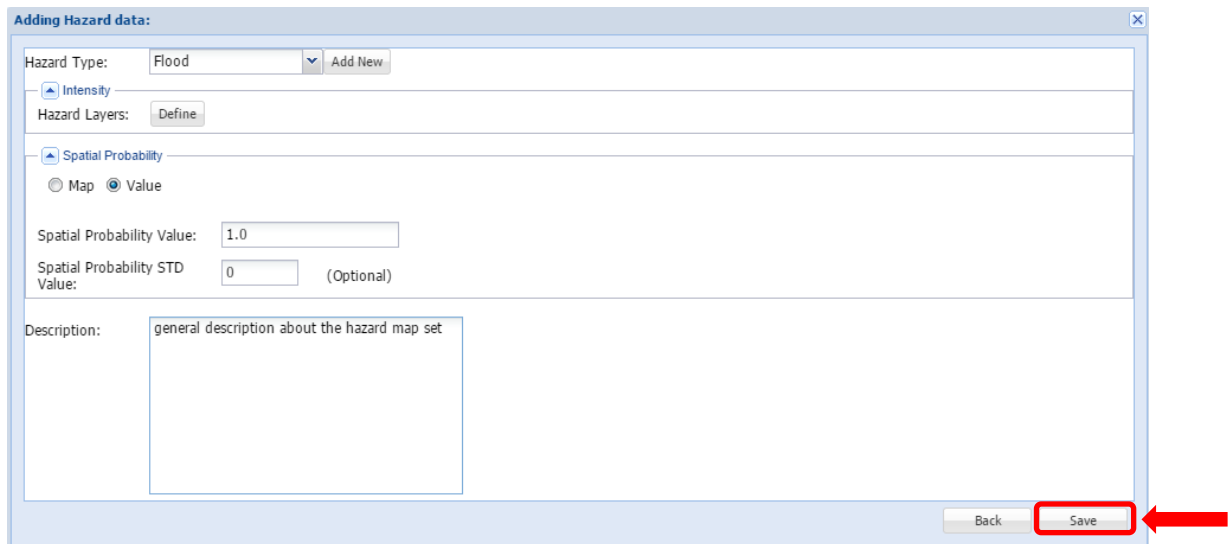
**Figure 9 Adding general hazard map set description**

Here you should specify the type of the hazard by making a selection from the hazard type dropdown and make a selection of *Spatial Probability Map* or *Value* related to the hazard depending of the data you are able to provide for the hazard. If *Value* is selected *the Spatial Probability Value* and *STD Value* are shown as visible fields. You should fill in the values for both fields here and add a general description about the hazard set. When you finished entering the values, you can click on the save button. If all the necessary values were entered, you will receive a message as in figure below and then you can proceed with the part for defining and entering the hazard layers.
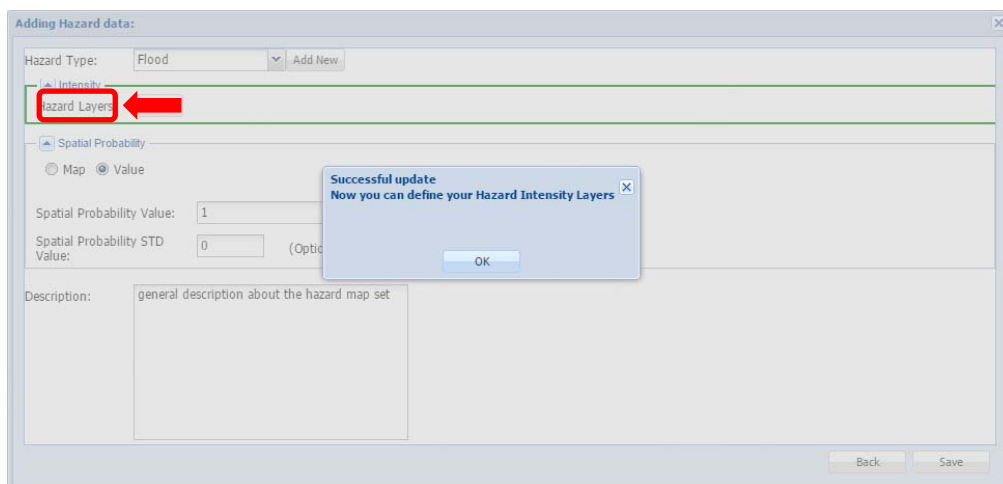


**Figure 10 Confirmation about successful saving/update of the general hazard map set information**

You have the option of adding Average (AVG) Intensity Layer and Standar deviation (STD) Intensity Layer separatelly here. The hazard intensity maps you are uploading must be in a GeoTiff format. Remark: It's recommended that the size of these files do not to exceed 50 MB.
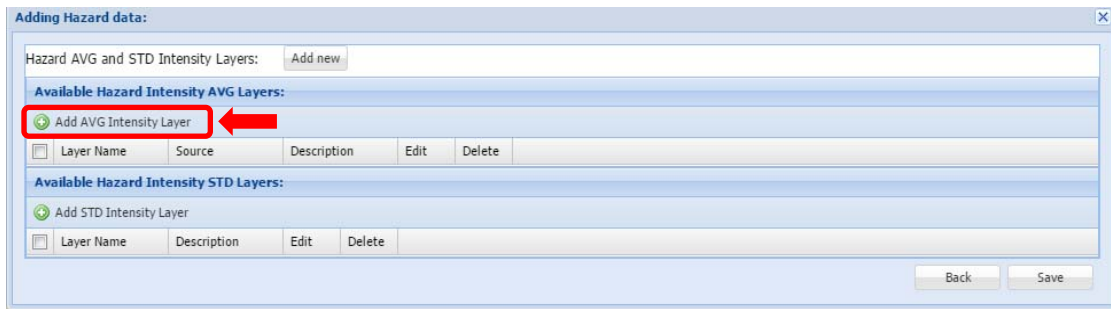
**Figure 11 Adding average (AVG) Intensity Layers**

You should fill in all the fields and make a selection of the hazard intensity type and units value from the dropdown depending of the intensity type and units that your map reflects.
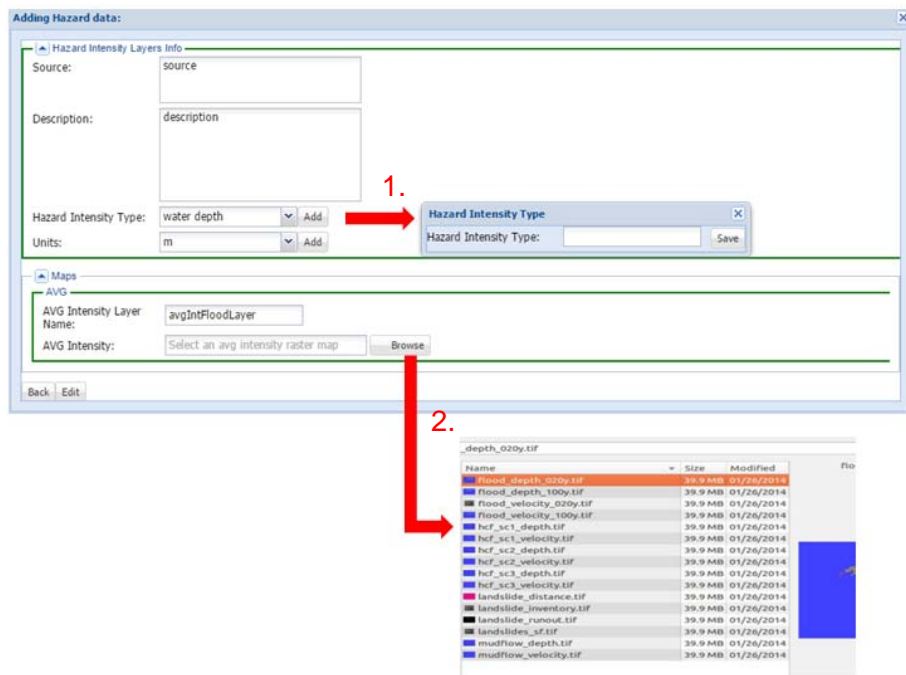


**Figure 12 1. Adding user defined hazard intensity types & units, 2. Selecting hazard intensity maps**

In case the intensity type or the units are not liste, you can add them to the list by clicking the *Add* button. In the *Source* field, add the source from where you obtained you hazard intensity layer. In the description field you can add additional information specific to the *AVG intensity layer*. At the end you can click the save (*Edit*) button. If everything went fine, you should see your AVG intensity layer in the *Available Hazard Intensity AVG Layer* list:
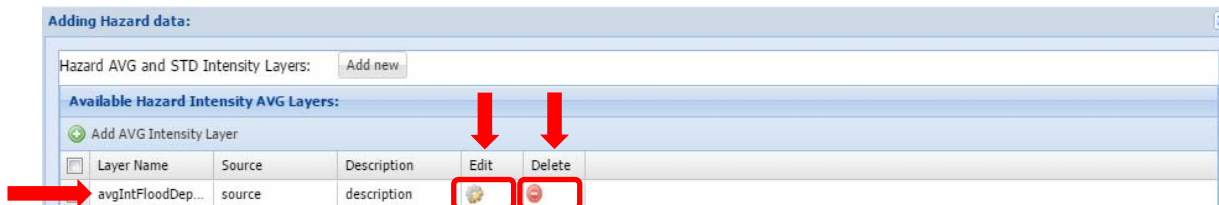


**Figure 13 Available Hazard Intensity Layers, edit and delete option**

If you want to modify your AVG intensity layer you can click on the *Edit* icon in the same record. You have also the option of deleting the AVG intensity layer by pressing the *Delete* icon.

You can upload your standard deviation (STD) intensity layer by clicking the *Add STD Intensity Layer* button as shown in the figure below:
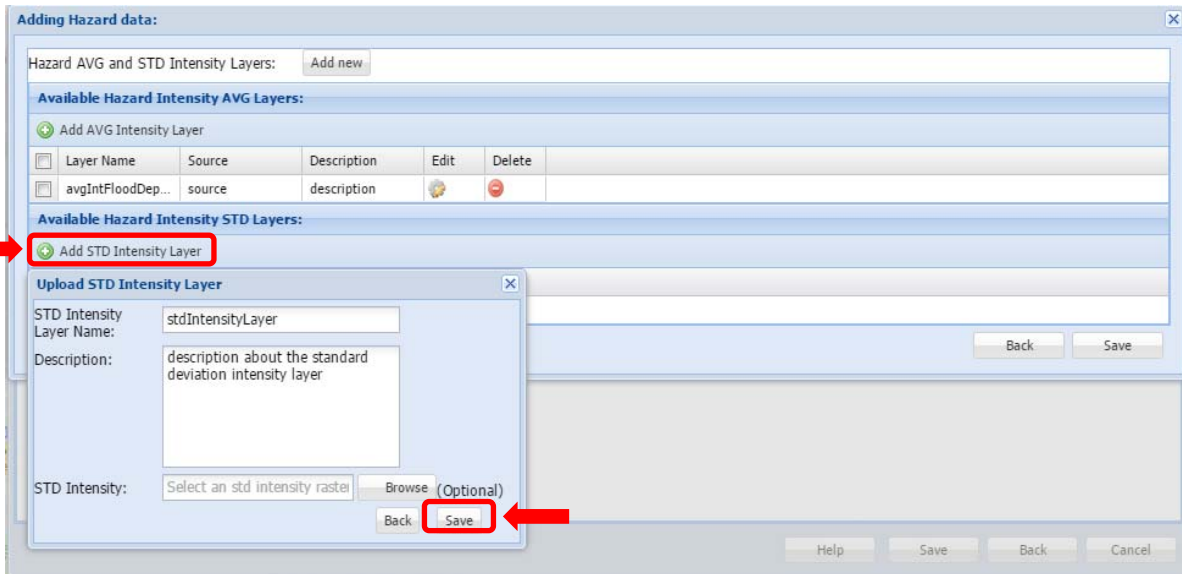
**Figure 14 Adding standard deviation (STD) Intensity Layer**

The result of your upload can be seen in the *Available STD intensity Layer* list:
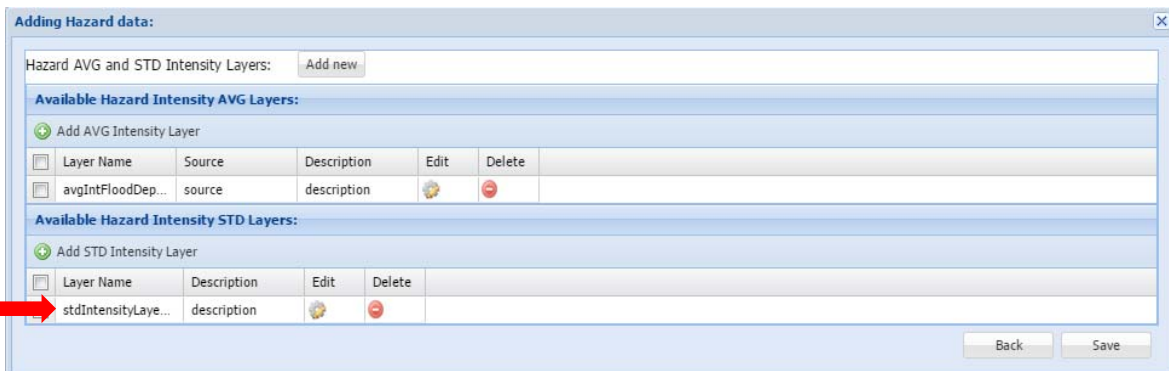


**Figure 15 Listing Available Hazard STD Intensity layers**

When you are finished with uploading of both the AVG and STD Intensity Layers you can go back to the main screen of the hazard map set management and check if there is a new record for your hazard map set as displayed in the following figure:
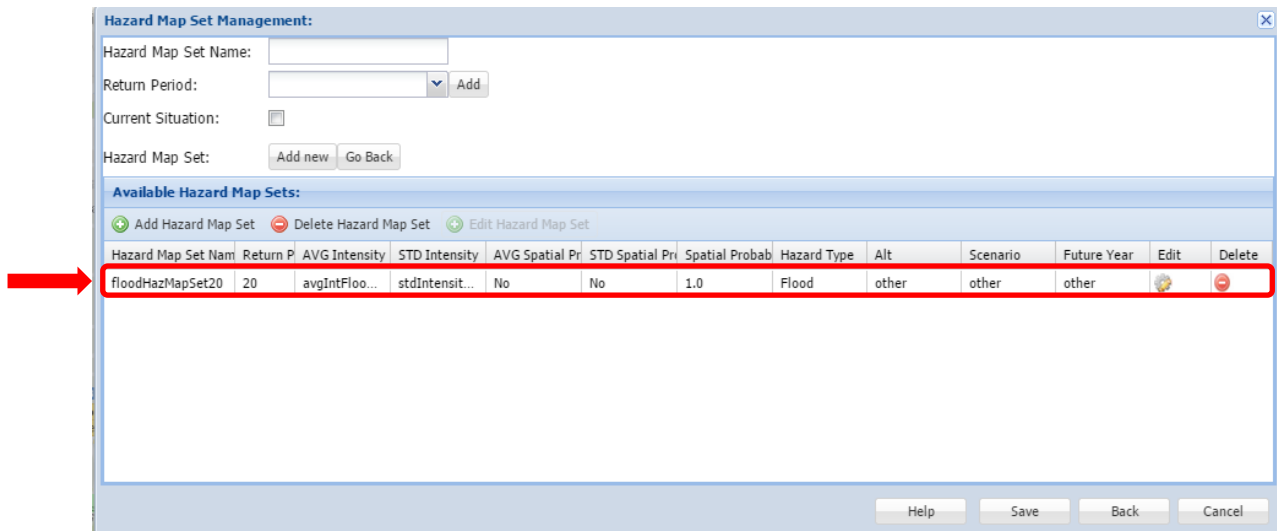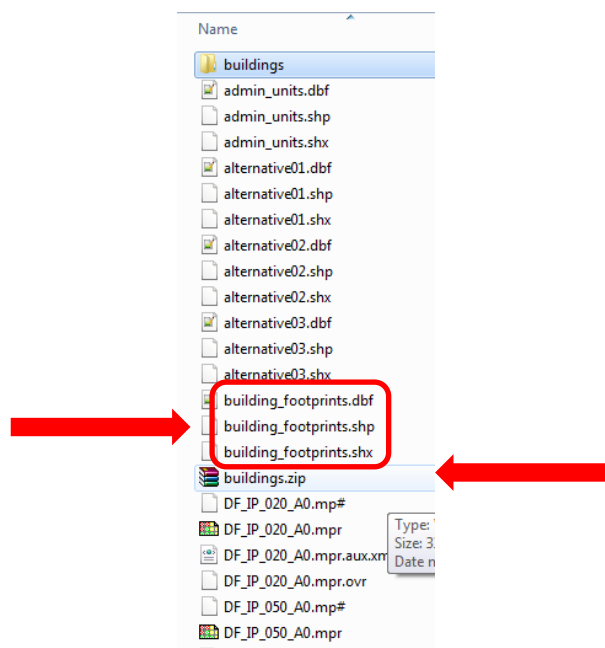
**Figure 16 Listing Available Hazard Map Sets**

## Element at Risk (EaR) / Asset maps

After uploading the set of hazard maps you can upload your EaR/asset maps. The format of your EaR maps should be a .zip file containing the files listed below:



- .dbf
- .shx
- .shp

  files

The EaR files, such as the .dbf, shp and .shx should be added in a folder such as the *buildings* folder displayed in the figure above, and then a .zip file should be created from that folder. You can start adding your EaR layers from the EaR Management section:
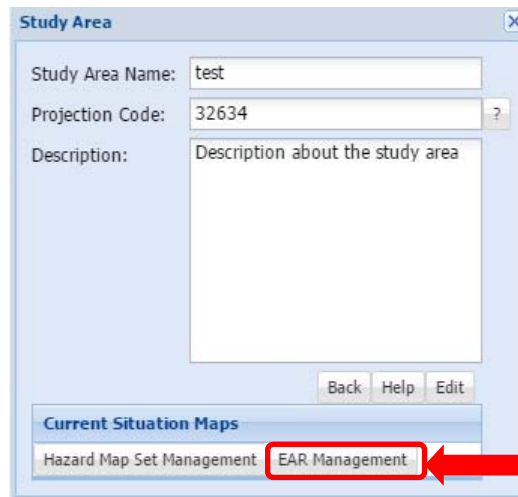
**Figure 17 EaR Management**

In the beginning there are no EaR maps for the study area, as it can be seen from the *Available EAR Maps* list in the figure below.
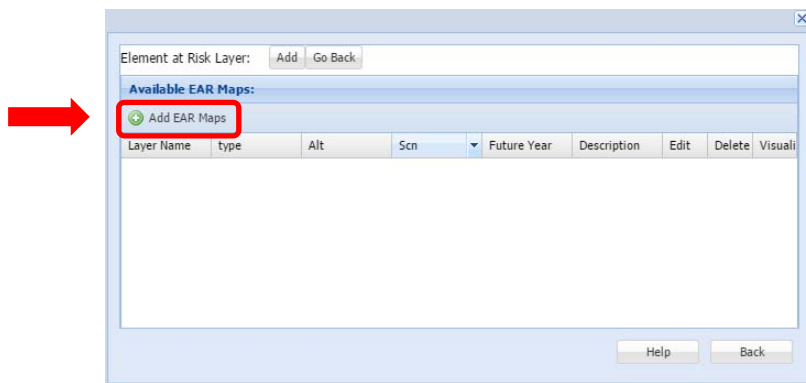


**Figure 18 Add EaR Maps**

A selection of the type of the asset should be made. There are four types of EaR types provided. Filling in the *Name* of the EaR layer, adding the *source* from where it is taken, entering additional *description*, stating if it's for the current situation or not by making a selection of the checkbox field and uploading your EaR layer as a .zip file.
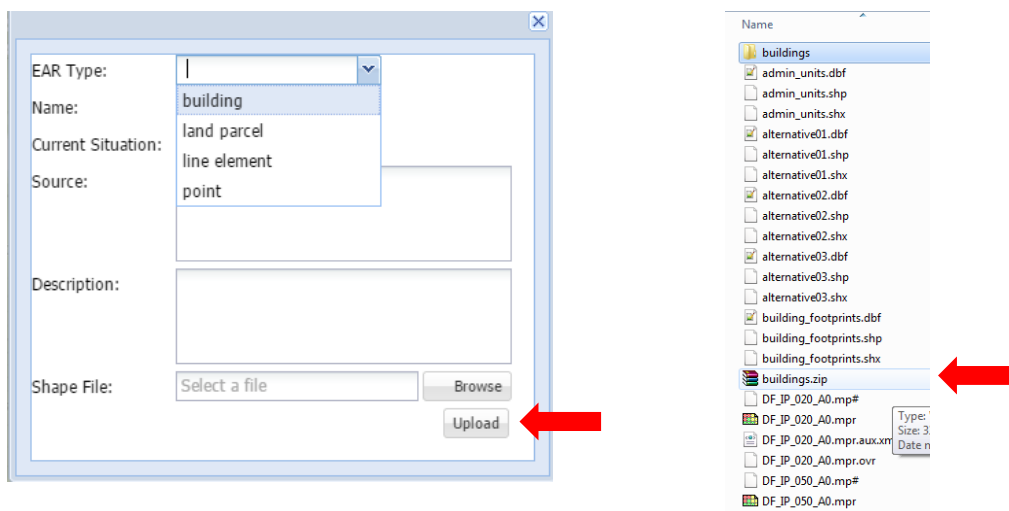


**Figure 19 Uploading EaR layer as a .zip file**

After uploading the EaR map, the additional part of the window - *EaR Map Properties* becomes visible. This part contains information related to the attribute names of your newly uploaded EaR map. From the first dropdown box you should select the name of the attribute containing the code type values of your EaR layer. From the second dropdown select the name of the attribute containing the economic values of the EaR in the layer, and from the last dropdown select the attribute name containing the population number of the EaR in your layer. Use the last edit button to save/edit your selection.
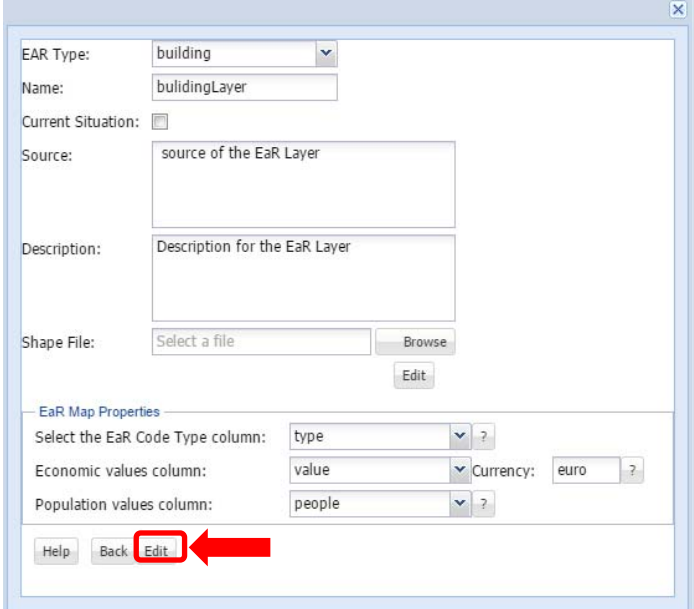


**Figure 20 Editing EaR Layer by selection/filling the EaR Map Properties**

You can then see that your new EaR layer will be displayed in the Available EaR Maps list:
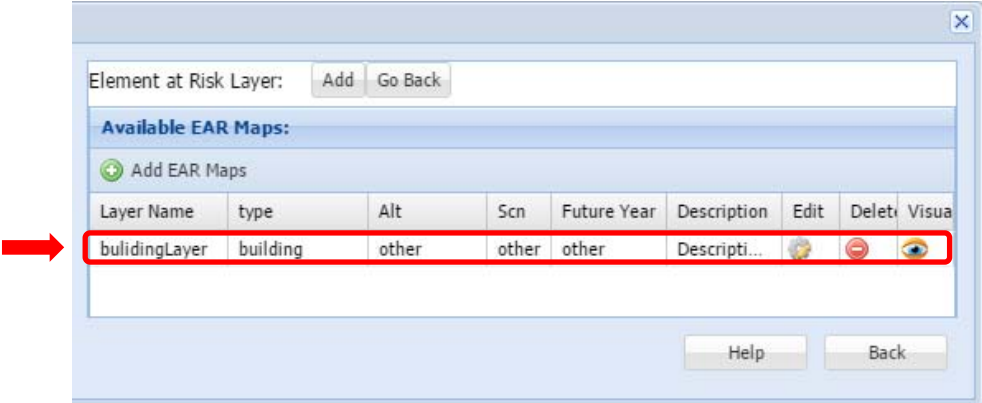


**Figure 21 EaR layer upload result**

# Project Management
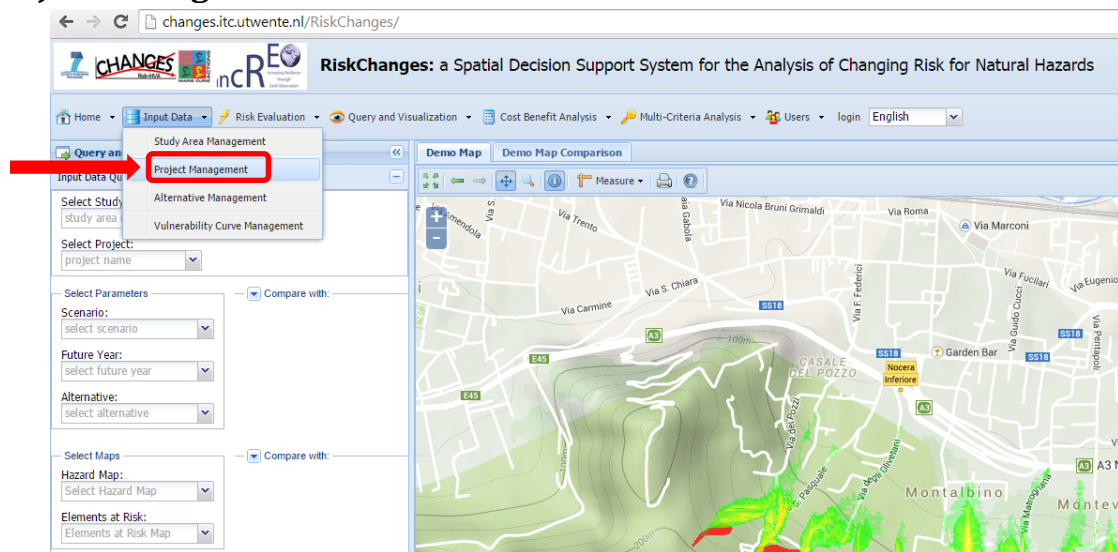


**Figure 22 Project Management**

The Project Management section maintains a collection of projects. Each project is a container of user defined parameters necessary for loss calculation. Start creating your project by making a selection of your study area for which you would like to create the project and press the *Add Project* button.
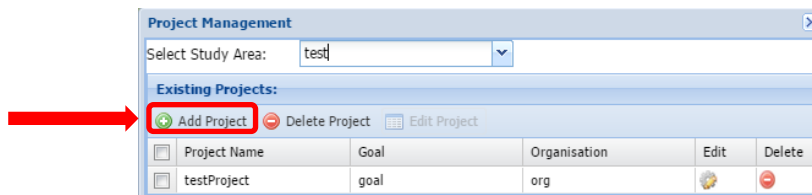


**Figure 23 Adding Project**

The project UI looks like the figure below:
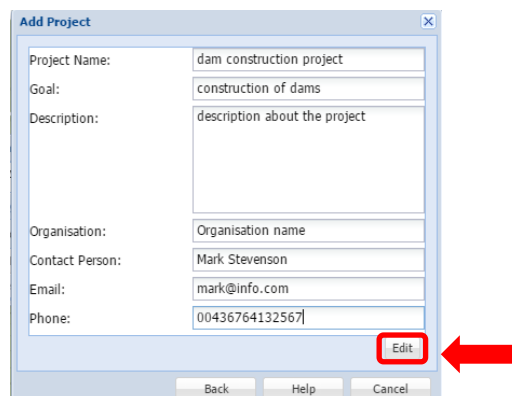


**Figure 24 Saving/Editing Project**

Fill in all the necessary fields and save/edit your project. Two additional sections will then appear:

- Link to Alternatives and Scenarios

- Link to specific Hazard and EaR Maps

*Link to Alternatives and Scenarios* leads you to the UIs from where you can create your alternatives, scenarios and add the required future years. After that, you can go to the *Link to specific Hazard and EaR Maps* and make connection with existing alternative, scenario and future year and attach to them to your previously uploaded EaR Maps, hazard sets and vulnerability curves.



**Figure 25 Linking point for Alternatives, Scenarios, Future Years with Hazard Map set, EaR Layer and Vulnerability Curves**

In case you would like to edit the project information, you can do this directly from here, or if you are somewhere else in the system, you can make a selection of your project from the Project Management list and click the *Edit* button:
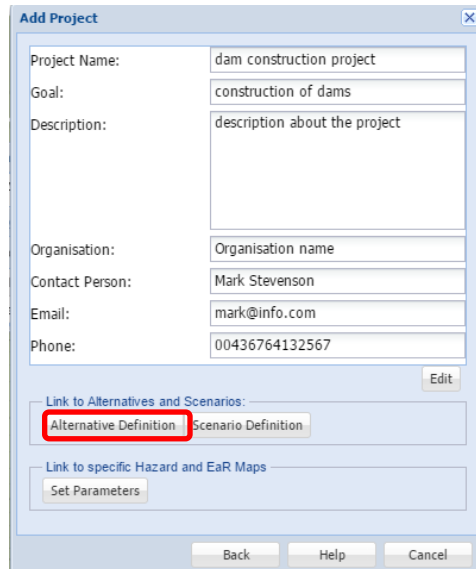


**Figure 26 Editing Project information**

## Alternative management

After having your project created you can start adding your alternatives. For this you should go to *Alternative Definition* which is under *Link to Alternatives and Scenarios*.
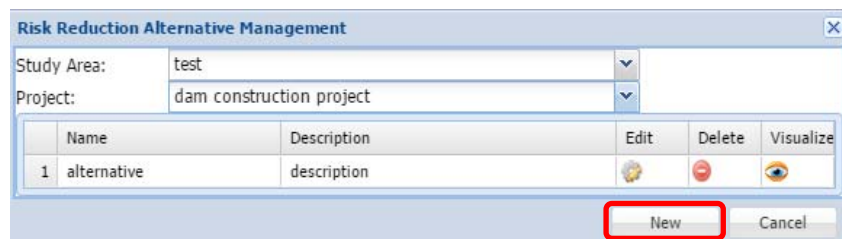


**Figure 27 Alternative Definition**

A new *Risk Reduction Alternative Management* window will appear. After selection of your study area of interest and project under which you would like to add your alternatives, the existing list of alternatives appears in the list. In order to create new alternative press the *New* button.



**Figure 28 Adding new Alternative**

Tab named *New Alternative* will appear on the main screen. The information about the project is also visible (you can move the project window on the right side in order to have a better overview) as it is shown in the figure below. In the new tab you should fill in the fields as *Name*, *keyword*, *description*, make a selection of *alternative type*, *start year*, *lifetime* etc. When you are finished you should save your defined alternative by pressing the *Save* button, which is on the lower right side of the form.

**Figure 29 Filling in information about the new alternative**

You can check if your alternative was successfully inserted by going to the Alternative Definition part again:



**Figure 30 Risk Reduction Management Grid listing the existing alternatives**

## Scenario Management

Within your project you should add your scenarios. That you can do by going to the *Scenario Definition* button as displayed below.



**Figure 31 Scenario Definition**

The list shows where the existing scenarios and future years for your project are listed. Here you have the option of adding new future years as well as additional scenarios.
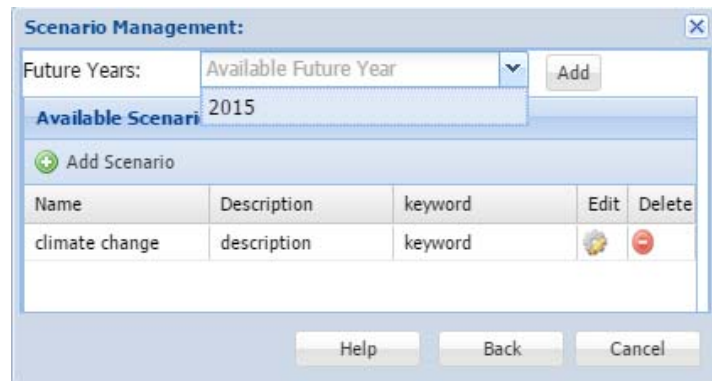


**Figure 32 Scenario Management UI**

**Scenarios**

The *Add Scenario* button gives you the option for adding new scenarios. You should fill in the basic information for the new scenario such as *Name*, *Keyword* and *Description*.
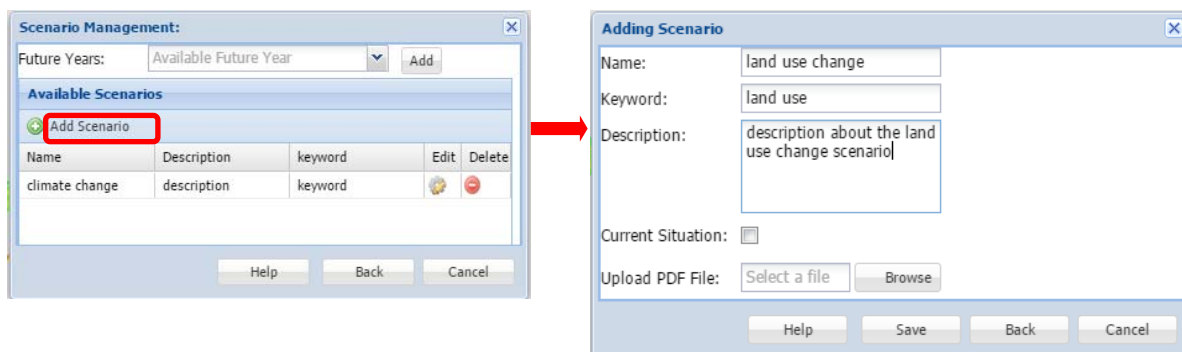


**Figure 33 Adding new scenarios**

After saving it, you can check and see the new record in the Available Scenarios list.
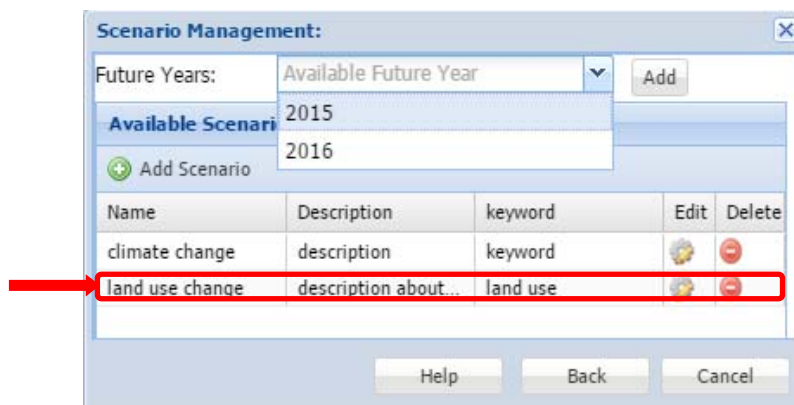


**Figure 34 Adding Scenario result**

**Future Year**

In order to add new future years you should go to the *Add* button and fill in the *Future Year* field:
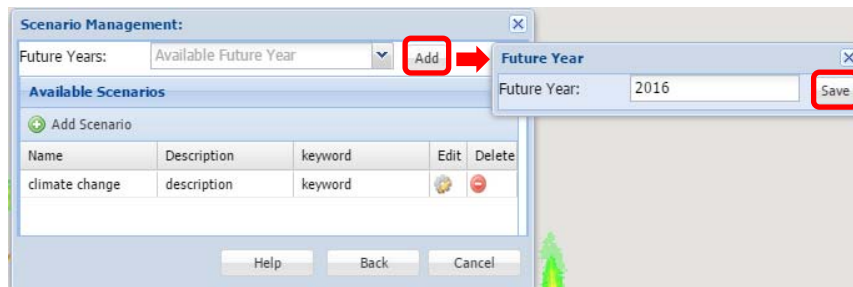


Figure 35 Adding user defined future years

The future year you have created appears in the Future Years drop down.


## Vulnerability Management

Vulnerability management part consists from three sections:

- Search part
- Visualization of the existing curves
- Uploading new curve

The *Search* part is used for an overview of all the existing curves in the system for your study area and in the loss map parameters section where a vulnerability curve needs to be attached to a specific loss map record. We first filter the curves by selecting values for the *hazard type*, *hazard intensity type*, *unit*, *EaR type*, *EaR code type* and *vulnerability type* fields from the Search Criteria section.

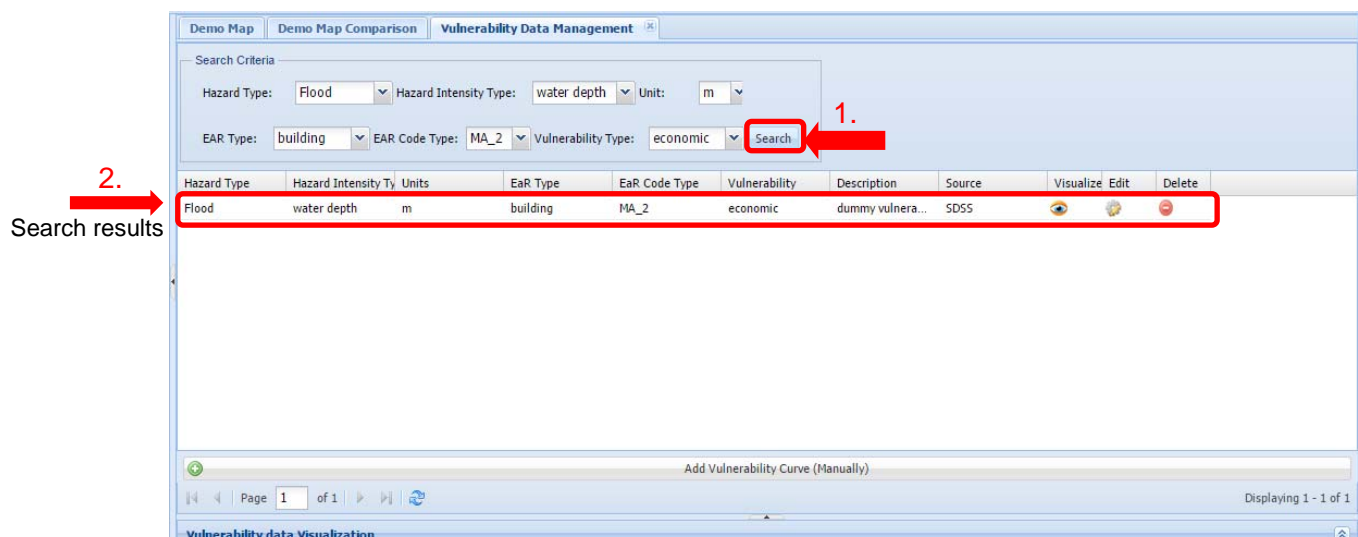You can see the results in the list below the *Search* button.



Figure 36 Searching for vulnerability curves fulfilling the filter criteria

You have the option to vizualize your curve by pressing the *Visualize* button.
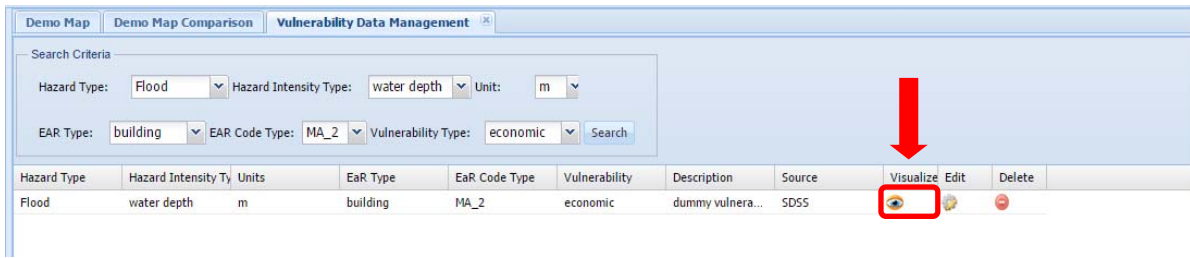
**Figure 37 Visualization button/icon of the vulnerability curve**

Then the *Vulnerability Data Visualization* section displays your selected curve in a graph together with the details for your curve such as: hazard intensity values and their corresponding vulneraility average (AVG) values.
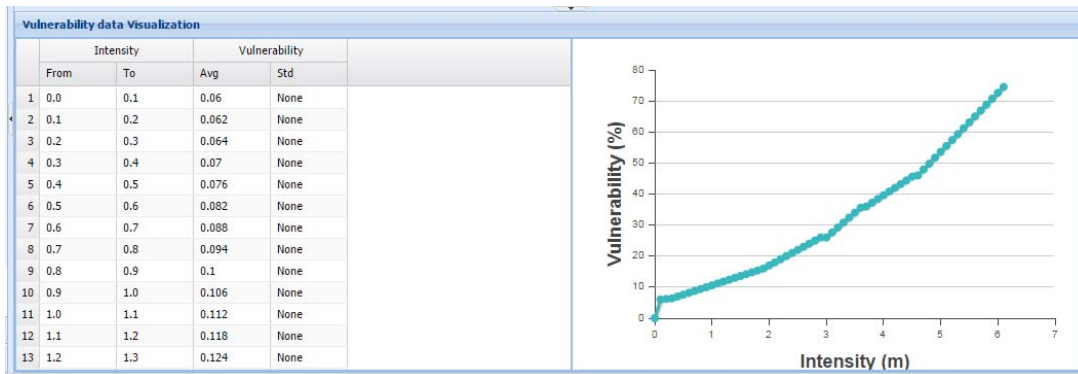


**Figure 38 Graph and tabular visualization of the vulnerability curve**

In case your curve doesn't exisit in the system you have the option of adding it by uploading your own vulnerability file.
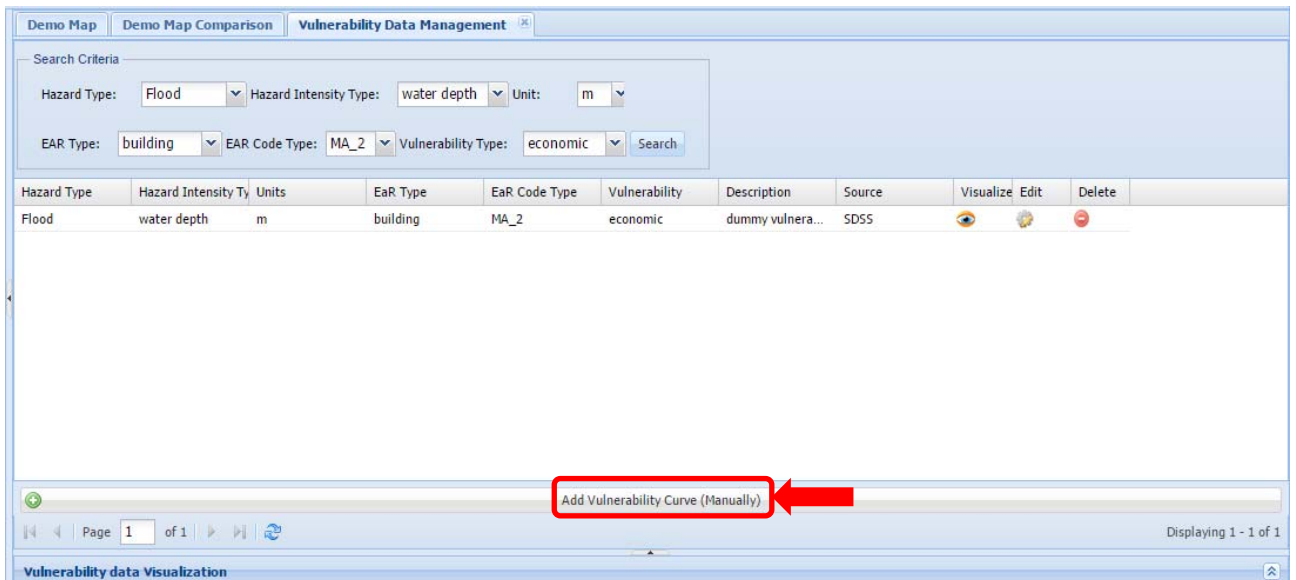


**Figure 39 Adding new Vulnerability Curve**

You first need to specify the necesarry information for your curve by making a selection of the values in the dropdowns, give information about the *source* and the *description* of your curve and in the end upload your vulnerability curve by pressing the browse button.
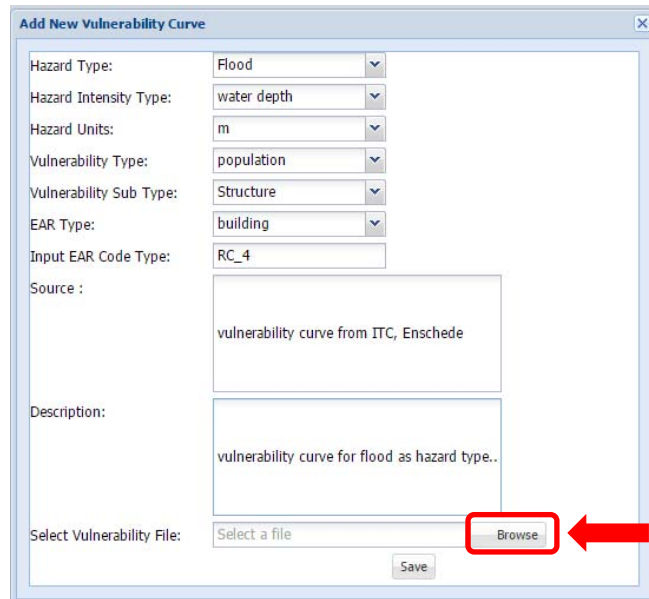
**Figure 40 Filling in the vulnerability curve information**

The vulnerability curve file should be a .txt file and should contain all the hazard intensity values with their corresponding vulnerability values as seen in the figure below:



**Figure 41 Vulnerability curve .txt file**

The first column represents the intensity value, the second column represents the *To* intensity value and the last column represents the *Vulnerability values*.
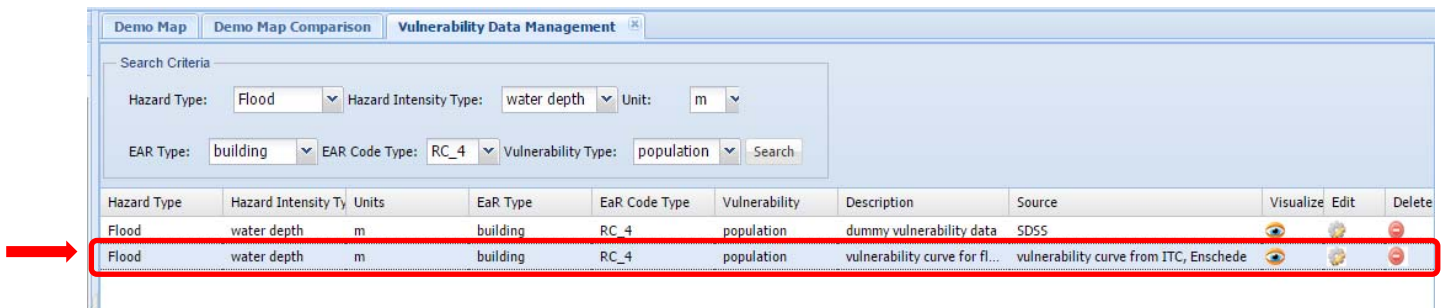


**Figure 42 The result from adding new vulnerability curve**

You can see the newly uploaded curve in the list now and you can visualize it as we did before:
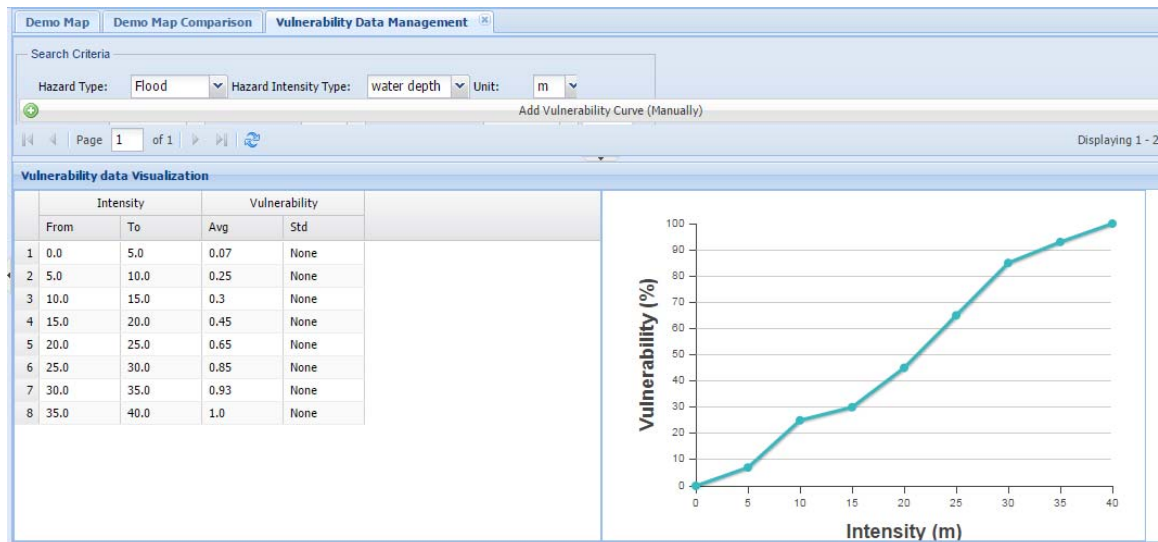
**Figure 43 Graph and tabular visualization of the vulnerability curve**

## Loss Map Parameters

At this point we have the set of hazard and EaR maps for our study area, created a project, added alternatives, scenarios and the future years we need within the project, uploaded the vulnerability curves related to the EaR and came to a point where we should combine all these information and create our loss map parameters which are a starting point for the loss calculation. So let's see how we can do that:



**Figure 44 Setting up the loss map parameters point**

As you can see, all the scenarios, alternatives and future years / reference years are listed in this grid. What you do now is select what is called a node in the system. For example:

- Scenario: Climate change
- Alternative: Construction of dams
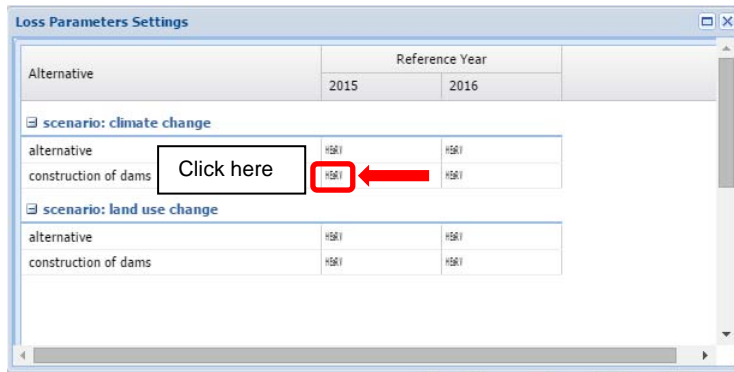- Reference year: 2015

**Figure 45 Loss Map parameters combination node**

A new window is going to show up as seen in the figure below, where the *name* of the selected alternative, *scenario* and *future year* are displayed. For the moment, for the combination we made, there are no loss map parameters. In order to connect your previously uploaded Hazard, Ear Maps and vulnerability curves first press the *Add* button to create a "loss map parameters" record:
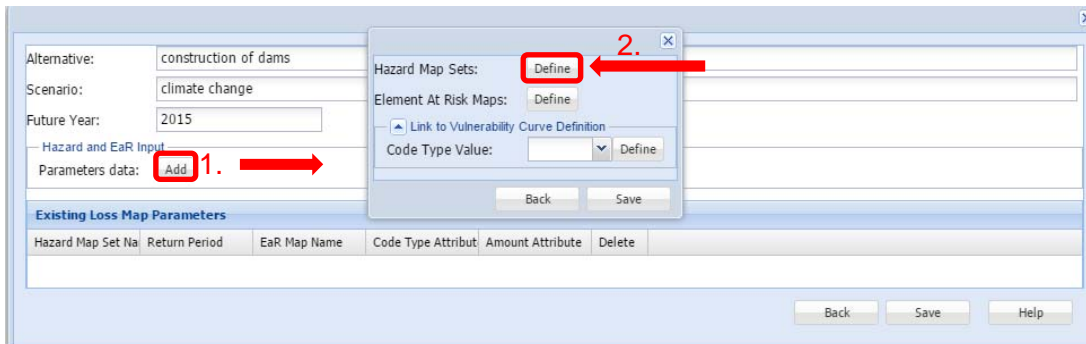


**Figure 46 Definition/attachment of Hazard Map Set to the loss map parameters combination node**

From the small window popping up, you should first make a selection of the hazard set by clicking the *Define* button. We see there is one hazard map set in the *Available Hazard Map Sets grid*, one we uploaded previously. We select that one, and press the upper Go Back button.
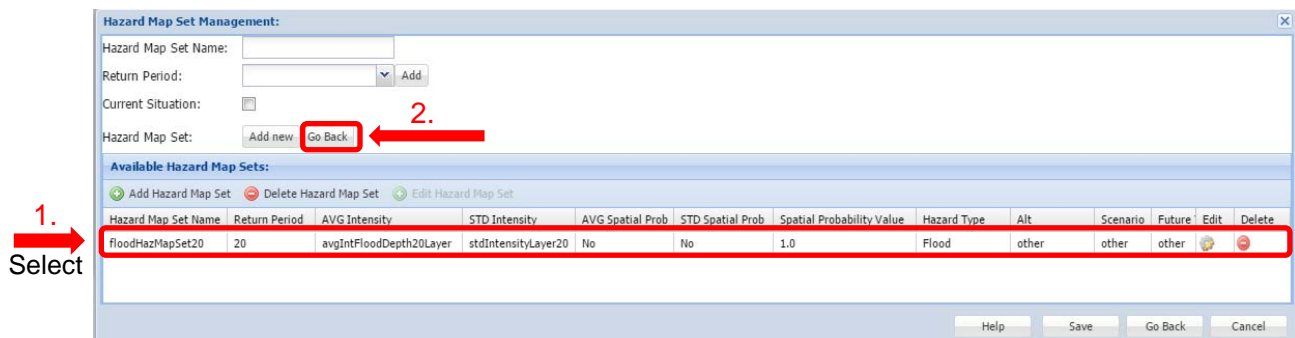


**Figure 47 Selection of hazard map set**

Next we should make a selection of the EaR Map by first clicking on the second *Define* button next to the Element At Risk Maps field:
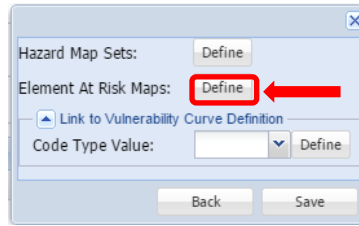
**Figure 48 Definition/attachment of EaR Map to the loss map parameters combination node**

Select the EaR layer listed in the Available EaR maps list and then click the Go Back button.
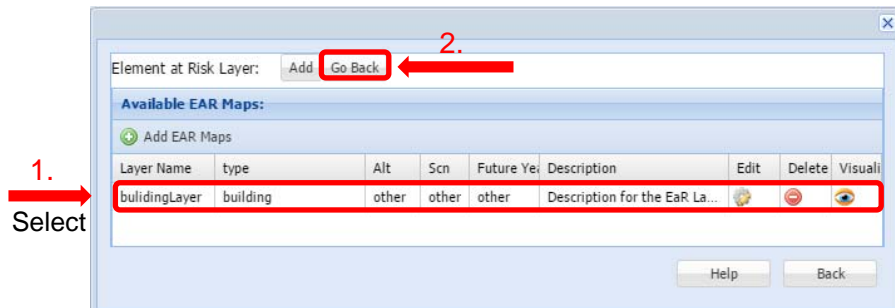


**Figure 49 Selection of EaR map**

After selecting your maps, the next thing to do is linking the Vulnerability curve. Depending on which EaR map you selected previously, the Code Type value dropdown lists all the code type values from your EaR layer. You must select all these values one by one and link them to the appropriate vulnerability curve! Start by choosing the first one and then press the *Define* button which will lead you to the section where you need to choose your Vulnerability curve.
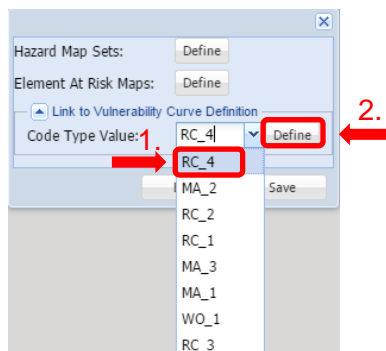


**Figure 50 Selection of EaR code type value**

The Vulnerability Management tab appears with prefilled values for most of the fields. The one that should be selected is the Vulnerabiltiy Type. Afterwards you press the *Search* button.



**Figure 51 Searching for a vulnerability curve fulfilling the filter criteria**

Based on the preselected values and on the *Vulnerability type* selection, we get the filtered results, which is the selected vulnerability curve as seen below on the figure:
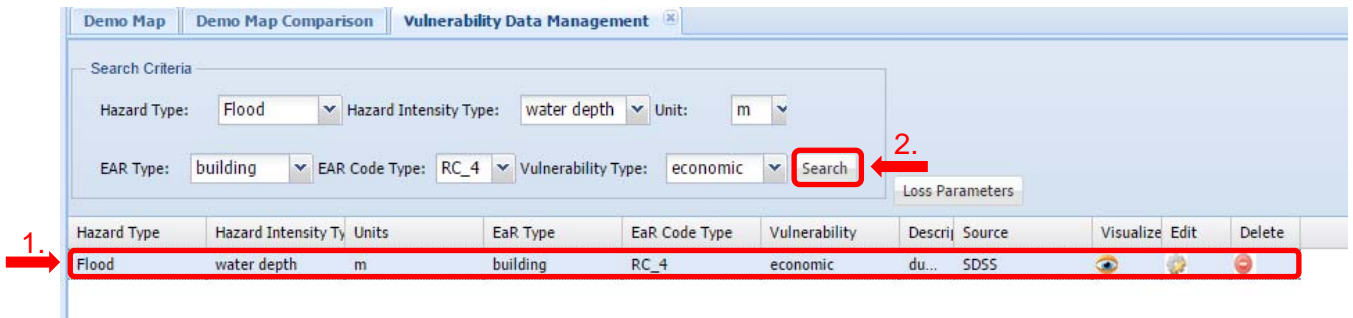


**Figure 52 Vulnerability curve search result**

You should select the matching vulnerability curve and press the *Loss Parameters* button, which will lead you back to the previous UI where you have to click the *Save* button in order to save
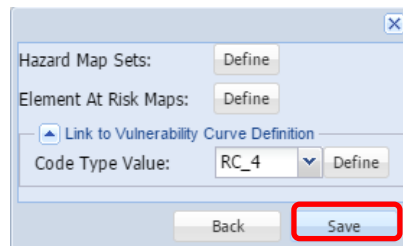


**Figure 53 Saving the loss map parameters**

the combination of all parameters you just made. You can see the newly inserted loss map parameter record in the *Existing Loss Map Parameters* list below:
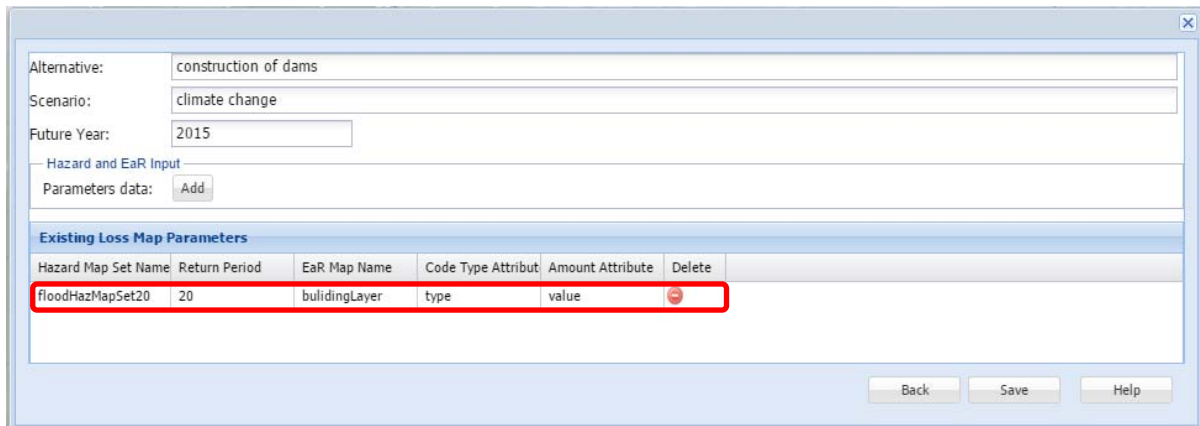


**Figure 54 Loss map parameters result**

You have to repeat the same procedure for **all** EaR code type values, so that you prepare the necessary information for loss calculation. Remark: for the remaining code type values we don't explicitly see new record/loss map parameter in the *Existing Loss Map Parameters* list.

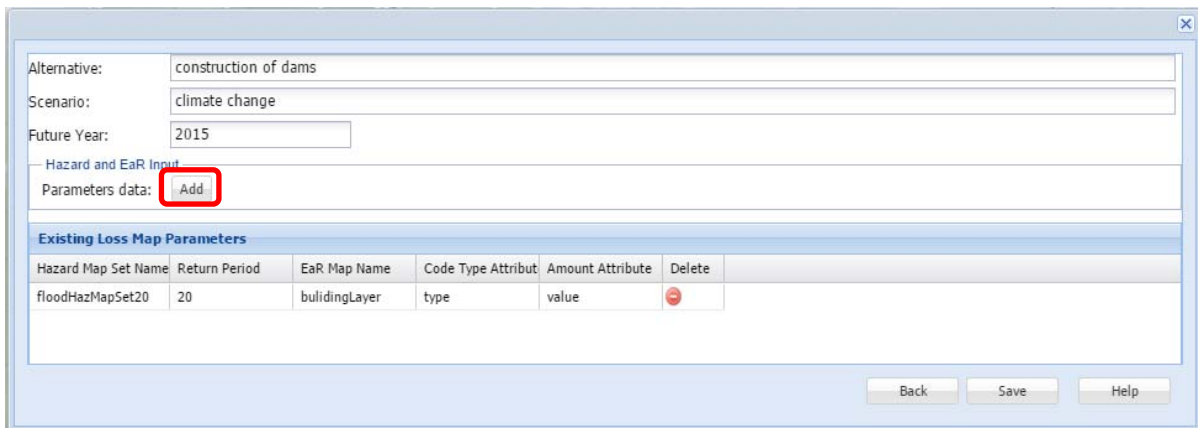In order to do that continue adding the rest of the loss map (sub)parameters:

**Figure 55 Adding new loss map (sub)parameters**

The Hazard Map Set and the EaR layer are known from your previous selection, and now you should select another/new code type value from the same EaR layer. Attach another vulnerability curve for this code type value in the same way as we did before.
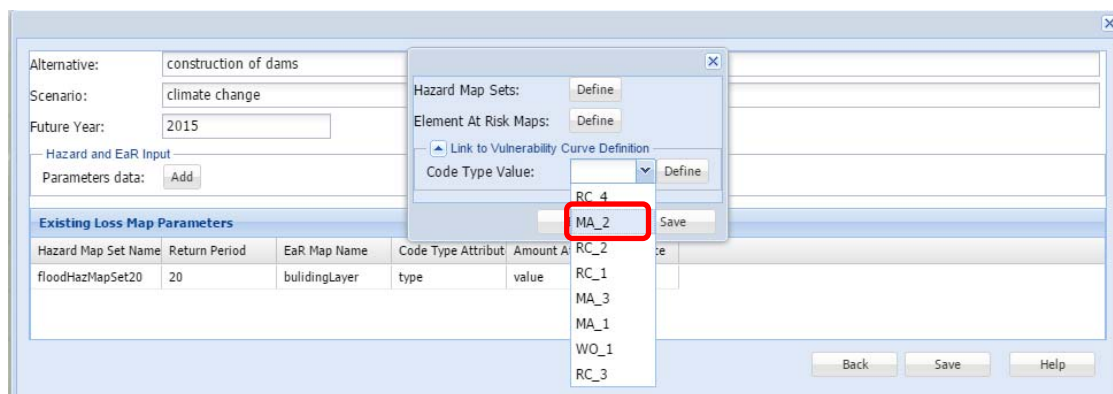


**Figure 56 New code type value selection**

When you repeat the same steps we did before for all code types, you have finished the loss parameters preparation part and you can move on to the loss calculation module, which is described in the following chapter.