

Manual for the Economics of Climate Adaptation (ECA) San Salvador

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Download and setting up:

climada is running on Matlab and Octave. Octave¹ is a free an open source version of Matlab. Download the following repositories from GitHub²:

- *climada* core: <https://github.com/davidnbresch/climada>
(The core module of *climada*, called *climada* core where we deem it necessary to make this clear distinction between the core and additional modules of the *climada* tool)
- *salvador_demo*: https://github.com/davidnbresch/climada_module_salvador_demo
(The functions, hazards and entities for the San Salvador ECA study. This is a *climada* module, i.e. it extends the functionality of *climada*³)
- Depending on the functionality (creation of tropical cyclone hazard or landslide hazard) more module like *climada_advanced*, *climada_flood* or *climada_tropical_cyclone* need to be downloaded.

A detailed guide on how to set up *climada* and modules (worth reading for new users) can be found at: https://github.com/davidnbresch/climada/blob/master/docs/climada_manual.pdf

In order to understand what *climada* is all about and how it works in principle, read the *climada* manual at least to page 14⁴.

It is highly recommended to study the step-by-step explanation⁵ as provided on pages 15-25 (page numbers might slightly vary). It is also recommended to once read this whole present document before getting started, as there are some hints to deal with issues noted at the end.

¹ Octave is powerful for calculating damage numbers, however Octave faces some issues with producing figures (and does not support complex GUIs).

² You can either clone or download. If not familiar with GitHub, use download, i.e. click on the green 'Clone or download' button and select 'Download ZIP'. Then move the unzipped file to a suitable location. Please note that GitHub names the unzipped folder like 'climada-master', hence rename by removing the '-master' for shorter filenames, as shown in Figure 1.

³ In order to make this module accessible to *climada*, create a folder named 'climada_modules' on the same level as core *climada* (as shown in Figure 1 on the left) and move the folder 'salvador_demo' (again, GitHub named it 'climada_module_salvador_demo-master', but it can be renamed to keep shorter filenames) into it (as shown bottom center of Figure 1). See the *climada* manual for details about modules, too.

⁴ I.e. sections „A brief introduction to the concepts behind *climada*“ and „Getting started“.

⁵ Entitled „From tropical cyclone hazard generation to the adaptation cost curve“

Setting up the working directories

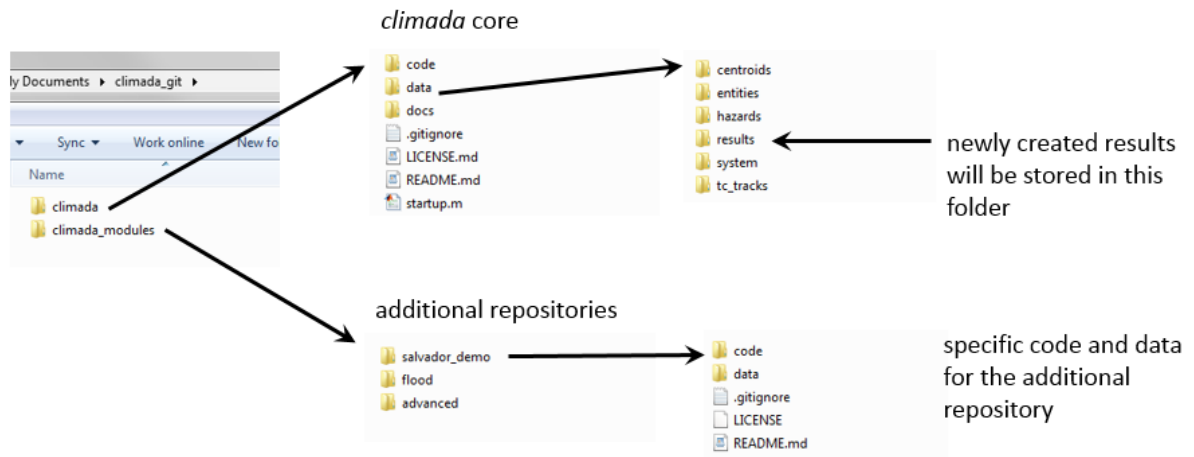


Figure 1: climada folder structure contains of core climada (upper part of the figure) and additional repositories (lower part).

In order to ease use, the hazards and entities within the *salvador_demo* module (in folders `.../salvador_demo/data/hazards` and `.../salvador_demo/data/entities`) need to be copied in the hazard (`.../climada/data/hazards`) and entity (`.../climada/data/entities`) folders of the climada core module. This way, they are directly accessible to climada users and they do not need to switch directories when selecting hazards/entities.

Two main functions to reproduce the results can be used. Type (or copy paste) the `courier` new formatted text into the MATLAB/Octave command line:

- The function `salvador_calc_waterfall('TC')` for example produces the waterfall graph for tropical cyclones ('TC'). Remark that 'TC' is only a nametag, the peril need to be chosen in the next step.
- The function `salvador_calc_measures('FL_AB1')` produces the adaptation bar chart and cost curve for flood.

The nametag 'TC' or 'FL_AB1' is the folder name where the results will be saved starting with the name of the current data, the type of results (e.g. waterfall) and the selected folder name ('TC'). This way, the results are easier to be found in the folder `.../climada/data/results`.

The functions then ask to choose a peril. There are 4 different perils to choose from:

- 'TC' – Tropical cyclone,
- 'FL' – Flood,
- 'LS_acelhuate' – Landslide
- 'LS_las_canas' – Landslide.

After the peril is chosen, the files asks to select a specific entity:

For each peril, 3 Excel (.xls or .xlsx) files need to be specified⁶:

- assets_file (The assets or entity file)
- damfun_file (The damage function file)
- measures_file (The file with the measures)

Table1: The listing of the entities and files to select:

Peril	Type	name
FL (flood)	Assets	FL_entity_AMSS.xls
	Damagefunction	FL_DamageFunction_150910.xlsx
	Measures 1	FL_measures_template_for_measures_location_A_B_1.xls
	Measures 2	FL_measures_template_for_measures_location_A_B_2.xls and entity_AMSS_urban_planning.xls
TC (tropical cyclone)	assets	TC_entity_AMSS_WIND-AMSS_250915_v2.xlsx
	damagefunction	TC_entity_AMSS_WIND-AMSS_250915_v2.xlsx
	measures	TC_entity_AMSS_WIND-AMSS_141015_FINAL_COSTS.xlsx
LS (Acelhuate)	assets	LS_entity_AMSS_DESLIZAMIENTO_ACELHUATE_141015_NEW.xls
	damagefunction	LS_entity_AMSS_DESLIZAMIENTO_ACELHUATE_141015_NEW.xls
	measures	LS_entity_AMSS_DESLIZAMIENTO_ACELHUATE_141015_NEW.xls
LS (las canas)	assets	LS_entity_AMSS_DESLIZAMIENTO_LAS_CANAS2.xls
	damagefunction	LS_entity_AMSS_DESLIZAMIENTO_ACELHUATE_141015_NEW.xls
	measures	LS_entity_AMSS_DESLIZAMIENTO_LAS_CANAS2.xls

(Remark: The damage function for las canas is specified in the acelhuate excel file.)

Modifying inputs:

These input excel files contain the location and the value of the assets, the damagefunctions, cost, location and impact of the measures⁷. All this can be modified by changing the excel input, as long as the filename and the structure of the files are not changed.

The hazard files (in .mat format) are recognized automatically, if not they need to be selected to. When asked for hazards, the first hazard is always the normal hazard, the second one the moderate climate change hazard and the third one the extreme climate change hazard.

Results

The results are stored in the folder '*results*' in the climada core module

Hazards

It is also possible to modify the hazards, by generating new flood hazards, new storm hazards (climada TC module) and new landslide hazards (in climada flood module) with

⁶ Note that climada does allow for all elements (assets, damagefunctions and measures) to be in one single Excel file, but for the study, the team preferred this setup. You find the Excel documented in the climada manual.

⁷ Note again that all these terms and their relations are explained in the climada manual.

different frequency, intensity and location. This however exceeds this manual and need advanced matlab and climada user skills.

Remarks:

It is important, that all the files have exactly the name which is used in the matlab scripts, they are case sensitive. Of course an entirely different folder structure can be used, if the references are set correctly.

If you encounter errors such as "WARN: no assets data read, XLSREAD unable to read sheet 'assets'. File contains unexpected record length. Try saving as Excel 98.", please open the respective Excel sheet(s) on your local computer in Excel and save again as Excel 97 or so. This seems to happen more often when running on Mac than on Windows, it has to do with the way the Microsoft .net environment handles the request from MATLAB to read an Excel file. If all fails, use the ../data/entities/entity_template.xls (or .xlsx) file as provided with core climada and copy/paste the values (but ONLY them) from the file(s) you could not open, and save under a new name (and then e.g. rename the Excel climada cannot read to _OLD and the name the newly generated file as the one you could not read).