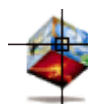
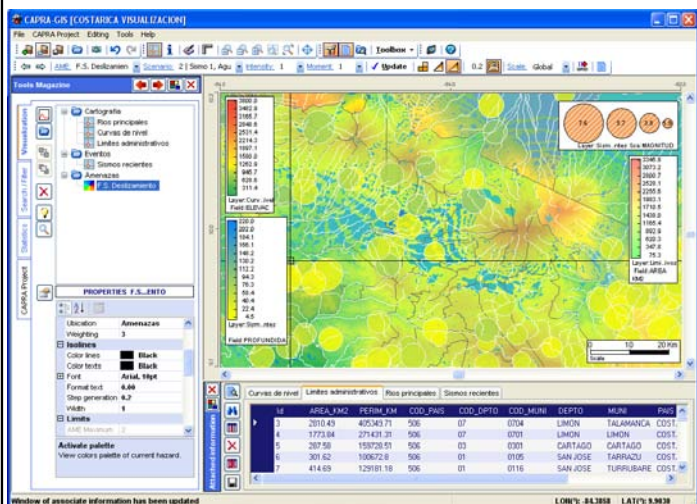


USER MANUAL



CAPRA-GIS

CENTRAL AMERICAN PROBABILISTIC RISK ASSESSMENT



Version 2009-03



BANCO
MUNDIAL



CEPREDENAC



EIRD

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Evaluación de Riesgos
Naturales
- América Latina -
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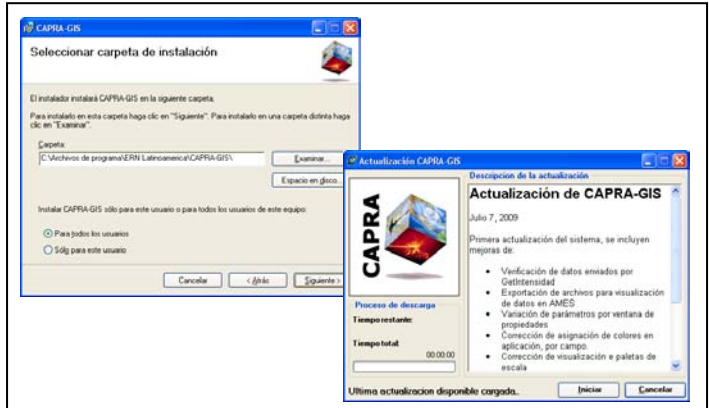
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REQUIREMENTS AND INSTALLATION



CHAPTER

1

Hardware requirements

The following are the minimum hardware requirements for the **CAPRA-GIS** installation:

- PC or compatible computer with Pentium III processor (or higher) and processor speed over 1.5 GHz.
- Operating systems: Microsoft® XP™ or Higher.
- Free hard drive capacity of 250 Mb or Higher.
- 512 MB Extended Memory (RAM).
- CD-ROM or diskette drive unit (Depending on installers set up)

To ensure a correct operation of the system, with high processing speed and display, it is recommended that your computer should have the following hardware specifications:

- PC or compatible computer with Pentium IV and processor speed of 2.0 GHz, HyperThreading technology or Dual Core (Core 2).
- Operating system: Microsoft® Windows XP™
- Free hard drive capacity of 500 Mb.
- 1000 MB Extended Memory (RAM).
- 32Mb Video card.

Installation Process

The following steps must be followed for the installation of software:

1. Start Windows™ insert CD in drive D. (D corresponds to the name of the CD drive in the computer)
2. Enter in Windows™ Explorer and select the drive where installers are located (Drive D), then, go to *Installers File*.
3. Run the **setup.exe** program in this drive; this command starts the installation program. This program is a sequential installer which installs the software requirements **CAPRA-GIS** needs to execute it. These software requirements are: Microsoft® FrameWork® V2.0 and the Microsoft® FrameWork® language package.
4. Once software requirements have been installed for **CAPRA-GIS** software installation starts (see Figure 1), please follow carefully each step indicated by the installation assistant.

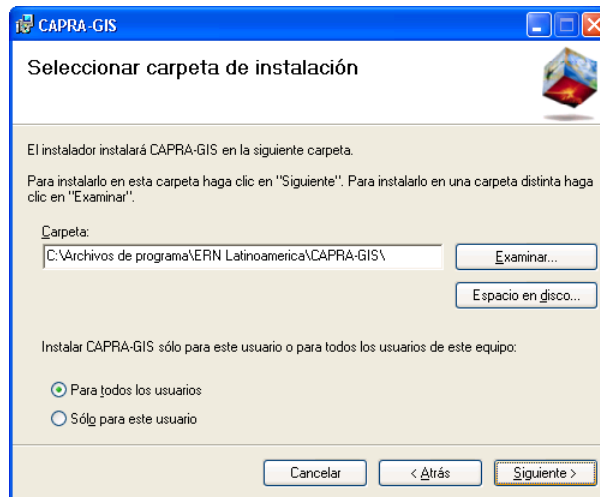


Figure 1 CAPRA-GIS Installation window

CAPRA-GIS Start and End

Click on *Start/Programs/CAPRA-GIS* in the Start menu to start the software. The installation program creates a direct access automatically in the desktop of your computer, from when you also may start **CAPRA-GIS**.

To end the application you may use any of the Windows™ standard methods (Example: Alt+F4, click on X of the program bar, etc.) or in the *File/Exit* menu. Before proceeding to close the application, the software checks whether there have been made changes to the active project and asks user if he wishes to save changes.

When the program starts, the system displays a welcome window which contains a progress bar that shows the level of data load. It is important to watch the bar advance since depending on the hardware and operating system, the load process may take between a few seconds and several minutes.

On-line update CAPRA-GIS

CAPRA-GIS has an automatic updating verification system. Using a higher version than that installed in user's computer, this system searches the program files via Internet files. The updating verification process starts automatically every time the user starts the system, informing user updates only if a download is available. It is possible to start update manually by activating the direct access tool of *User programs menu/Search update* or from the *Hel/Search update* menu.

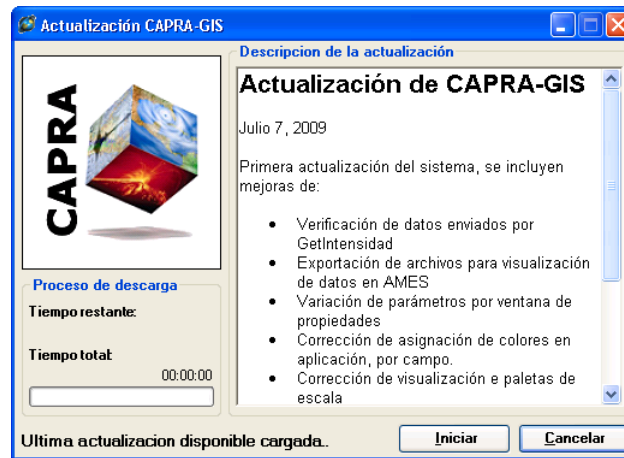


Figure 2 **CAPRA-GIS** Update window

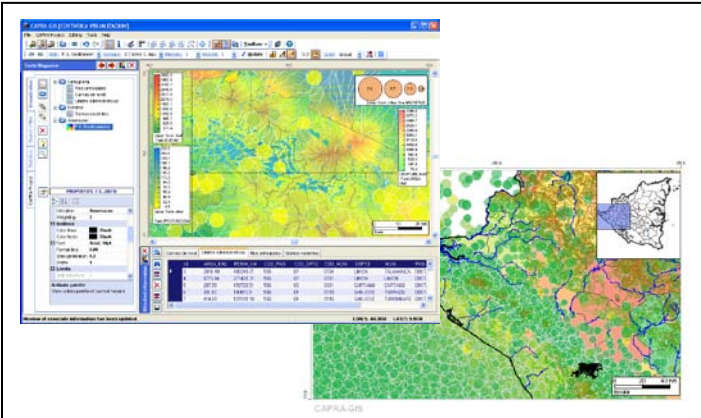
To update the system, **CAPRA-GIS** must not be active in the computer. Once the system is updated, it will not be possible to return to the previous version; if you need to return to a previous version uninstall and reinstall it.

Execution problems for Windows Vista™ users

Due to use restrictions of the operating system on users, there may be some problems when starting **CAPRA-GIS**. A possible solution to this problem is to raise user restrictions of the operating system through the following process:

1. Open **Control Panel** in Windows™
2. Enter **User Accounts** setup
3. Click on **Activate or deactivate user accounts Control**.
4. The verification box must be deactivated. **Use user accounts Control (UAC) to help protect the equipment.**
5. Click on **Accept**
6. Restart the system

**USER INTERFACE AND
GRAPHIC COMMANDS**



CHAPTER

2

General Description

The **CAPRA-GIS** main screen has five areas: tools and menu area, geographical display area, selection area, display control and calculation; display area of georeferenced data and status bar area and processing messages (see Figure 3, where the corresponding areas are marked in red, green, purple, orange and blue).

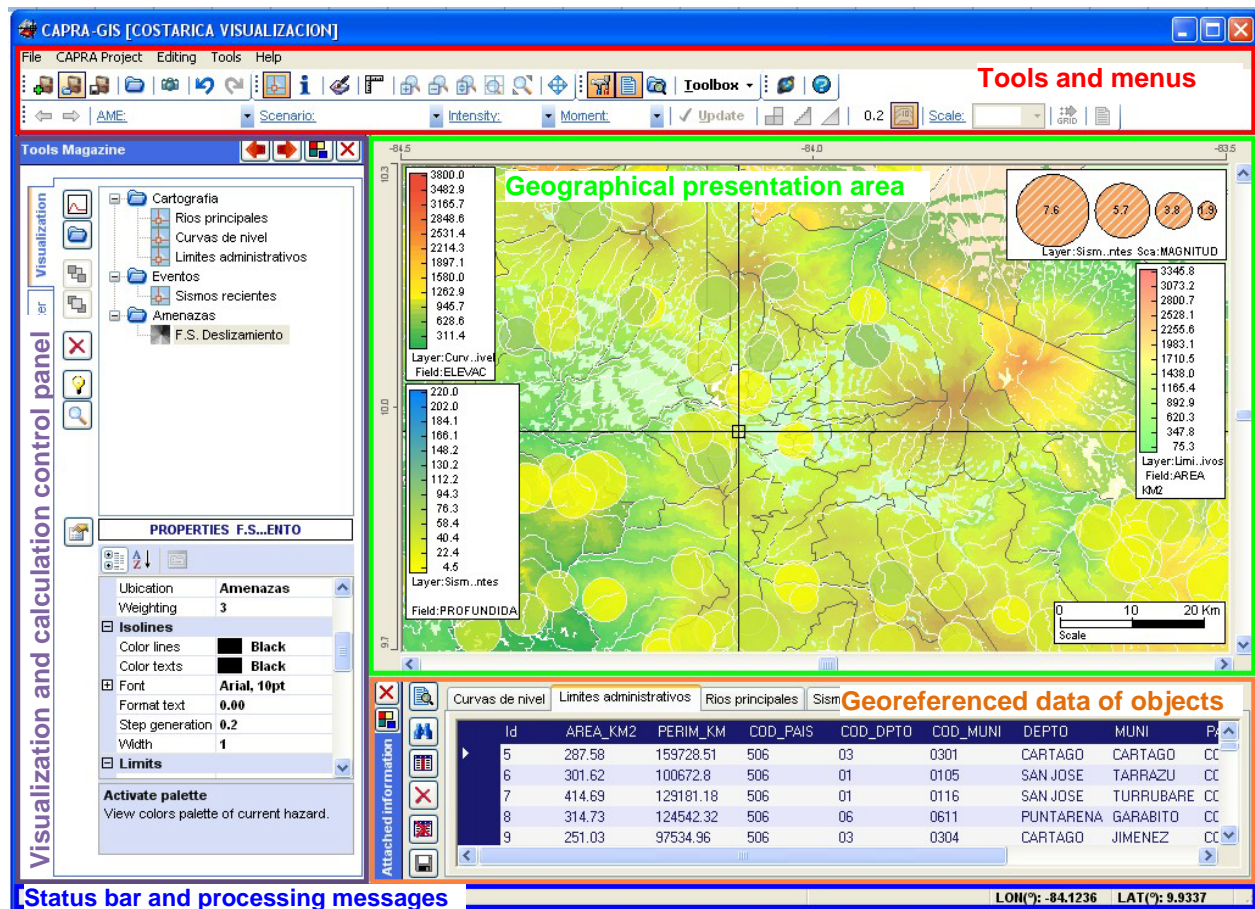









Figure 3 Program Overview

The **CAPRA-GIS** system is built around an independent windows system located within a global container and the center is the geographical display area. The display of each window can be controlled by icons , which disengages the window from the main window and the  command that closes the corresponding area. Once an area has been closed it is possible to display it again using the commands (the window closes if the area is reactivated):

-  **Tools Magazine:** Corresponds to the selection area, display control and calculation

-  **Data Viewer:** Display window of data georeferenced to objects
-  **Data Explorer:** Optional display window of common data and map location files

The **CAPRA-GIS** menu bar comprises five dropdown menus where the necessary functions for display file management (*File*), display and edition of CAPRA projects (*CAPRA Project*), map display control (*Edition*), work windows display control (*Window*) and a help menu (*Help*) are found).

The selection area, display control and calculation has 4 *TabControl* type areas. To activate a given control, click on the control name you wish to display, or use  y  buttons in the tool magazine.

Tools and menus

The **CAPRA-GIS** bar menu has five dropdown menus to access certain system functions, such as file management and visualization plane. These dropdown menus include:

- **File:** Access to functions, file load for display, exportation as a graphic file of the current display and related data graphs. Also, the creation of Project compressed copies and language selection of the application.
- **CAPRA Project:** This menu groups edition and creation functions of display projects. It is possible to start a creation Windows of new projects, on existing projects, store the current Project in edition or save a copy of same, set up additional information of the project and set up the loss estimate process.
- **Edition:** Control of certain functions of project display.
- **Tools:** Control of information panels display and visible tools in the application, as well as creation methods of links to external applications or web sites set up by user.
- **Help:** Help and software update application. Also, the credits of **CAPRA-GIS** creators are found here.

Figure 4 shows the **CAPRA-GIS** tools bar, made up of 5 mobile components: project functions, display functions, tool control, help and update and AMES browse and display.

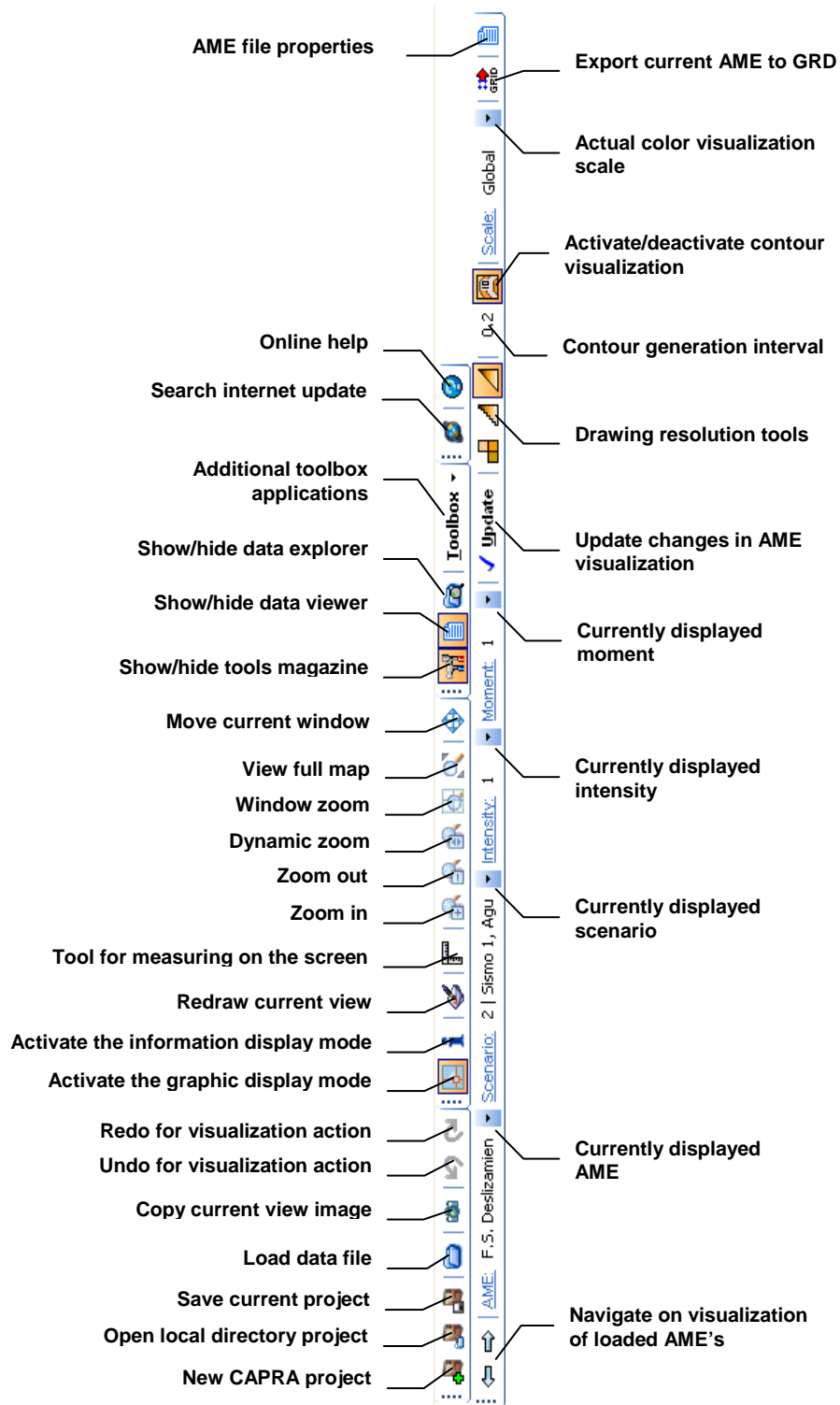







Figure 4 Tool bar buttons

The **CAPRA-GIS** system has two main operation modes. The first, is a “*geographical display*” mode that allows the edition of the current display in the geographical location window and at the same time, prevents object selection. By default, the cursor of this operation is a telescopic type cursor. The second mode of operation is the “*selection mode*” which allows to select available entities in the geographical location window without deactivating the display mode. In this operating mode, the mouse cursor corresponds to a pointer. The commands explained below are found in the main tools bar:

 **NOTE:** Each time the selection mode is changed, the active command of the *geographical location window* is cancelled.

Project functions: Groups the functions used for project load, storage and creation in display.

-  **New project:** Starts a window for a new Project or opens an existing project recently created.
-  **Open project:** Shows a search and browse window in the file system.
-  **Save current project:** Stores in disk the current project being edited. If the project had not been previously saved, then a location windows and name for the new file *cpv is shown.
-  **Copy current image to clipboard:** Copies on clipboard the current project display as image display to be used by any imaging support software. The image copied to clipboard includes a box with the aerial view of the current plane (see **¡Error! No se encuentra el origen de la referencia.**).

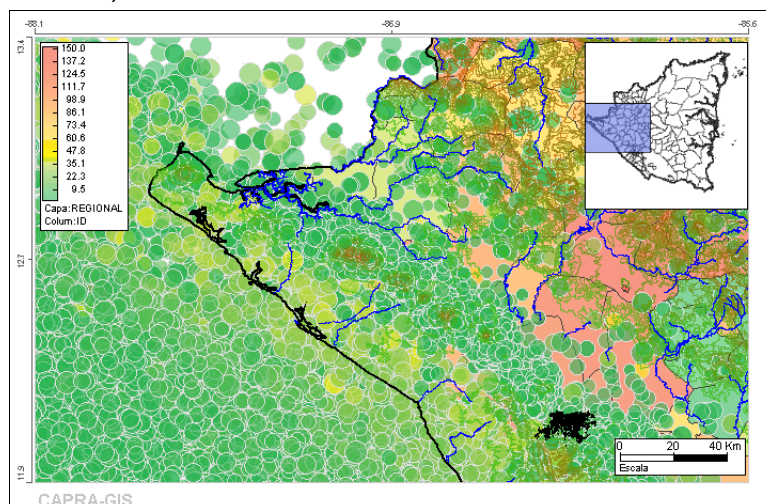







Figure 5 Result of an image copy

-  **Undo:** Cancels the last graphic command leaving the previous screen.

-  **Redo:** Redoes the last command cancelled by Undo.

Display functions: Groups graphic tools used to setup/change display of the current project being edited.

-  **Graphic mode:** Enables the display graphic mode of the current Project being edited.
-  **Selection Mode:** Enables the selection mode for the current project being edited
-  **Redraw:** Redraws the current project, updating all the pending changes on the screen
-  **Measure Distance:** Activates a tool to measure distances in the visualization plane. The method of use is to press the left mouse button on the desired measurement point base and pressing the button, move the mouse over the display area; this presents a level of measurement as shown in Figure 6.

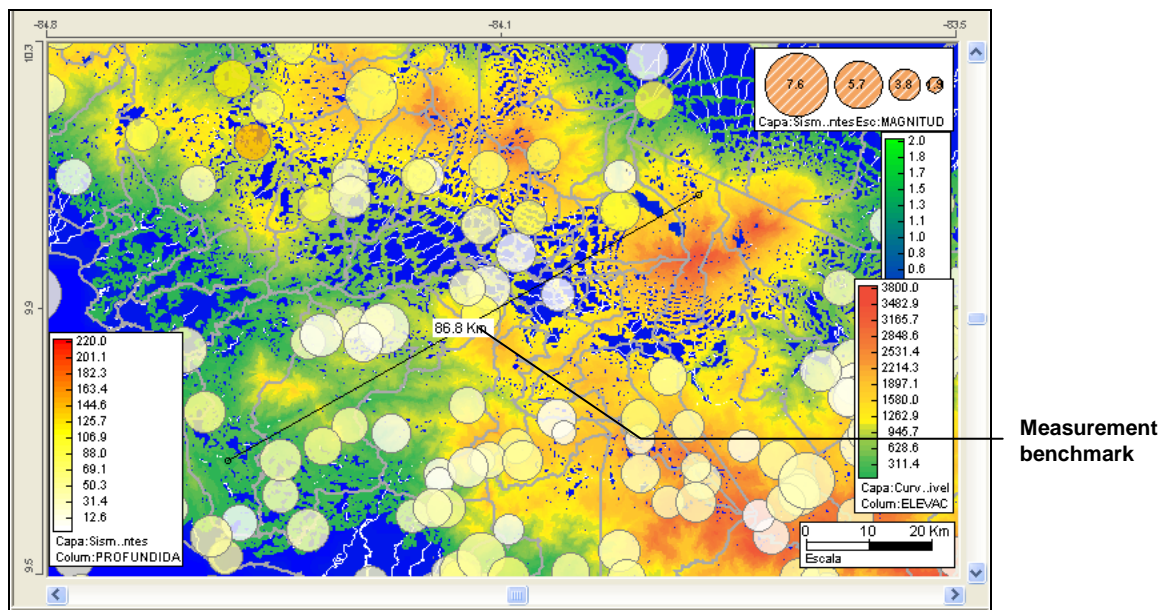






Figure 6 Zoom process by window

-  **Zoom in:** Zooms the selected region towards the center at a rate of 40%. The command is activated by simply clicking on the icon or menu system.
-  **Zoom out:** Zooms the selected region from its center by 40%. The command is activated by simply clicking on the icon or menu system.
-  **Dynamic zoom:** Pans and zooms the region of observation according to the direction in which the mouse is moved. To execute this function, you click the icon on the map and then scroll up, Zoom in, or down, zoom out, as appropriate. This command is available immediately by turning the middle mouse button (MouseWheel)

- 
Zoom window: Zooms according to the selection of a window in the background. To do this, select the tool, then choose a starting point for window selection (red dot in Figure 7) by clicking on the map display window. At that time, it activates a blue display rectangle that changes size as you move your mouse on the screen. The blue window will indicate which area you wish to magnify; to execute this command click on the other end of the screen you want to display (blue dot in ¡Error! No se encuentra el origen de la referencia.).

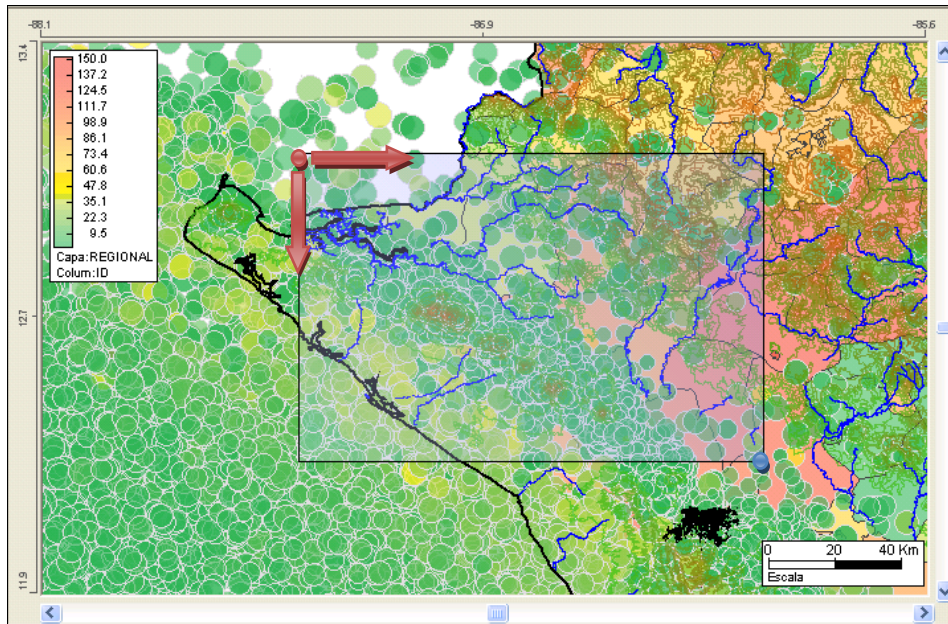







Figure 7 Zoom process by window



- 
Zoom extend: Extends the plane to the maximum viewing limits; this is a way to undo the previous zooms. The command is activated by simply clicking on the icon or menu system.
- 
Move window: Allows you to scroll on the imaging plane to get to areas not currently visible. To do this, select the tool and keep pressing the click and drag the view to the selected location. This command remains active until it is canceled by the operation of another command or by changing the mode of operation. This command is available immediately if you click the middle mouse button.

Tool Control: Controls the display of the tool windows in the **CAPRA-GIS** system.











- 
Tool Magazine: Displays or hides the selection area, control display and calculation.
- 
Linked data: Displays or hides the display window area of geo-referenced data to objects.
- 
Data Explorer: Displays or hides the display window shared folder location data and maps.

- **Hazard:** Displays a popup menu with shortcuts created by the user to external applications used to calculate hazard maps.
- **Other applications:** Displays a popup menu with shortcuts created by the user to use external applications of general use.

Help and update: General tools and update online help

-  **Update system:** Start the online update for Internet **CAPRA-GIS**
-  **Online help:** Displays program online help.

AMES browsing and viewing: Specialized tool to display hazard files (*.ame)

-  **Back on display:** Moves back one step in setting the scenario, intensity and timing of the AME selected, updates project view.
-  **Advance display:** Moves back one step in setting the scenario, intensity and timing of the AME selected, updates the project view.
-  **Update:** Redraws the selected setup for the AME being editing
-  **Unrefine:** Draws the AME with the original resolution (no interpolation or refined) given by the file.
-  **Simple refine:** Makes a subdivision of each cell in the original AME.
-  **Complex refine:** Makes a subdivision of each cell in the original AME and calculates an interpolation between continuing cells, presenting a smooth and continuous display.
-  **Isolines:** Activates or deactivates isovalue line son the selected AME.
-  **Export to GRD:** Starts the export window for the current AME display visualizing the GOLDEN grid format.
-  **AME Edit:** Executes AMES edition application.
-  **See mandates:** Displays the information screen associated with the selected AME.

Graphic presentation of objects

This window shows the geographical map location that allows map search of the information. To interact in this area you should use the flat display Commands described below, under the same title.

Around the perimeter of this area you can see the coordinates (in units longitude - latitude) of the sector being studied, as well as a scale (in kilometers or meters, depending on zoom level) at the bottom.

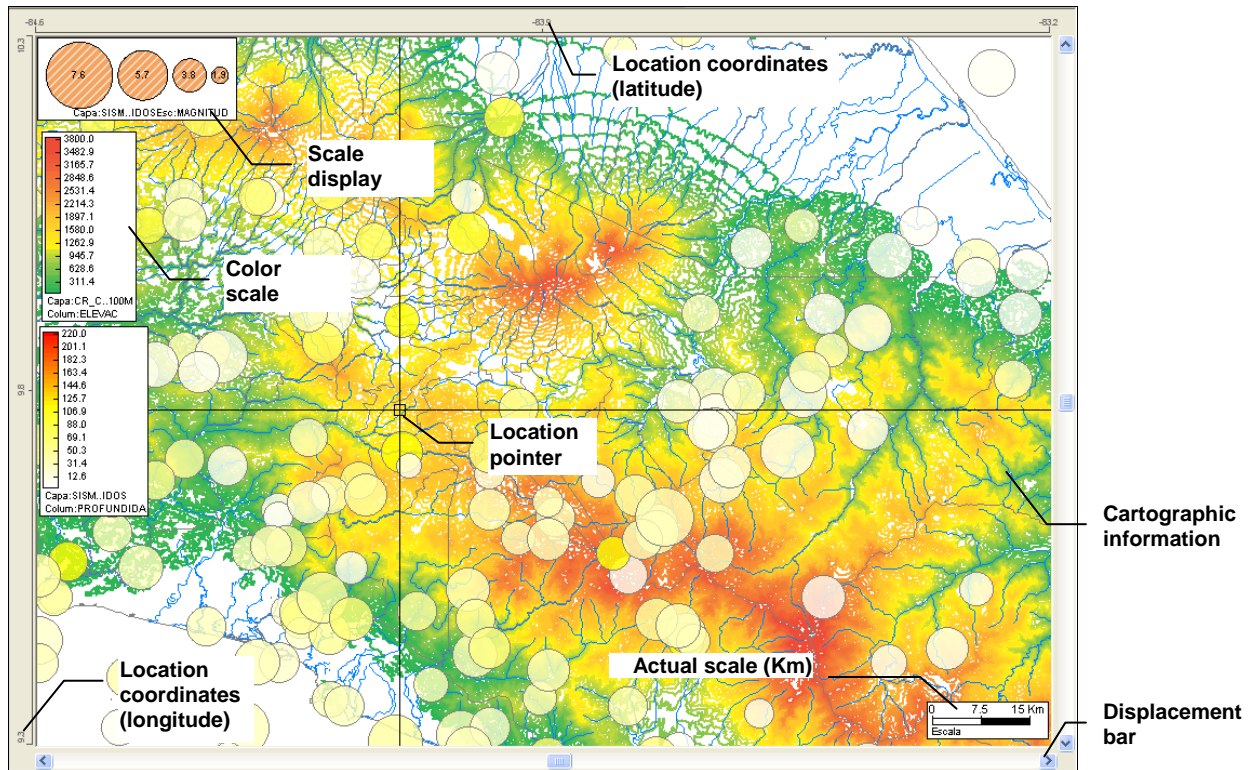


Figure 8 Map display plane

As you move your mouse over the map display you can view the current coordinates (in the coordinate system of latitude, longitude) display in the status bar in the last two boxes from left to right. The scroll bars allow you to move the current display area of the plane, to locate the area of interest in the plane.

According to the type of object a **CAPRA-GIS** visualization is obtained, and therefore, the objects displayed in the map view area are:

- **Hazard files (*.ame):** Are grid of calculated data which results are shown graphically. The resulting map is a spectrum of colors associated with a segmented scale. In these files it is only possible to activate a hazard layer at a time and are always located at the bottom of the order of redrawing of the project. The display configuration of the hazard files is determined by the scenario, intensity and time selected by the user. It configures display ranges, colors and resolution.

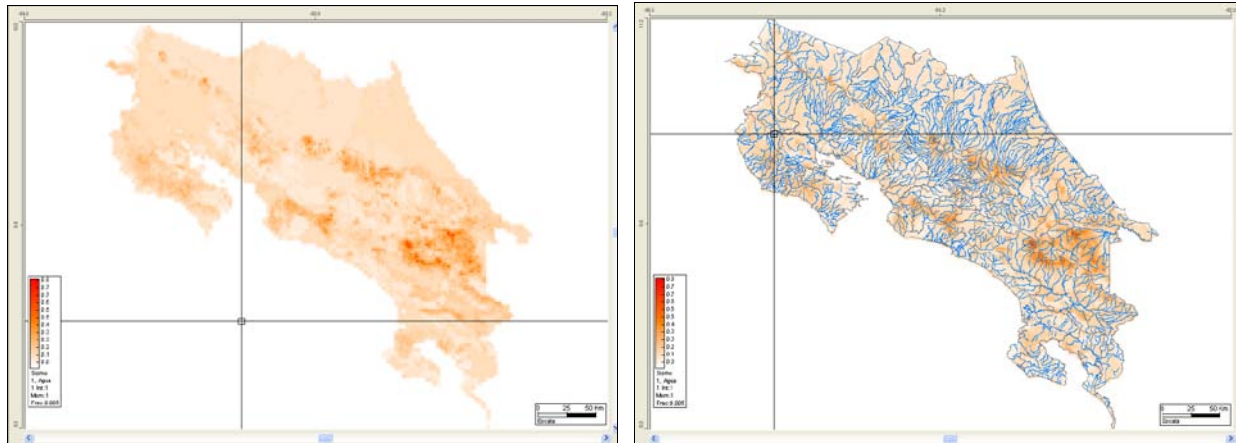


Figure 9 Visualization of a hazard file: (left) hazard map (right) hazard file and ShapeFile hydrography

- **ShapeFiles (*.shp):** Are vectorial layers that contain spatial geographical information. In these layers, it is possible to have several layers activated at the time and to configure colors, font sizes and line widths.

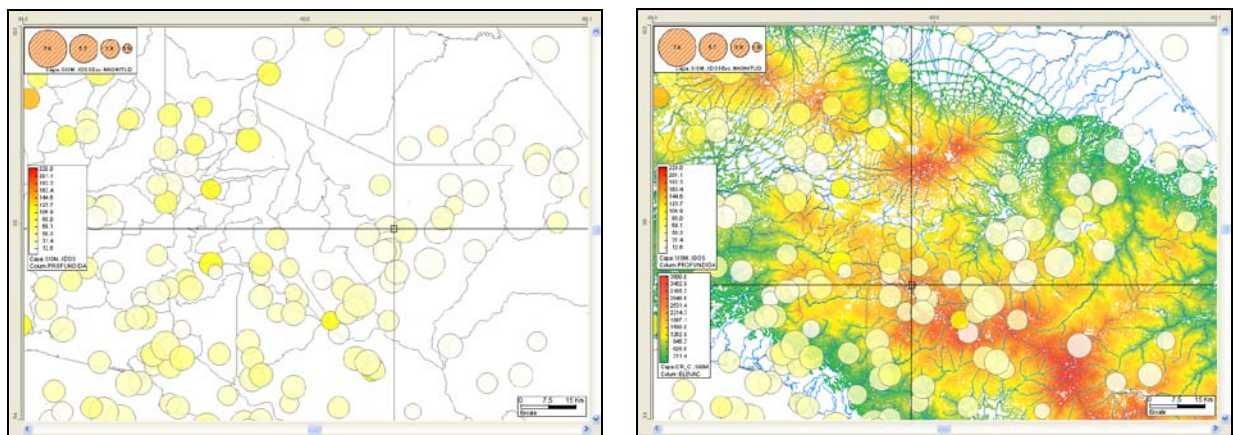


Figure 10 Visualization of layers: (left.) seismic events, political division (right). Seismic events, political division, hydrography and level curves

Click the right mouse button on the control display. This will display a popup menu as shown in Figure 11, which represents a shortcut to commands display the same way as the items in the main taskbar.

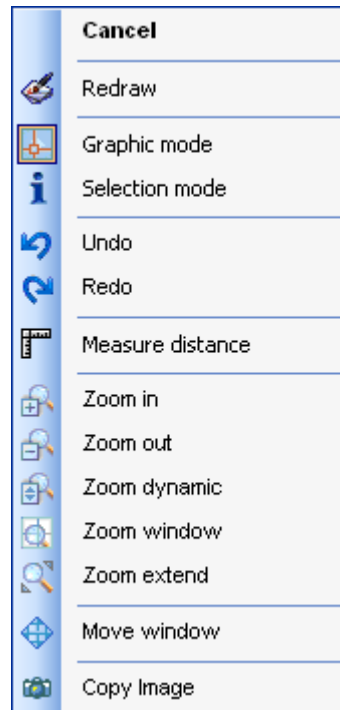


Figure 11 Emerging menu for geographical display

OBJECTS IN THE DISPLAY AREA

The display area has several objects placed on the Layers and hazards files. These objects are intended to show the user additional information about the configuration of layers and hazards or actual level drawn. The following is a description of the objects found on display.

Current scale

An object that identifies graphically the current scale of the display in units of the international measurement system ((kilometers-Km and meters-m). The object changes automatically when you change zoom levels on the display. It is always visible and with fixed location (it is not possible for user to change its location and/or display)

Color palette

The color palette consists of certain ranges identified by a lower numerical limit, an upper numerical limit and an associated color. This object makes graphic representations in color scale for data associated with a grid or layer. A palette is always a text data source identifier located at the bottom of the color scale (see Figure 12).

It is a movable object and configurable by the user. To move a palette object, click on it, keeping the mouse button pressed down and if the cursor location is changed, the pallet moves across the display area (see Figure 12).

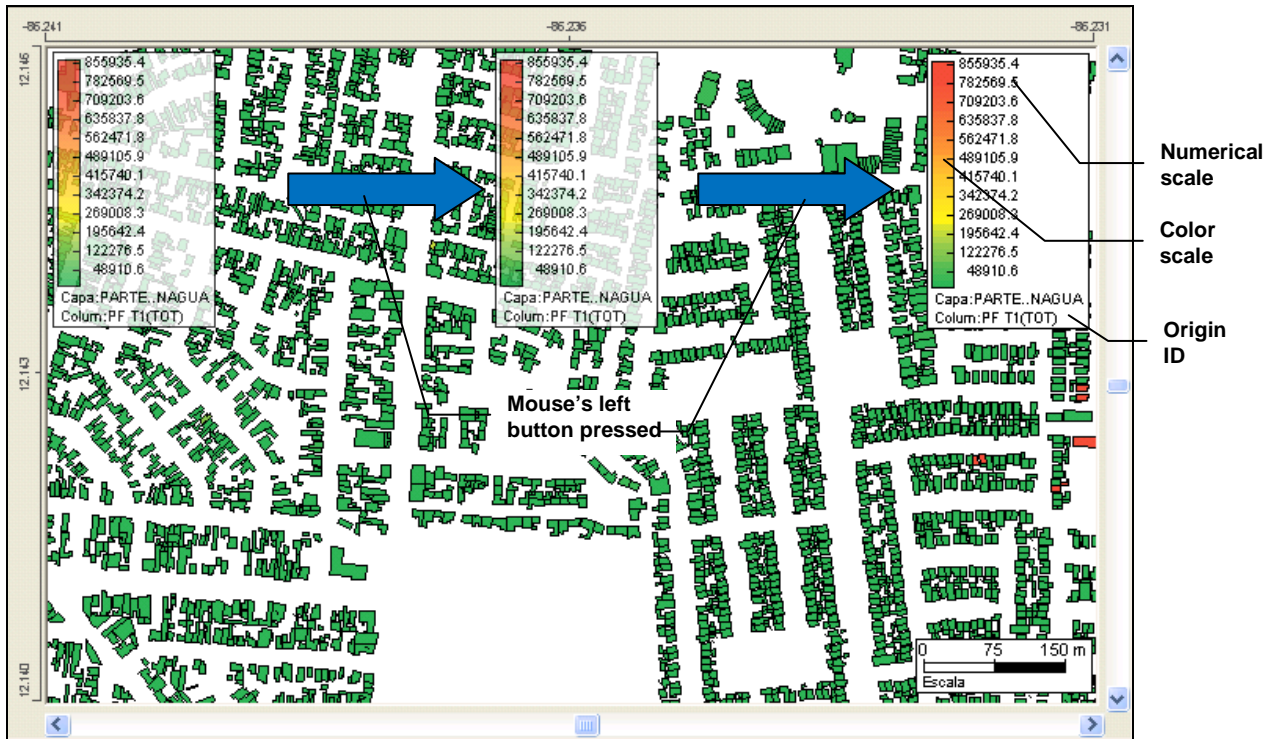


Figure 12 Color palette movement on the display plane

The color palette is the control responsible for making the distribution of colors for certain ranges. A palette is basically determined by the number of ranges, range limits and color scale used for drawing.

Figure 13 shows the effect on the display of a layer, changing only the number of ranges for display. A smaller number of ranges generates more clearly differentiated groups than with a higher range, but the latter can lead to a better presentation.

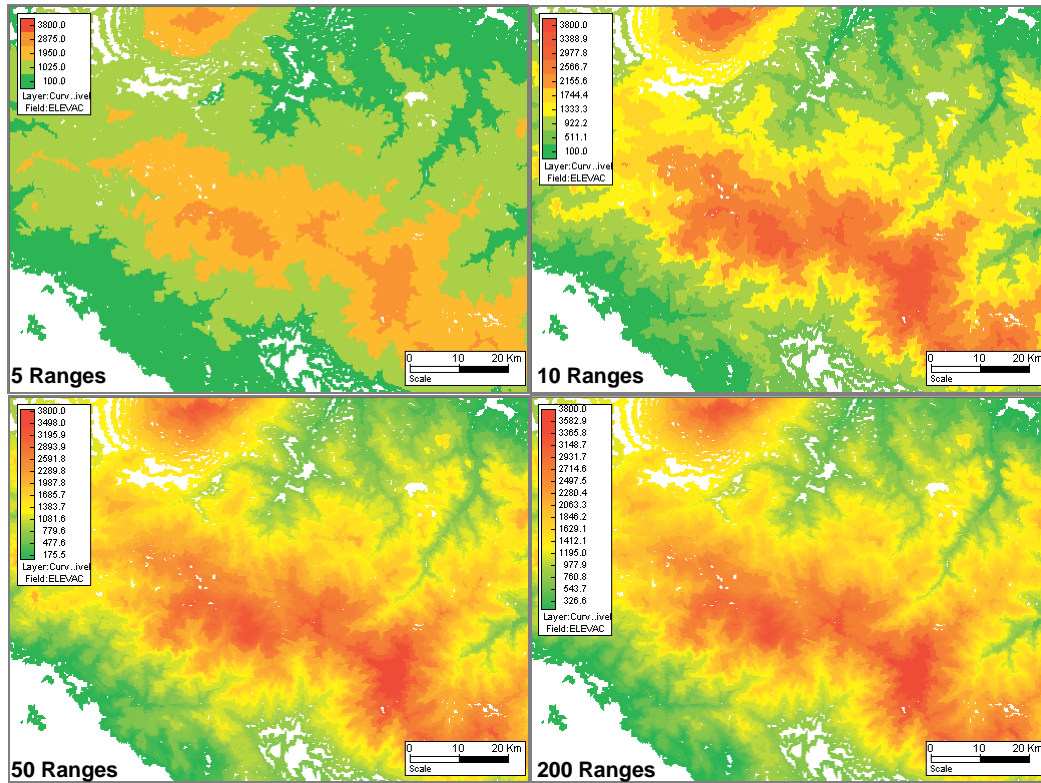


Figure 13 Effect of change in the number of color ranges in the drawing palette

As can be seen in Figure 14, the color scale changes the graphical display. Depending on the color range used, a high level of differentiation between data areas can be obtained. By default, **CAPRA-GIS** has a series of palettes that user may use in the color palette.

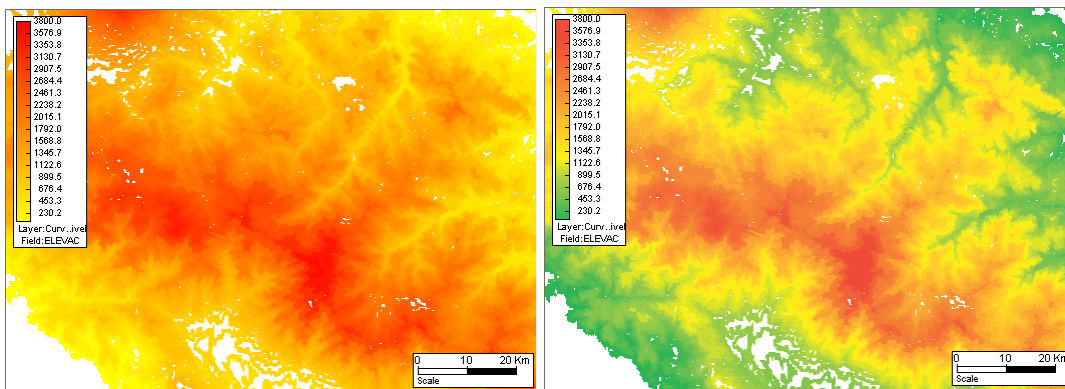


Figure 14 Effect of change in the drawing palette. Left. Red yellow palette and right, Original palette

Figure 15 shows the distribution of the system colors by default; at the left, each palette shows the name that appears in the dropdown list of the palette configuration windows.

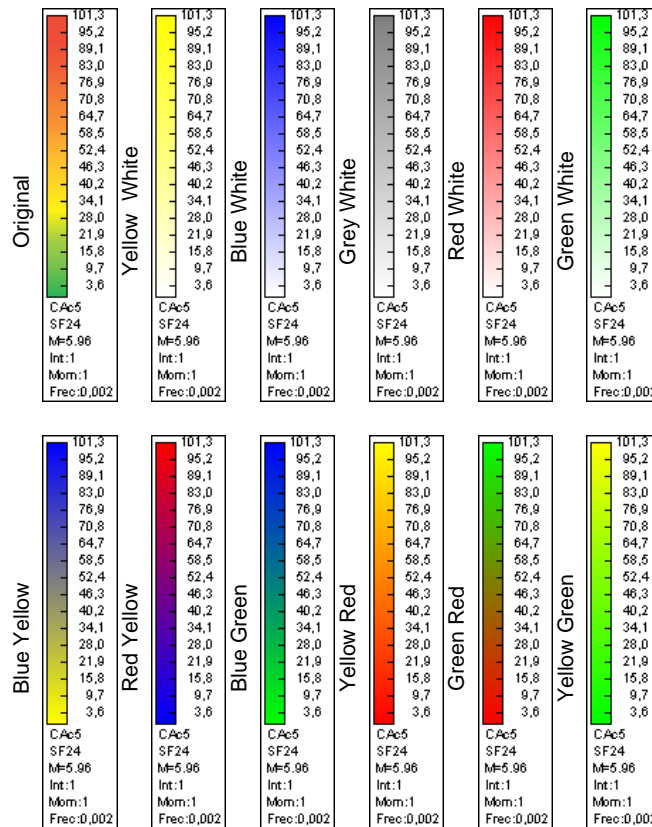


Figure 15 Automatic color range associated for associated palettes

The properties associated to the color palette can be dropped down for edition by clicking on it, where a **Quick Editor of properties** is shown. Also, many of the properties of this object are directly related with their base objects (layer or grid) and therefore it is possible to modify them from the objects designed for edition of these objects (see **Properties Windows**).

Scale palette

The palette of scales represents the dimensions that an object may have when the scale parameter is associated with certain field. The palette scale (Figure 16), consists of a series of figures with a given diameter / side, a numerical value indicates the numeric scale associated with the figure and a description of the source field. The ratio of diameter / side with the internal numeric value corresponds to the equivalent scale. This object is associated only with layer objects.

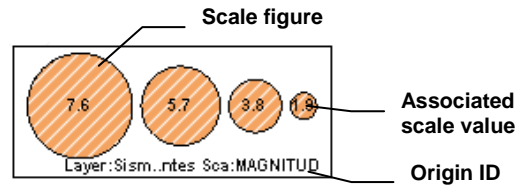



Figure 16 Scale Palette

The properties associated with the color palette can be dropped down for edition by double-clicking on it, which shows a **rapid properties Editor**. Also, many of the properties of this object are directly related to its base layer and it is therefore possible to modify them from the objects designed for layer edition (see **Properties Window**)

ASSOCIATE DATA WITH GRAPHICAL OBJECTS

Geographic objects in a Shapefile (*.shp) have data linked in a table (*.dbf), with which each graphic object has a linked data series or fields. If the **selection mode**  is activated, if the mouse on an object is left for longer than 15 seconds, an information window displays indicating that the search is being conducted in each of the visible Layers of the objects containing that item; if the search is successful, a window shows as in Figure 17, if the search yields no results, a window will indicate that the search returned no results. This floating window is shown as title of the total number of objects that that item can contain for each of the visible layers. Then, one item after one is broken down (up to a maximum of 5), the source layer, the unique identifier of the matching object and the field value currently used in the graphic representation of the object. If the mouse pointer moves, the window closes automatically.

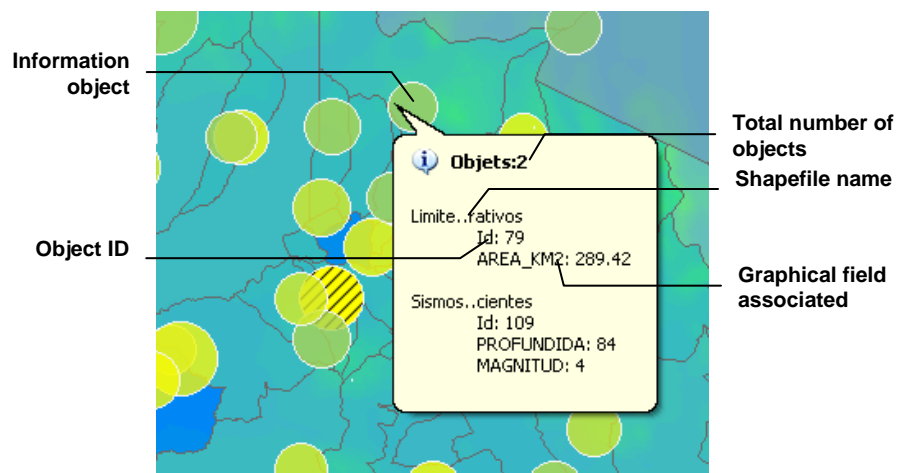



Figure 17 Floating view of linked data

If pressing the **Selection Mode**  you click on a given object in the visualization area, this object will be highlighted as shown in Figure 18 and highlighted in the data table associated to the corresponding associated field row.

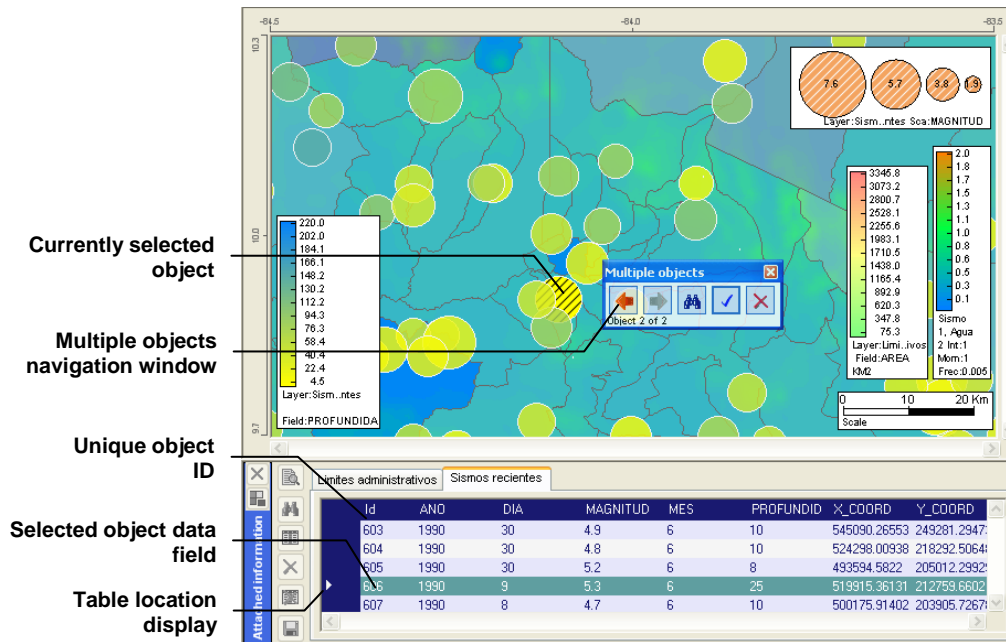








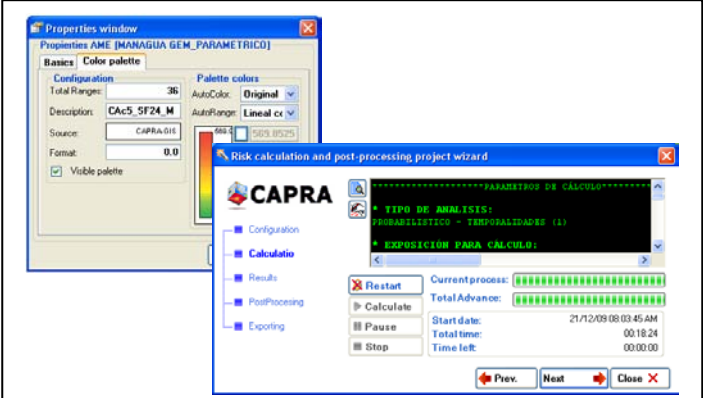
Figure 18 Object selection on screen an linked data field

If after clicking several objects meet this condition, a small browse window among objects will be displayed (see Figure 18). In the bottom part of the window there appears a text that indicates in which item current browse is and the total number of objects that match with the selection. The available commands in this window are:

-  **Previous:** See previous item that matches the selection.
-  **Next:** See next item that matches the selection.
-  **Accept selection:** Browsing is stopped among selected objects, leaving the current item selected.
-  **Cancel selection:** Browsing is stopped among selected objects, cancelling the selection among objects.

Each time the view log is changed, the corresponding view table is activated, the current object will be selected and the linked data line will be highlighted. To make a selection from the data window attached to the mapping information view, click on the column before Id (column selection) of the data table, thus triggering the cursor location . Then, use the available commands in the data view tools bar. (see  **Linked data**).

**PROJECTS, CONTROL
VISUALIZATION AND
CALCULATION**



CHAPTER

3

Visualization CAPRA Projects (*.cpv)

A CAPRA visualization project is a single file that has all the configurations set by the user, such as colors, display area, text fonts, etc. A file (*.cpv) can store an unlimited number of the described files in Figure 19.

CAPRA-GIS PROJECT (*.cpv)	Geographic reference: ESRI Shape file (*.shp)	Associated geographic information
	Exposure definition: ESRI Shape file (*.shp)	Geographical configuration
	Hazard definition: ERN Hazard file (*.ame)	Geographical configuration
	Probabilistic loss assessment: ERN Vulnerability file (*.fvu)	Associated geographic information Information of scenarios, intensities, momentums and frequencies

Figure 19 General Structure of the **CAPRA-GIS** visualization project

- ESRI ShapeFile (*.shp):** This computer format is an open proprietary file type of spatial data developed by ESRI, for Geographical Information Systems as Arc / Info or ArcGIS. It has become a standard format to exchange geographical information between GIS. A ShapeFile is a vectorial format of digital storage which stores the location of geographic features and their attributes. The format lacks the capacity to store topological information. A ShapeFile consists of multiple files. The minimum number required is three and have the following extensions:
 - .shp** – is the file that stores the geometrical entities of objects.
 - .shx** – is the file that stores the index of geometrical entities.
 - .dbf** – the dBASE, o data base, is the file that stores information of object attributes.
- ERN Hazard file (*.ame):** Hazard files can store any number of combinations of settings, intensities and times, for a given frequency of occurrence. These types of files are built under the technique of a grid of values around a fixed grid, which

allows for any point located within the file, assigned a specific value determined by the combination of settings, intensity and timing. This file type is represented by a color map associated with an associated palette, determined by a specific color ranges.

- **ERN Vulnerability file (*.dat):** Referenced external text files and additional parameters stored together with the Project, used to configure calculation of losses.

CREATION AND CONFIGURATION OF PROJECTS



A visualization Project may be initialized with no content or with a series of Layers by default (drawing templates). **CAPRA-GIS** always starts with a project with no contents, and with the  command, available in several parts of the program, you may add view files in ShapeFile (*.shp) format and ERN Hazard file (*.ame). The tools for manipulation of projects are available in the **Tools Magazine** () , in the **CAPRA Project** tab.

Figure 20 shows the **CAPRA Project** tab, where the creation tools and project edition are found, together with the tree of recent projects. Project edition commands are also available in the *CAPRA Project* menu.

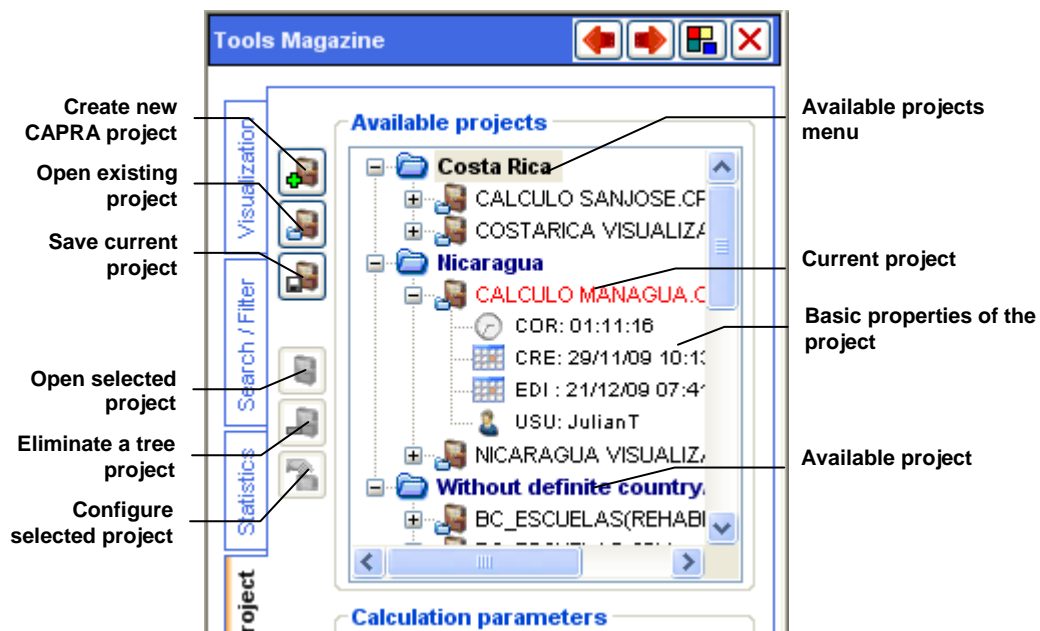


Figure 20 Tools with configuration of projects

The following are the available commands for manipulation of projects:

- 
Create new project: This command drops down the window shown in Figure 21. This window has two individual tabs: **New Project** (see Figure 21) and **Recent Project** (see Figure 22).

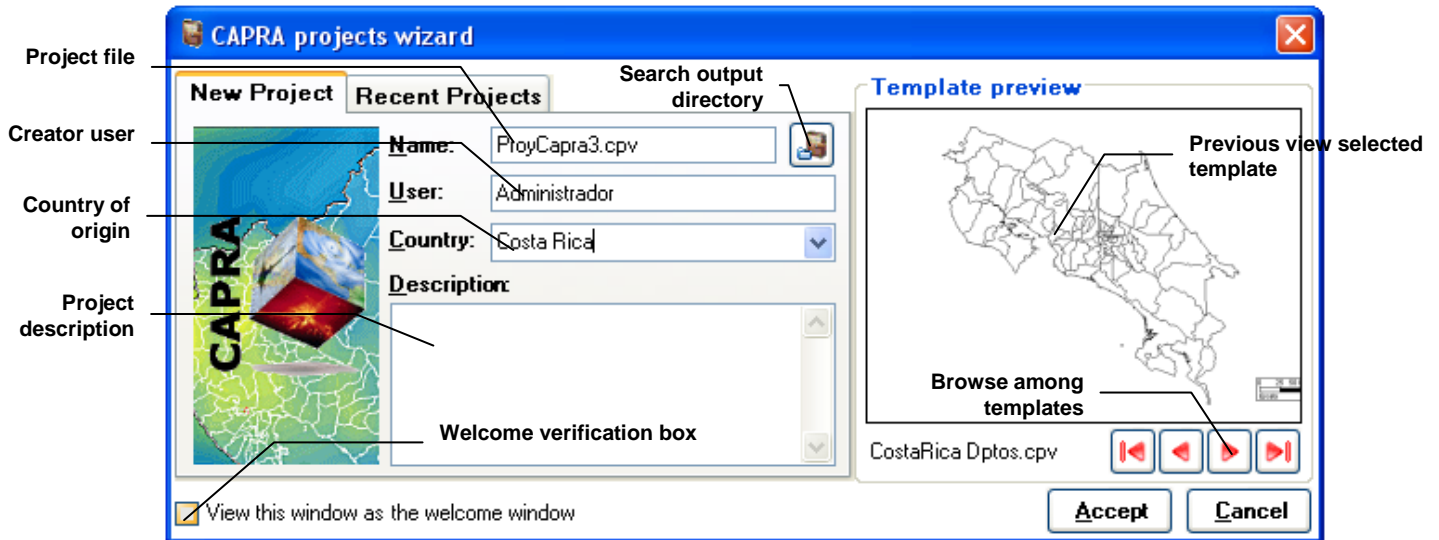


Figure 21 Window of creation of new project

In the **New Project** tab (see Figure 21) you can start an empty project or work from a system template. At the left, the directory and name of the project to be created can be configured, also, some identification variables such as creator user, country of origin and project description. A useful parameter for classification of projects is the country of origin, since the classification tree for projects creates a file node for each country. The default directory for new projects created with this function is the *My documents\CAPRA Projects*.

System templates are projects located in the *installation file\template*. To select an initial template, browse through the buttons located under previous view, and click on **Accept** once you have selected the initial template.

Recent Projects tab (see Figure 22) shows a list of recently opened or created files in the application. As an item is selected in the file list, a previous view of same can be seen. To open a file, select it from the list and then click on **Accept**.

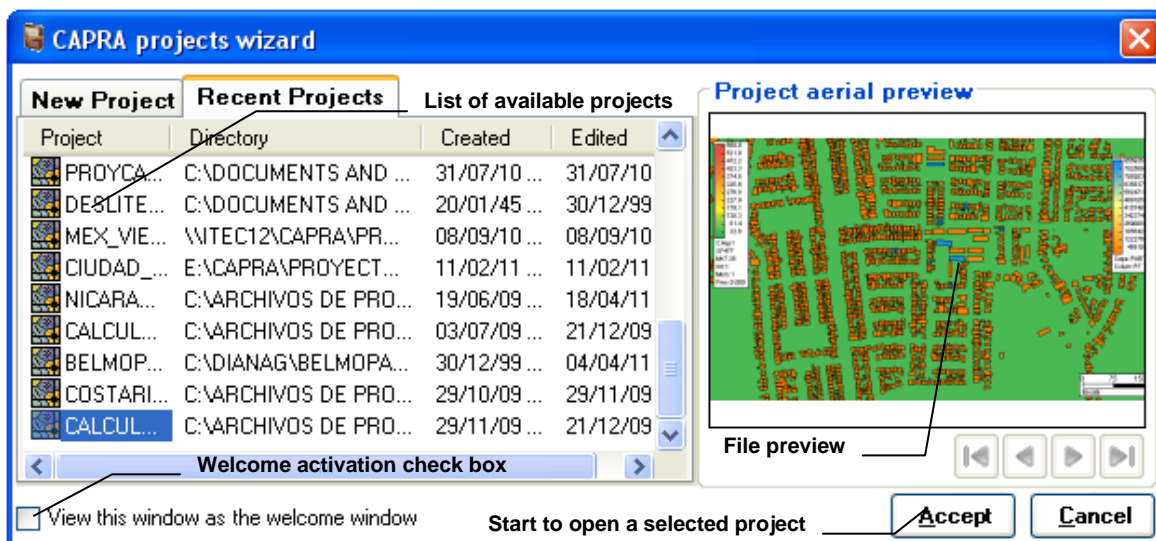


Figure 22 Opening of existing projects

This window can be configured as a welcome window, to do this, select the check box **View this window as the welcome window**.



-  **Open disk project:** The project opening icon drops down a window as shown in the figure, where the basic information of the Project is at the right along with a view of same. Project load starts when the file is selected and you click on the **Accept** button.




Figure 23 Window to open a disk project

CAPRA-GIS always verifies whether there are changes on the current Project being edited asking user the action to take in case the Project has changes that have not been stored.

-  **Store current Project on disc:** This command stores the current project on disk. If the project has not been previously stored **CAPRA-GIS** displays a window where user will be asked file destination and name *.cpv associated with the project.

VISUALIZATION TREE OF THE PROJECT

The visualization tree of the projects (see Figure 20) is a structure that allows stored in disk to be seen. The structure is based in a hierarchical systems by countries as a base, if the project has not a defined country defined, and the project is grouped in a node called **Without definite country**. Placing the mouse on , next to the Project name, and keeps it pressed for over 3 seconds, a small window containing a previous view of the Project (see Figure 24) will be displayed; the Windows closes automatically when the mouse is moved away from that position.

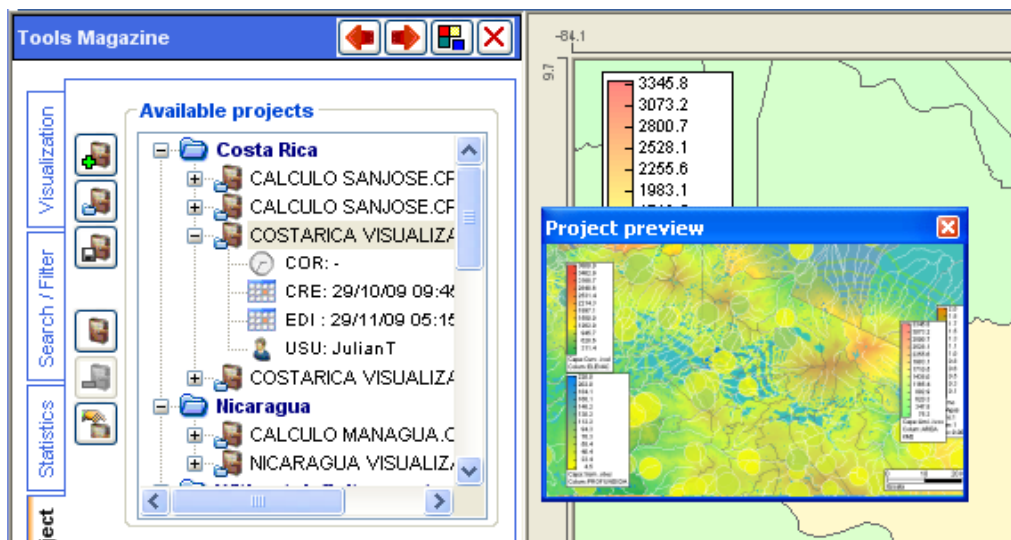









Figure 24 Previous view of the Project

In Project node () inside the **available Projects** tree, the following information is found by nodes:

-  **COR:** This field shows the processing time (in hours, minutes and seconds) necessary to estimate project losses. If the project has not been calculated, a character "-" will be shown.
-  **CRE:** Creation date of the project. When clicking on the mouse, a window with a calendar control will appear highlighting the associated date.

-  **EDI:** Last date made on the project. When double clicking on the mouse, a window with date control will be displayed highlighting the associated date.
-  **USU:** Name of name who created the project. When a project is created, the default value is the current user name of the operating system.

The following Project edition commands are located next to the **available Projects** tree:

-  **Open current project selected:** This button is activated when clicking on a tree node of **available projects** (selecting a tree item). If this button is activated, the selected Project in the tree will be loaded in the program.
-  **Eliminate from project tree:** This button is activated when clicking on a tree node of **available Projects** (selecting a tree item). If this button is activated, the selected Project in the tree will be eliminated from the program.
- **Available projects,** this command only eliminates the reference to the Project but not the Project as such, then, when this command is activated, the element exits from the list of available nodes, but the *.cpv file remains in the system files.
-  **See edition of project properties:** Are the basic properties of additional information on the current project being edited, this information contains data such as user name (the default is the name of the user's current operating system), country of origin and description. A useful parameter for the classification of projects is the country of origin, since the project classification tree creates a file node for each country. When this command is activated, a window as shown in Figure 25 will appear and changes are updated when you click on **Accept**.

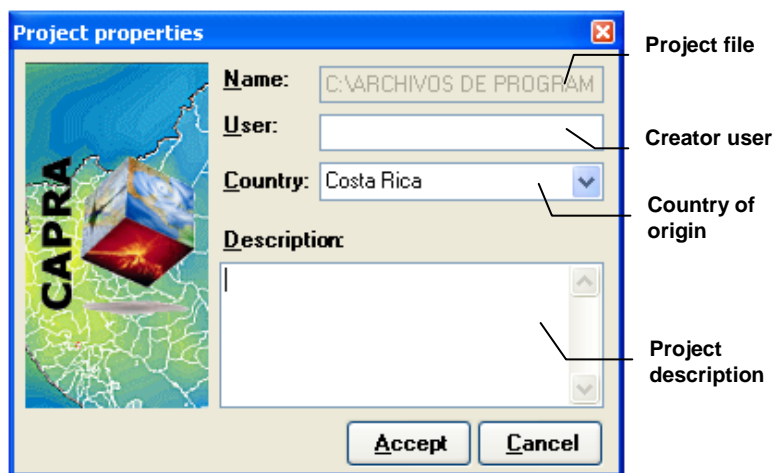






Figure 25 Configuration window of project properties

LAYER LOADING AND VISUALIZATION GRIDS

Once a project is loaded in **CAPRA-GIS** (empty project, based on a template or a previously created project), it is possible to initiate the loading of information maps, such as the

Layers (ESRI ShapeFile files *-shp) or grids (ERN Hazard files *-ame). To load files, use  command available in the various areas of the software. These are the areas where this command can be located:

- Main toolbar of the program
- **Visualization** tab in the **Tools Magazine** ()
- **CAPRA Project** tab in the **Tools Magazine** ()
- **File/Add Visualization file** menu

When this command is activated , a navigation window displays in the file system of the operating system. It can be possible to select several files at the time using the Windows TM multiple selection features with Ctrl and Shift buttons on the keyboard. Once one or more files have been selected and clicked on **Accept**, the system starts the individual load of each file. When the system has completed loading the **CAPRA-GIS** file, it zooms in on the visualization.

There is a fast method of loading files using the **Data Explorer** (see Figure 26). This tool is available by selecting the command from the toolbar in the main window. The **Data Explorer** is a tree view of multiple directories of files, each main node corresponds to a searchable directory selected by the user. Each primary node may release up to 2 nodes, one node of available Hazards (*. ame) and a node available Shapefiles (*. shp). The node will not exit if in the search directory there are not files of the corresponding type, does not exist for file type.

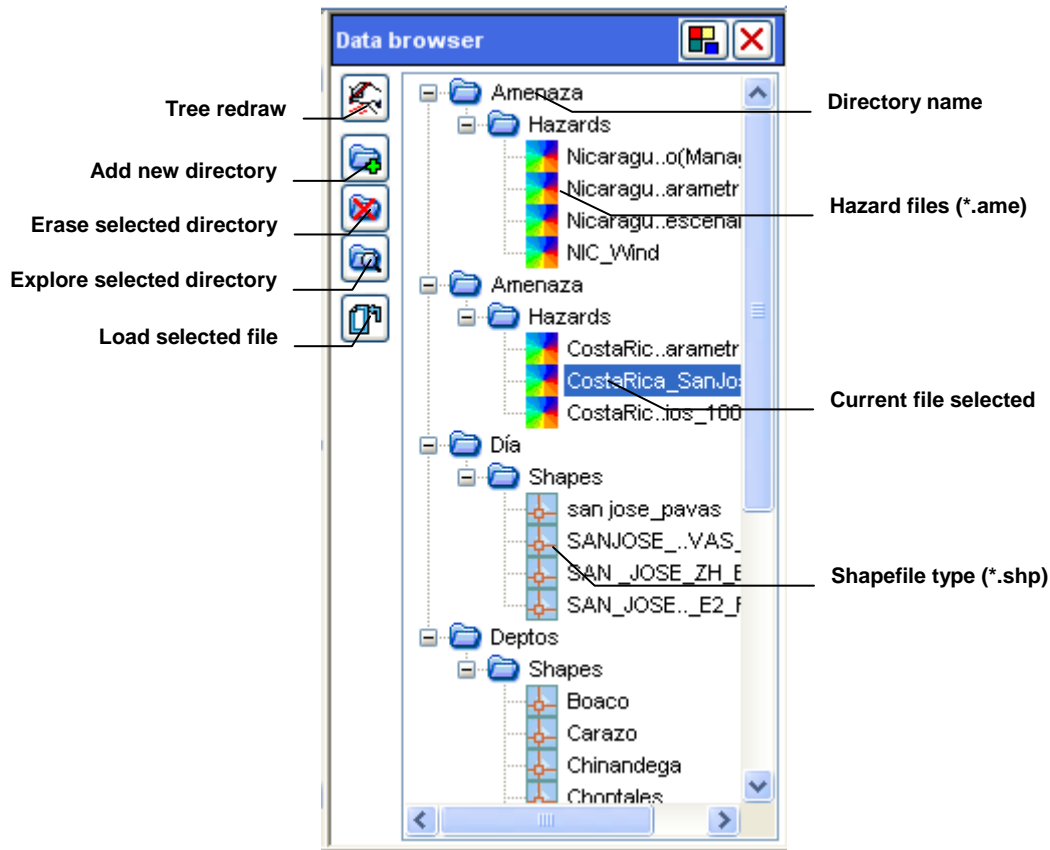







Figure 26 Data Explorer

Data Explorer commands are located at the left side of the window. The available commands are:

-  **Tree redraw:** This command updates the list of existing files in the search directories. When this command is activated, the configuration of node expansion is reset to collapsed.
-  **Add new directory:** This command display a directory selection window and clicking on **accept** the new directory will be added to the directories available in the **Data Explorer** tree.
-  **Erase directory:** Erases from the list of selected directory. This command only erases the directory from the tree and not from the file system.
-  **Explore directory:** When this command is activated, a new window in Windows™ explorer will be created
-  **Load file:** Loads the selected file in the **Data Explorer** tree to the current project under edition.

LOAD ERRORS IN PROJECTS

A visualization project of visualization has the location of the display files absolutely referenced- This means that when any of the files that make up the project is mode, an error message as that shown in Figure 27 will appear.

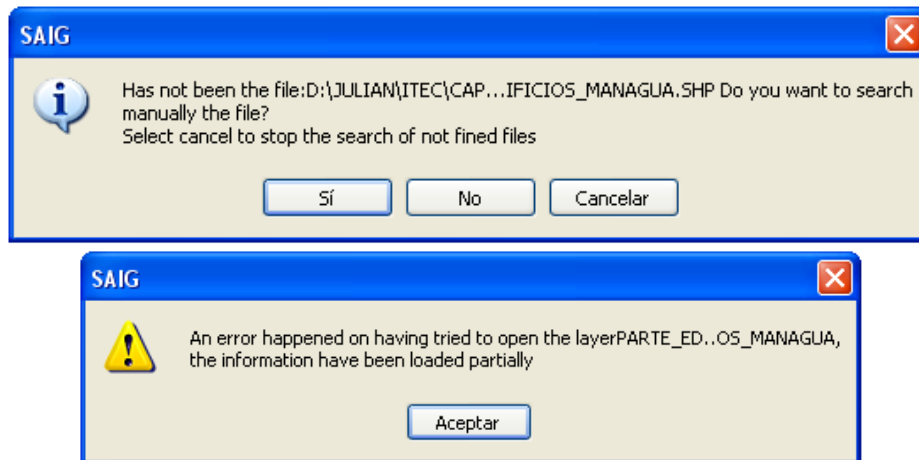



Figure 27 Error Windows during project load

If you click on the option **Yes**, the system will display a search window for the user to locate the new file location not found, and the project will be now referenced to the new location. With the command **No**, the system skips that file completely making it unavailable in the project display, and when stored on disk its reference will be erased from the project. The **Cancel** option permanently suspends the appearance of the dialog box of Figure 27 thus canceling permanently the process of manual relocation of files. The lower window of Figure 27 is shown the end of the loading process, indicating the occurrence of an error during the process of opening the project.

When **CAPRA-GIS** does not find a visualization project file, it has as base search file the directory where the project file *.cpv is stored. This feature allows that if files related to project are located in the same file directory of the project, it is possible to move the directory and no problem for lost references will be caused.

EXPORT/IMPORT OF COMPRESSED PROJECTS

A visualization project can have multiple related files, with different location references for each, which could cause problems if projects are required to be moved to new systems or to place them in some storage medium. To solve this problem, command  **Export compressed file (*.zip)** located in the **File** menu, creates a *.zip file with all related files of the visualization Project. When the command is activated, it asks the destination location of the file and the command starts the packing of the project.

To open a visualization project stored in a *.zip file, decompress the file in a determined directory with any compression software or with the explorer of the operating system.

Tools Magazine

The tools magazine is made up by an object with 4 vertical tabs. In each element the different tool types are grouped according to the typical visualization tasks of data and calculation. The, a description of each vertical tabs and its functions is made.

VISUALIZATION

This tab groups the visualization and configuration functions of objects. Figure 28 shows a view of this control with a brief description of its functions.

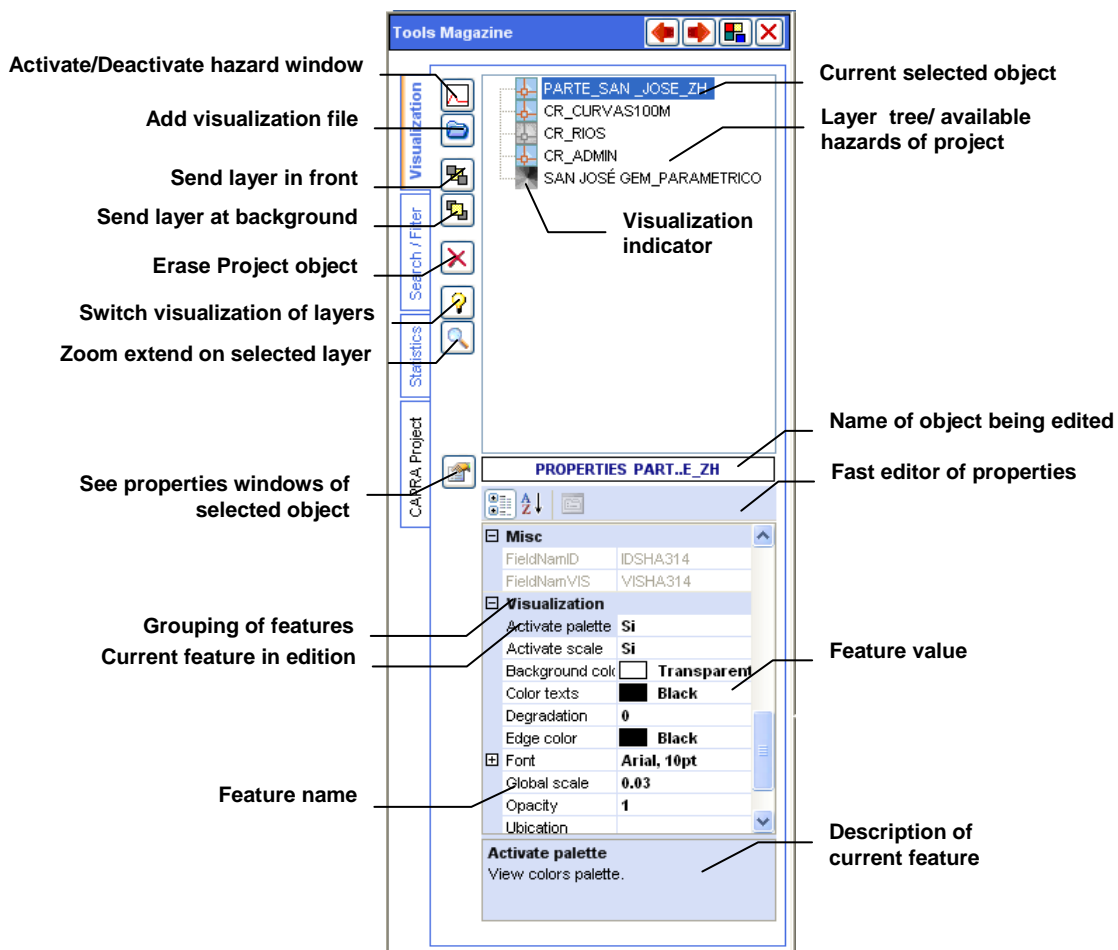







Figure 28 Configuration window of Project visualization









The visualization tab is divided in three main zones: **Visualization tree**, **Hazard window** and **Properties window**. Below is a description of each of these zones.

Visualization tree


The **Visualization tree** is a control with which it is possible to manipulate which elements are visible at any time. This tree is made up by nodes that identify  layers (ShapeFile files) and  Grids (hazard files). If a layer or grid is visible in the current view, its icon has colors, while if it is OFF, its icon will be in ( and ). The visualization control is done by double clicking on the icon related to the object, this action switches its view (if it is visible, it turns it off and if it is on, it turns it on); also, the **Enter** key acts as an accelerator through the keyboard. A project can have only one active grid on display at the time, and therefore, if you try to view a grid, the system will automatically switch off the visible grid before making the current object visible.

It is possible to configure objects so as to be grouped, with which elements will form part of the main node, icon  , grouping configuration is done through the **Location** property of the selected object.

When clicking on an element of the **Visualization tree**, this element becomes the current object and the edition tools are activated. Tools are located at the left of the **Visualization tree**; also, there are accelerators of these functions through the use of the computer. The available commands are:

-  **Activate/Deactivate hazard window:** This function switches the visualization of the **Hazard window**. It is a check box type button which if it is activated the associated controls are activated.
-  **Add a visualization file:** This command displays a dialogue box that allows user to search a layer (ShapeFile files) or a grid (ame files) in the file system to be loaded to the current Project being edited. Keyboard accelerator: **Insert**.
-  **Send layer at the front:** With this command, the current object being edited is sent to the start of the redraw list. It only applies to layer objects, since grid objects are drawn always in the visualization background. Keyboard accelerator + (**Plus**).
-  **Send layer at background:** With this command, the current object being edited is sent at the end of the redraw list. It only applies to layer objects, since grid objects are drawn always in the visualization background. Keyboard accelerator – (**Minus**).
-  **Erase project object:** When clicking this button, the selected object is erased from the current Project but does not eliminate the system file. Keyboard accelerator **Delete**.
-  **Switch visualization of layers:** Switches the visibility of the layer objects turning off visible objects and turning on not currently visible objects.
-  **Zoom extend on selected layer:** Zoom window and centers it in the current view on the selected object. Keyboard accelerator **Z**.
-  **Properties window :** Shows the window (see **Properties window**) of edition of properties for the selected object in the **Visualization tree**

Hazard window

When the **Activate/Deactivate hazard window**  button is activated, the appearance of the visualization tab changes to that shown in Figure 29. The Hazard window allows to see the comportment of a geographical point in a loaded hazard of the current Project, through one or more available scenarios selected by the user.

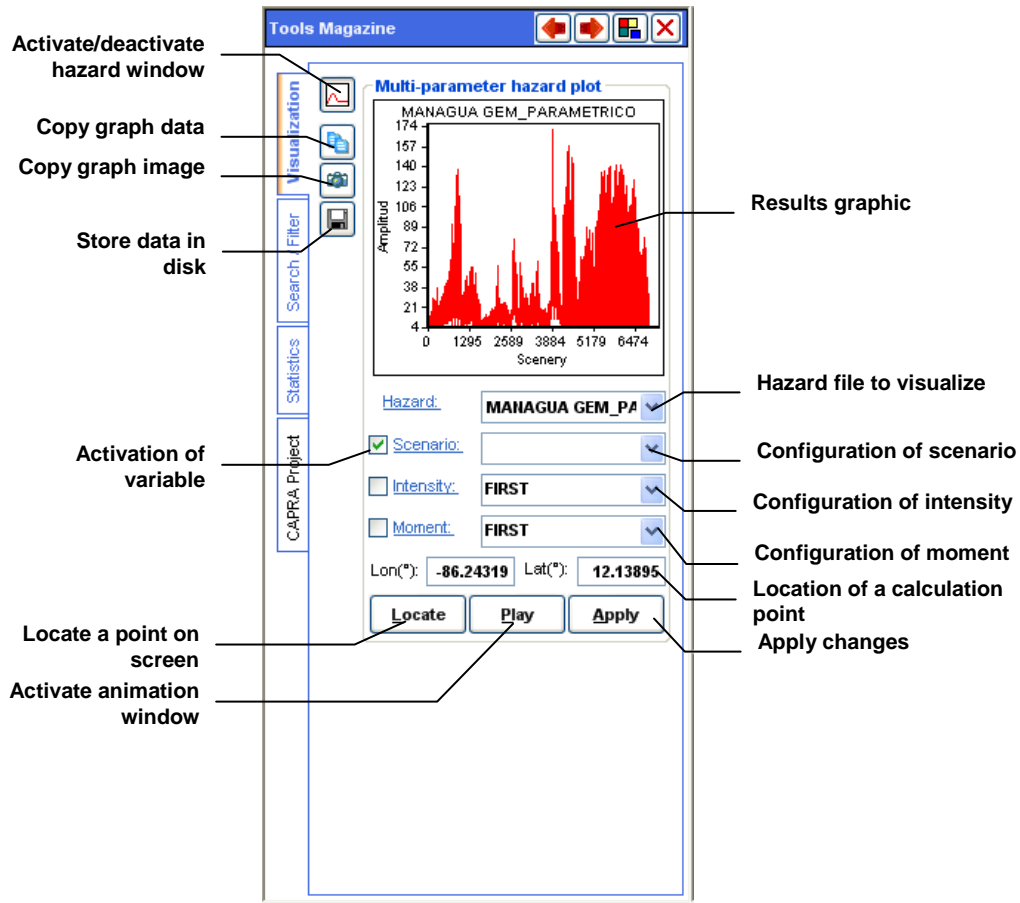





Figure 29 Multi-scenario visualization window of hazard files (AME)

The visualization is a sequential variation of the parameters that define a scenario (scenario, intensity and time), leaving fixed two of these parameters and the other varying in a given range. The result is a free variable graphic vs. amplitude. The configuration process is divided in the following stages:

1. **Selection of hazard of origin:** The dropdown **Hazard** list contains the names of the hazard files (ame file) available in the current Project. The configuration consists in choosing one of the items available in this list.

2. **Activation of free parameter:** By activating the verification box, the field is activated as free field. When a field (scenario, intensity or time) is configured as free, the algorithm will do the variation of this variable, thus becoming the X-axis of the results graph.
3. **Free parameter configuration:** A free parameter that leaves empty its configuration filed indicates that the variation of the parameter will be done in all its available values. Configuration also can be made to use a series of given elements or a limited continuous series. To do this, if in the configuration filed it is written, for example: 1,5,6-19, it means that individual elements 1 and 5, and elements between 6 and 18 (6,7,8,9,10,11...18), must be used.
4. **Fixed parameter configuration:** When a fixed parameter is left, it must indicate which parameter index will be used. There is the possibility to select the **First** or **Last** item, or a fixed index selected by user. A parameter must always be selected or written.
5. **Location of a geographical point of calculation:** The calculation is made for a given point; to select this point, you can use a graphic method activating the **Locate** command which asks user to click on the geographical visualization area. The other method consists in the direct writing of field coordinates **Lon(°)** y **Lat(°)**.
6. **Visualization of results:** When the parameters and location point have been configured, double click on **Apply**, and the graph calculation process starts. If you make changes on the location of the calculation point, double click on **Apply** to update the graph.

The resulting graph has export commands located at the left, being it possible to extract data and/or the calculated graph. Activating the  button, it is possible to copy the graph image to the clipboard and with the  button, the generating data of the graph are copied in text format to the clipboard (see Figure 30). With the  button, it is also possible to export data to a plain text file.

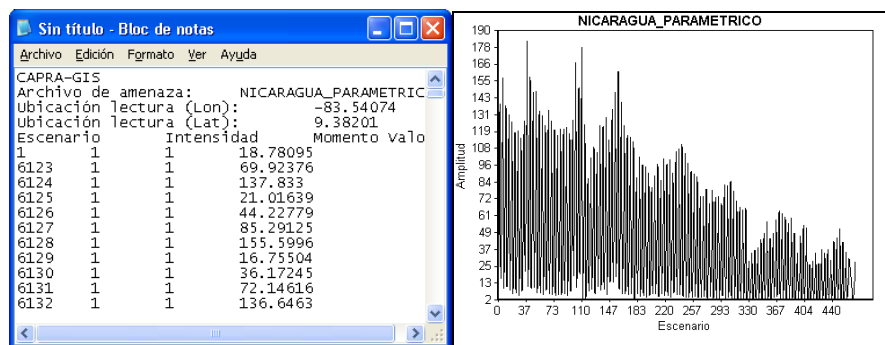





Figure 30 Data copy (left) and image copy (right) results

CAPRA-GIS has a method to visualize animation type scenarios, whereby it is possible to program that a hazard file shows sequentially the combination of scenario, time and intensity previously configured with the visualization hazard controls. To start the process, configure the parameters as previously explained, and then click on **Animate**, which drops down the control window (see Figure 31) when clicking on  button. In the control window, it is possible to change the animation speed, stop animation , pause animation , see

previous slide ◀, see first slide ◀◀, see next slide ▶ and see last slide ▶▶. To cancel the visualization of the animation, click on the stop ■ button or close the control window.

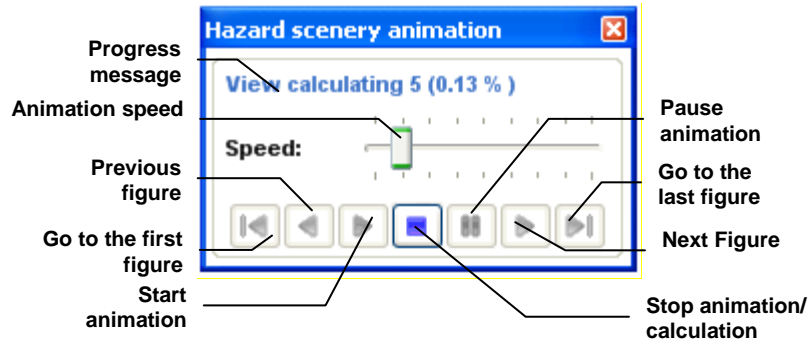




Figure 31 Control window of multi-scenario view by animation

Fast editor of properties

The fast editor of properties is an object formed by two columns: the left column corresponds to the name of the property associated to the object being edited, the right column corresponds to the current value of the property; once a property has been selected, there appears at the bottom a brief description of the selected property. The control also has two control buttons at the top:  that orders properties alphabetically  and that groups properties according to a common feature. This control also displays read only information (in gray) shown only as information. The object is dynamic, and therefore, depending on the object being edited, the list of available properties changes, displaying only those that belong to the object being edited (see Figure 32).

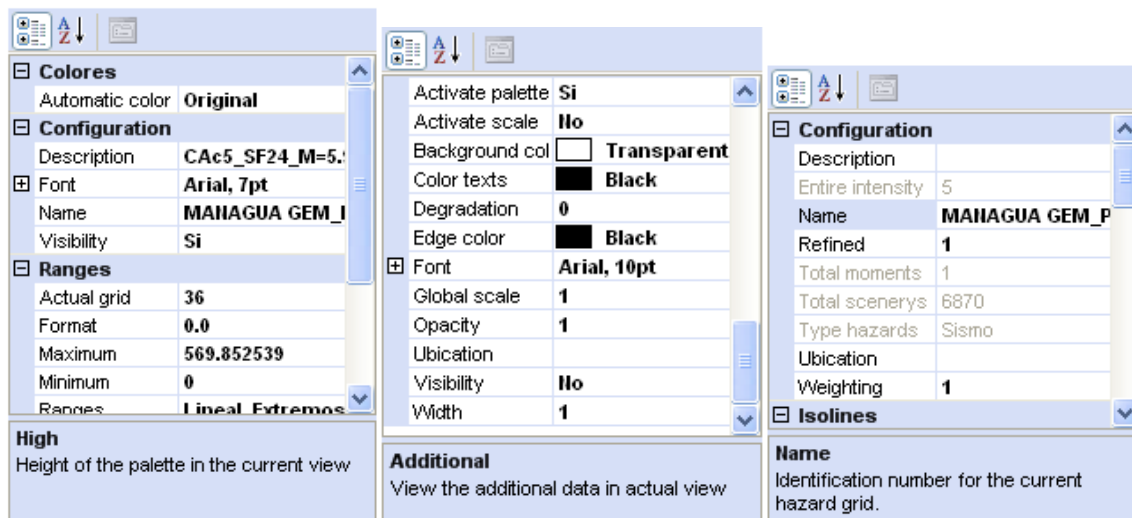




Figure 32 Fast editor of properties for objects, left to right: Palette, Layer and Grid

The Layer and Grid edition control is located in the **Visualization** tab of the **Tools Magazine**  and responds to the selection of an object (click on a node) of the **Layer Tree /available hazards of the project**. To activate the properties control in palettes (color or scale) double click with the mouse on the object you wish to edit.

Properties window

The **Properties window** is a graphic setting for the variation of layer and grid parameters. Essentially, it shows the same functions of the **Fast editor of properties**. The properties window is activated by the selection method in the tree and then clicking on the  button. The changes made on object properties are updated when clicking on the **Apply button**. The **Properties window** has two related views according to the selected object.

- **Properties window for hazard files (Grids):** If the selected object is a grid type, the **Properties window** is formed by two tabs; the first contains the configuration parameters of the hazard file, and the second contains the configuration variables for the related color palette (see Figure 33).

In Figure 33 you can see the main properties associated with the hazard file being edited. The left section contains the descriptive information non modifiable by the user, in addition to vulnerability file associated with the hazard (which can be modified by the user), while the right section contains parameters that can be changed by the user to alter the hazard visualization being edited. The drawing parameters of the isolines, such as border color, text color and font are modified by clicking on areas (plain buttons) located in front of the name tags of the property.

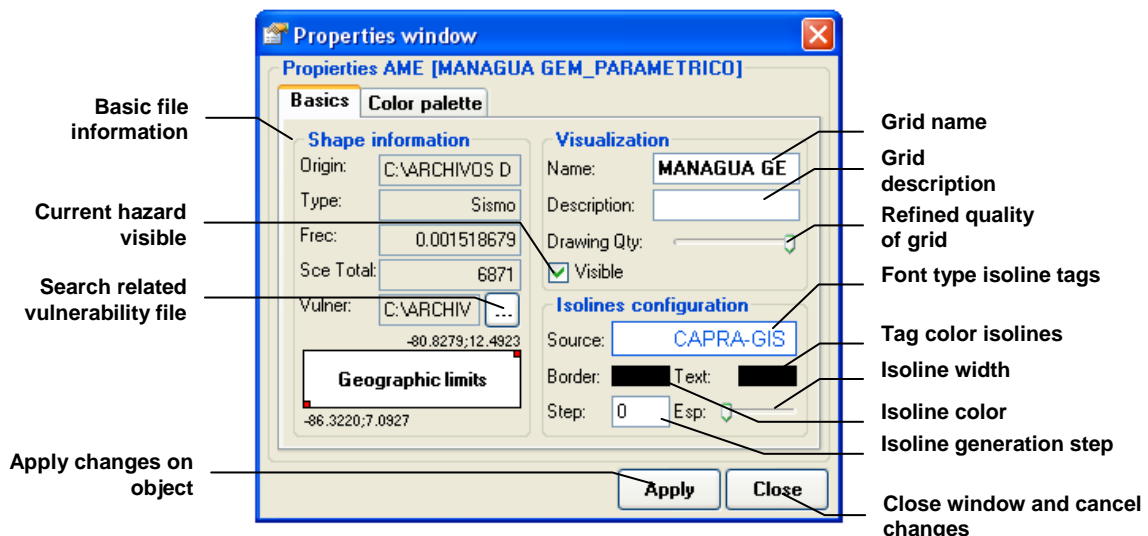


Figure 33 General Properties window for hazard

- **Properties window for ShapeFile files (layers):** When a layer is selected as edition object, a window as that shown in Figure 34 is displayed. This window contains four

tabs: **Basic** configuration tab, configuration of **Linked Data** visualization tab, **color palette** and **Scale palette**. The **Color palette** is explained in more detail in this chapter.

The **Basics** tab is divided in two parts; the left part shows the information of the file being edited, and the right part shows the basic controls of visualization edition and a previous view of objects, which varies as parameters are changed (Figure 34)

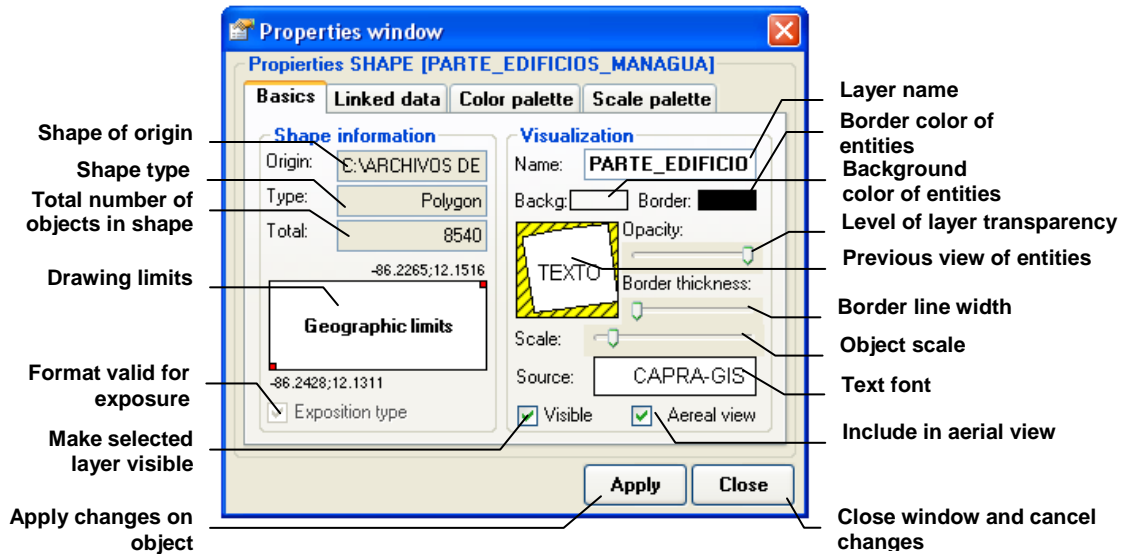


Figure 34 General Properties window for Shapes files

Linked data (at the left, description information that user may use to store more information of layer, contains 3 selection boxes that allow to control the visualization of the information in plane: **Search inf.** Controls whether user wishes to include this layer in searches when used in information mode; **Data table**, controls the visualization of the related information table (*.dbf file) in the **Linked Data** area and **See identifier** controls whether each entity of the layer draws its identifier in the center of its visualization area.

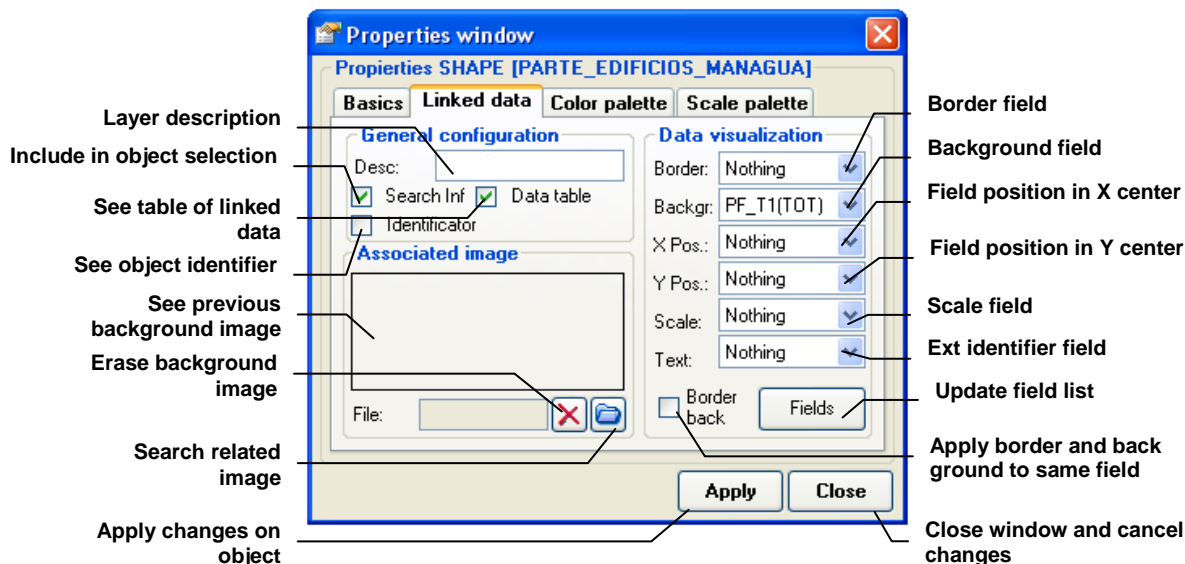


Figure 35 Properties window of linked data for Shapefiles

Also, the left section contains a preview of a background image associated with the layer being edited (see Figure 36). To associate an image with background to a layer it must be georeferenced in the same location and size (limit border for the layer).

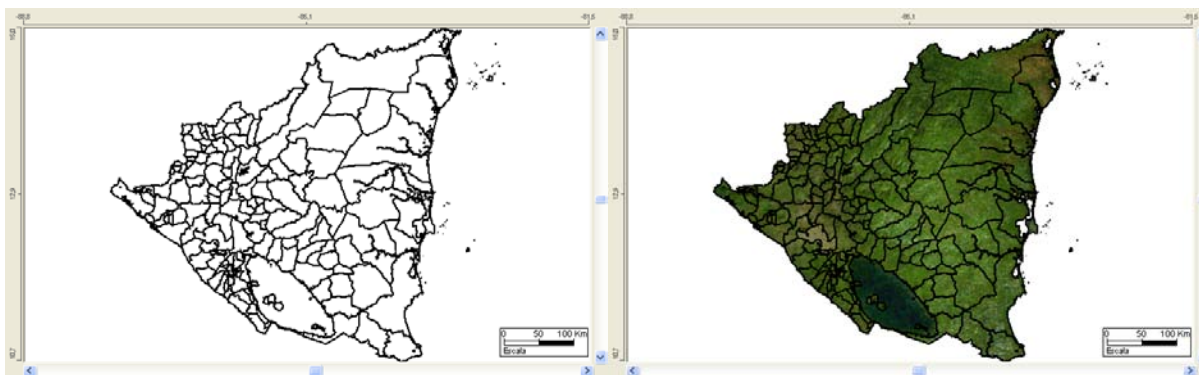


Figure 36 Visualization of layers with associated background image

On the right is **Data Visualization**, which controls the graphical form as information shown on objects of the layer being edited. The visualization variables that can be controlled with these data are: **Border** is the limit that defines each of the geographical entities, **Background** corresponds to the color to be used to draw background, **PosX** location in X at the center of the object, **PosY** location in Y at the center of the object, **Scale** controls the amplification of the object from the center and the **Text** field allows to show a written field within each object. The **Border** and **Background** properties are excluding, and prevent to assign two at the time, but the selection box **Border** and **Background** causes border and background properties to have the same associated field.

- Properties window for color palette:** Layer and grid objects have an associated color palette that appears available for edition in the **Color Palette** file (see Figure 37). The **Total Range** field displays the number of color to be used by the palette, **Font** allows you to change the type and size of text to be used to draw the palette, **Format** allows configuring the number of decimals in the drawing and the **Visible Palette** option controls visibility in the current view of the palette.

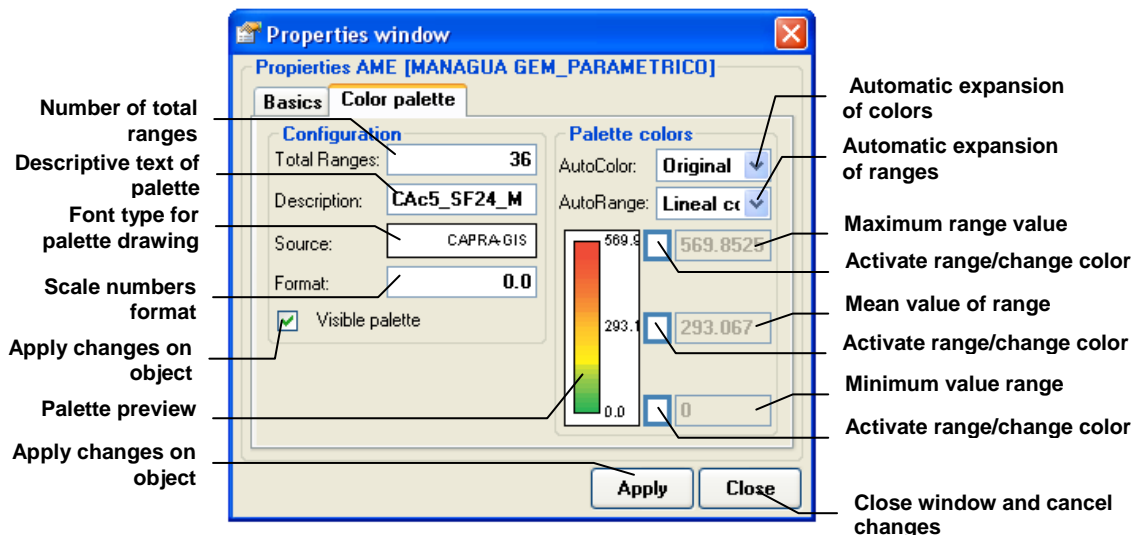


Figure 37 Properties window of palette for hazard

On the right side of the Properties window you have edit fields of ranges and colors, **AutoColor** allows to select a predetermined configuration of colors and the **AutoRange** makes an expansion of ranges on values preset or manipulated by the user. At the bottom right it shows a preview of the configured palette, and three activation options with a value box at the side; with these controls the user can manipulate and the expansion of colors for the palette. The manual configuration process of palettes and ranges starts with the activation of minimum two fields (the associated end fields) of the three fields available. When a field is activated, it is possible to change its associated color by clicking the right click on the button whereby a color selection window is dropped down. Once the field is activated, it allows you to alter the associated numeric value, by clicking on the **Apply** button and the new color distribution is calculated.

Properties window scale palettes: **The layer objects can have a field associated to determine the ShapeFiles scale or points and with this, a scale palette that allows to control the variation of size of the entities regarding the associated field. The properties window of layer displays a Scale Palette file (see**

- Figure 38) with which it is possible to edit the main properties of a **Scale Palette**. At the left, there are the basic visualization properties of the palette, such as the type of icon drawn, description, font type and background color used to draw. At the right, the scale values used as the maximum and minimum range (in units of data base) are controlled.

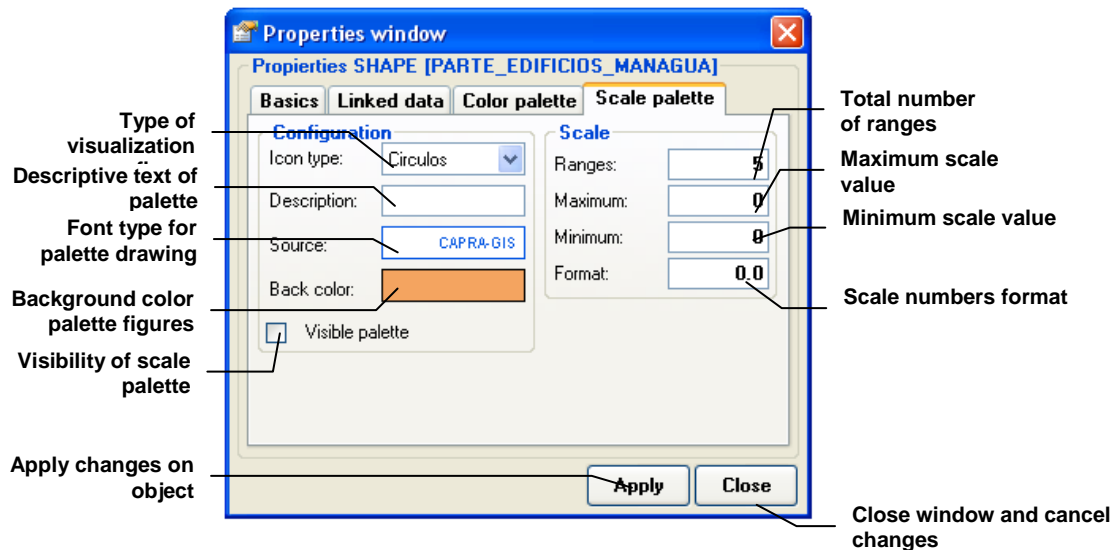


Figure 38 Properties window of color palette for scales

SEARCH / FILTER

This folder groups the tools used to locate the current display area, move quickly to a specific area, search specific objects in the database and filter the visibility of objects in the database. The control is divided in three parts: aerial view Area, object parameter search Area and Filter Area (see Figure 39)

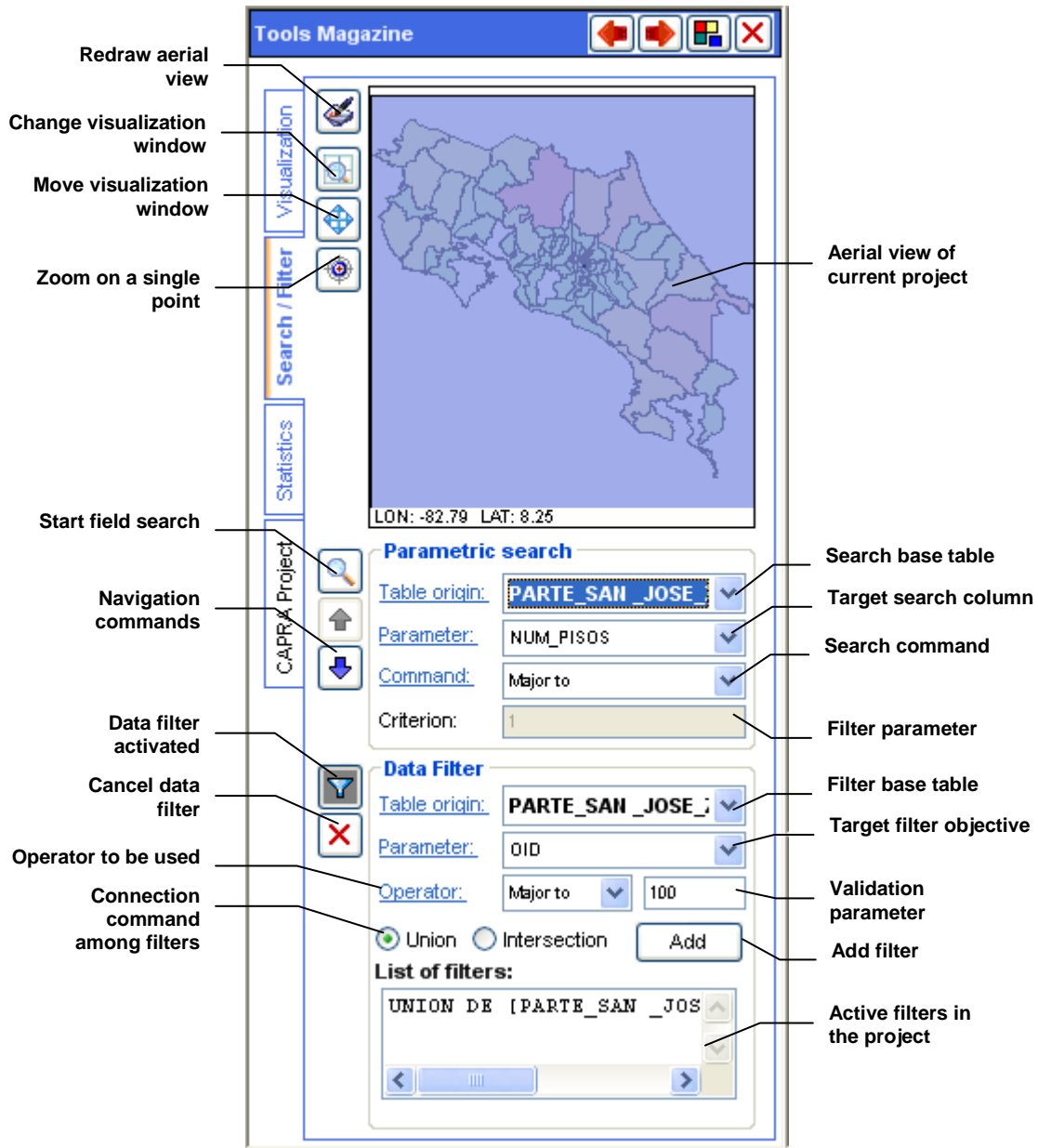






Figure 39 Search window and register filter

Aerial view




The aerial view is a small box that contains the general extended view of the plane, with a blue box that indicates the area currently visible in the visualization plane (see Figure 39). The commands editing visualization of the aerial view are:

-  **Redraw aerial view:** Updates the aerial view with changes made in configuration. If clicking with the right button of mouse on the view area of the aerial view, a control menu to configure layer visualization is displayed.
-  **Zoom window:** Zooms according to the selection of a window inside the plane. To do this, you must select the tool, and then choose the initial selection point of the window by clicking on the “Aerial View” window. This activates a visualization rectangle that changes its size as the mouse is moved on the screen. This blue screen indicates the area to be amplified. To execute this command, double click at the other end of the screen you wish to show.
-  **Move window:** Allows displacement through the visualization plane to arrive to regions not visible in the active image. To do this, select the tool, then click and move the view to the selected point.
-  **Exact location:** With this method, you may select a visualization point when clicking on the aerial visualization plane.

Search by parameters

The search by parameters allows to locate quickly areas of database and thus, the objects in the mapping display. The search process starts when you select a data source, corresponding to the name of ShapeFile where to search (**Source Table**), then select a search parameter, which is the name of a table column (**Parameter**), select a command to apply the search (**Command**) and finally, write a comparison value to be used (**Criterion**). The **Command** is set up do the following comparison:

- **Contains:** Is a function only available for alphanumeric fields. It searches within a text chain the display of the indicated text. Special characters can be used to determine the search method. Example: If you use the *Contain* command with the “*sal**” **Criterion** the system will identify commands as **salesian**, **saline**, or **salt**, but not words such as **salaried**, but with the **sal** criterion it will include **Salaried** in the search.
- **Different:** Is a function available for numerical and alphanumeric fields. It selects the fields that are not equal to the parameter passed in **Criterion**. In the case of alphanumeric field, it does not identify the difference between upper case and lower case letters.
- **Equal:** Is a function available for numeric and alphanumeric fields. It selects fields equal to the parameter passed in **Criterion**. In the case of alphanumeric field, it does not identify the difference between upper case and lower case letters.
- **Higher than:** Is a function only available for numerical fields. It selects the fields higher than the parameter passed in **Criterion**.
- **Lower tan:** Is a function only available for numerical fields. It selects the fields lower than the parameter passed in **Criterion**.



When search configuration has been completed, click on  button, the search process may take several seconds, but once completed, the  button next search register and  previous search register. Each time some of the search navigation buttons is activated, the corresponding register in the linked data table will be activated and a message in the status bar will indicate the position and the total number of coinciding registers.



Note: The search process is performed on only the objects currently visible in the visualization map. If objects are filtered or if they are outside the visualization area, they will not be included in the search process.

Data filter

With this command it is possible to make object not visible according to a series of comparison criteria (see Figure 39). The filtering process of data starts selecting a source (**Source Table**) filtering column (**Parameter**), a mathematical operator (**Operator**) and a validation parameter. If the filtering field is numerical, then operators higher than (>), lower than (<) and equal to (=) can be used. If the field is not numerical, then only the “equal” and “contain” fields are available, the contained field is designed to search any appearance of the search chain within the column fields and the selected table.

When the fields required to define the filter have been selected and completed, click the **Add** button, and a description by fields of the filter created is added to the filter list. To activate/deactivate filtering on the current project, click on the  button and with the  button you can eliminate the selected filter from the list of active filters.

One or several filters can be created for each of the ShapeFiles loaded in the Project. It is possible to create nested filters of several columns for the same table or ShapeFile; to do this, select between union or intersection (options button next to the **Add** button). With this, **CAPRA-GIS** creates advanced combinations of filter for each ShapeFile of the project. As a use example, see Figure 40, in a regional division map whose objects have a feature called “STL_2” (part a Figure 40, background color and associated text), creates an “STL_2” filter type lower than 3 which causes that the layer makes all objects non visible with “STL_2” higher or equal to 3 (part b, Figure 40), and finally, it creates an associated filter linked to “STL_2” higher than 8, with which **CAPRA-GIS** makes all objects non visible whose “STL_2”, are higher or equal to 3 and lower or equal to 8.



Note: The filters generated in a project are not stored on disk when the project is stored.

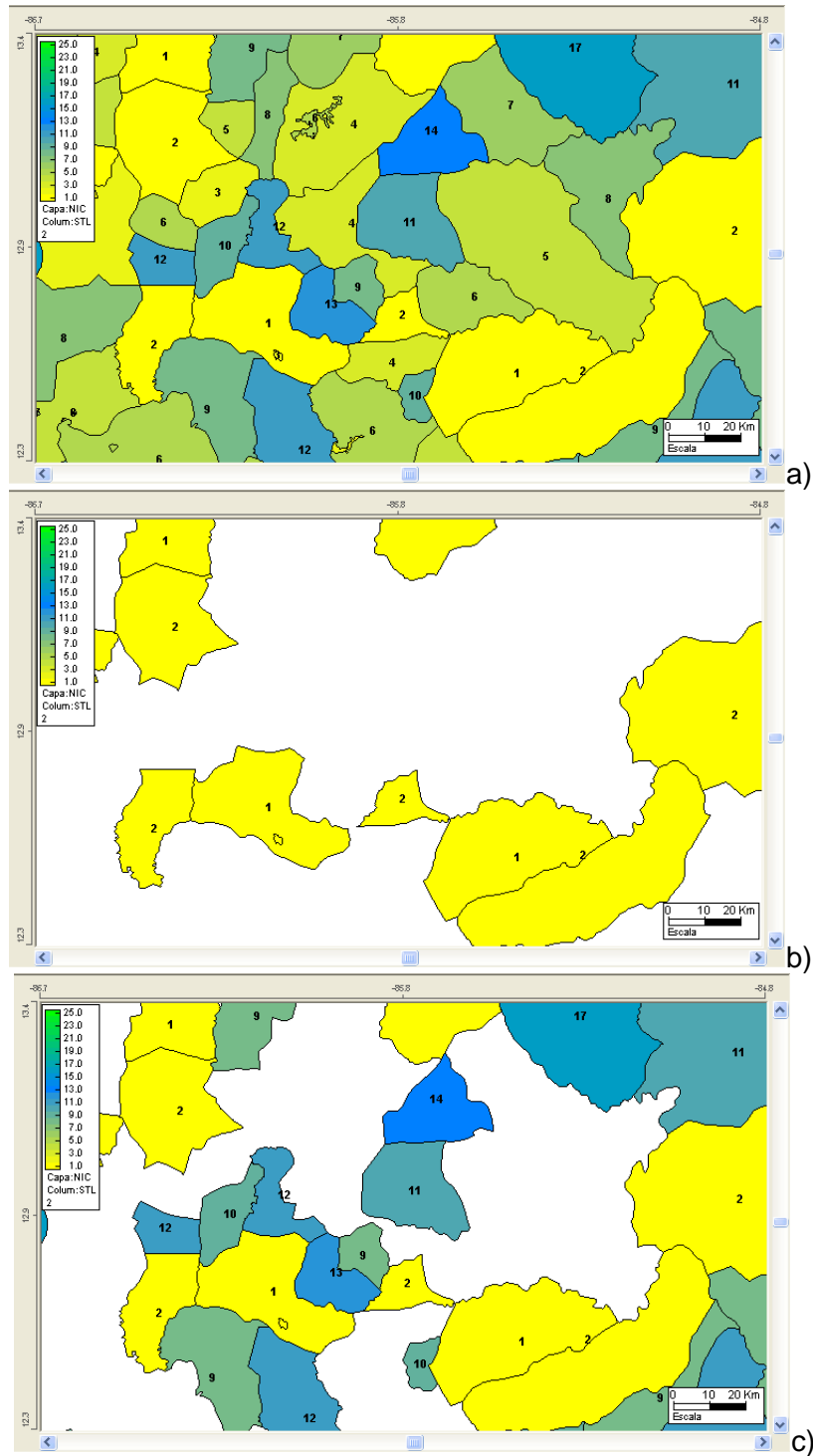



Figure 40 Data filtering. a) Map without filter, b) Fields lower than 3, and c) Fields lower than 3 linked with higher than 8

STATISTICS

The statistics file shows a representation in frequencies and basic statistical values of a selected ShapeFile. The process of the graphical generation of frequencies and calculation of statistical data starts with the selection of number of ranges for the calculation of frequency; if you wish, you may use the Sturges rule and click on the **Automatic Range** option; to make a custom made selection of the number of classes, the **Automatic Range** option must be deactivated. The next configuration step is the selection of the **source Table**, selection of a field or column in the table (**Analysis Variation**) which updates automatically the statistics fields and the frequency graph. If a change is done on any graphic parameter, click the  **Redraw button**.

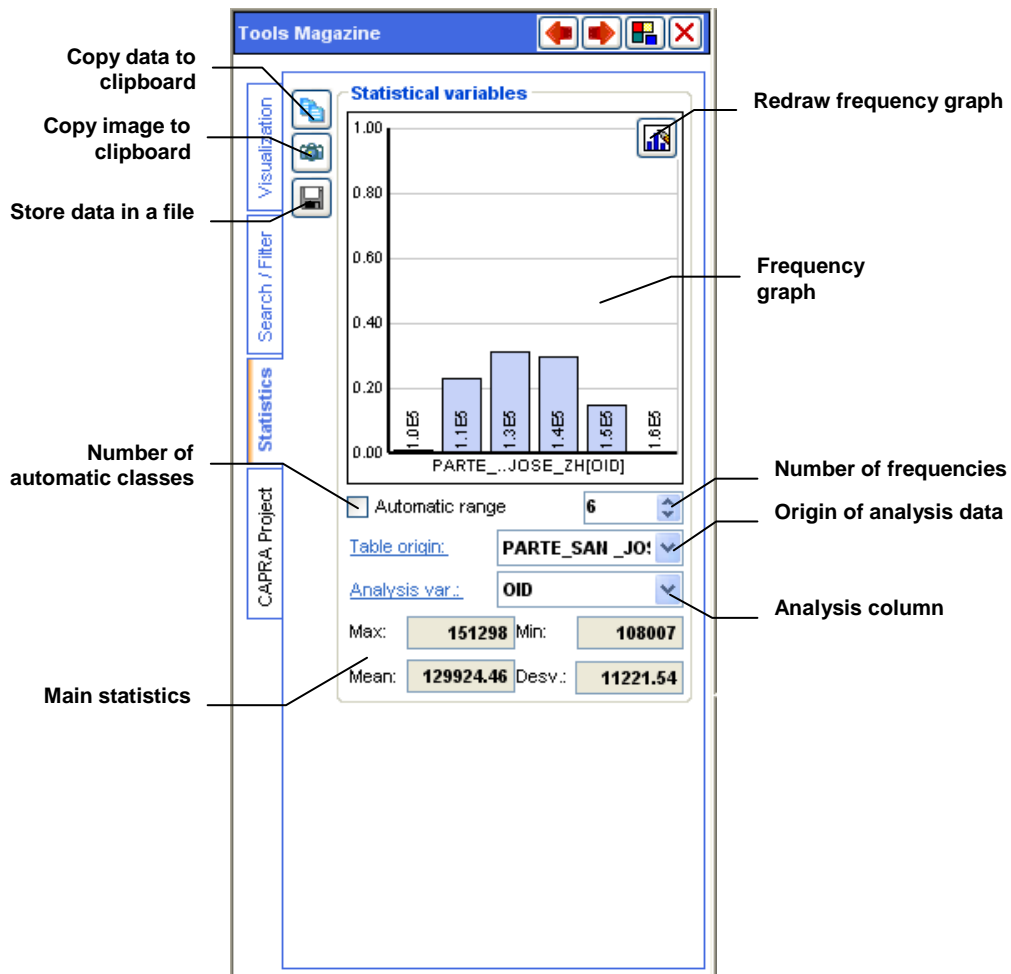





Figure 41 Statistical visualization window of registrations

With commands  **Copy data**,  **Copy image** and  **Save data**, it is possible to export data from the frequency curve to the clipboard (the first two commands), or to a plain text file.



Note: The statistical calculation process is made only on objects currently visible in the visualization map. If there are filtered objects or if they are outside the view area, these will not be included in the search process.

CAPRA PROJECT



The **Capra Project** file groups all available tools for opening, configuration and calculation of loss estimates in visualization projects. The file is divided in two parts:

Available projects

Shows the Project tree created in **CAPRA-GIS** in the current computer. The description of the project tree and its function is found in the PROJECT VISUALIZATION TREE section.

Calculation parameters

This section groups the information and configuration of the parameters necessary for making loss estimate. The calculation parameters tree is divided in 4 parts:

-  **Configuration:** The loss estimate can be calculated by complete or temporary hazards and by a single scenario of a hazard. This section shows/configures the type of calculation for the Project being edited. By clicking the loss estimation mode by single scenario (double clicking on " **By scenario**"), it is possible to change the scenario by double clicking on " **Esc:**", which drops down a window as that shown in Figure 42.

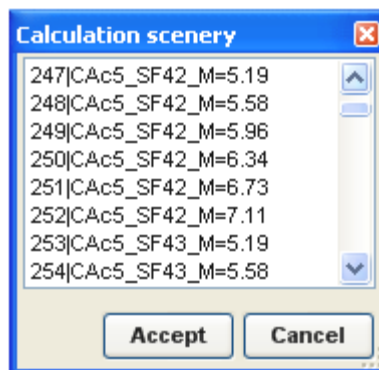






Figure 42 Scenario selection for loss estimate

-  **Available hazards:** shows a selection list with hazards loaded in the Project being edited. Each hazard may be selected/deselected (/) by double clicking on the hazard name. It is only possible to change the selection status when the project is set up in loss estimate by single scenario.

- **Available exposure:** **CAPRA-GIS** identifies automatically the ShapeFiles having the adequate format (features of graphic format and additional information). Each ShapeFile that complies with the conditions is added to the list and shows in square parentheses the number of ShapeFiles. The loss estimate is calculated on the selected items. To select an item () double click on the item, if a selected item is double clicked again, the item will be deselected ().
- **Site effects:** By clicking on this item, a popup menu is dropped down with three items: **Add file**, when selected it displays a file search window which adds new site effect files, **Erase file**, erases the last file added to the site effect list, **Erase All** erases completely the list of selected files.
- **Processing files:** Groups the files generated by the loss estimate system and shows a direct Access to the results fields (). If a results file () is selected by double click, **CAPRA-GIS** will indicate the operating system to display the selected file in the associated application by default. Clicking on a results field () and the system will assign it as background color field for the related exposure ShapeFile.

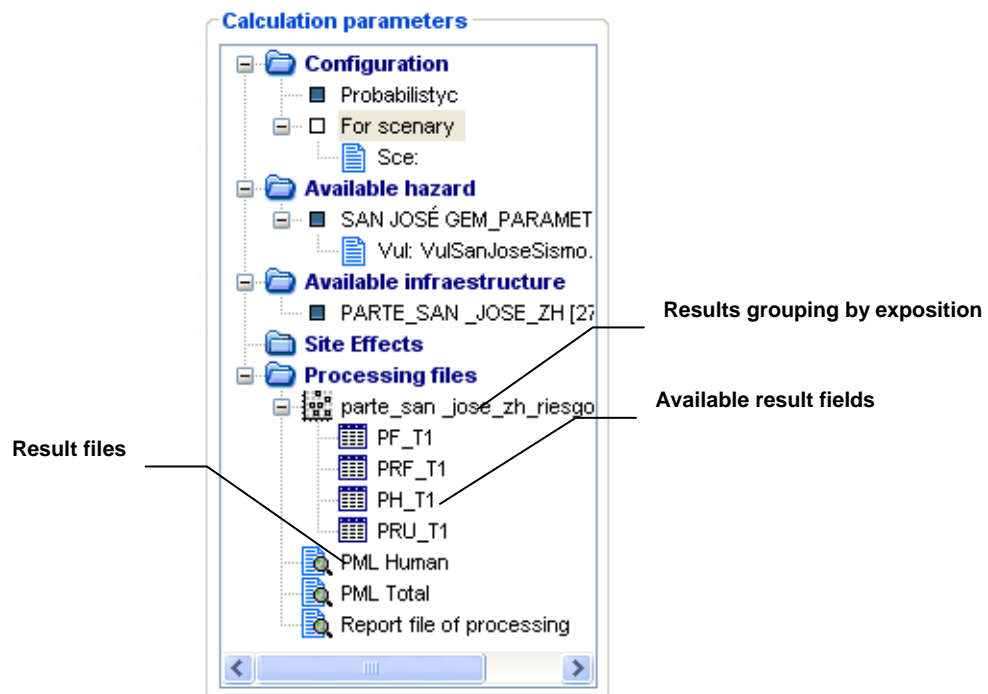


Figure 43 Scenario selection for loss estimate

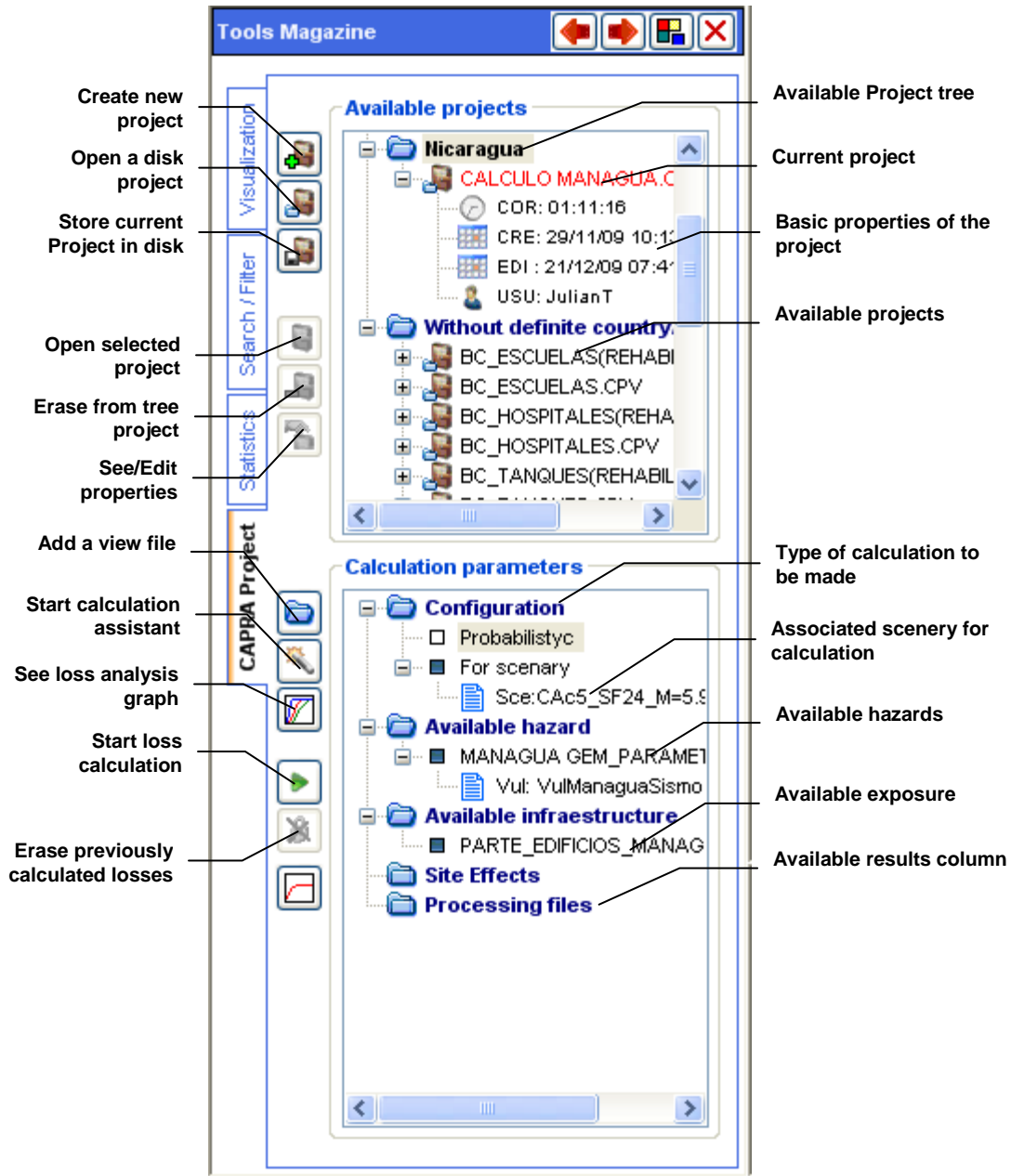
















Figure 44 Visualization window and configuration of projects

There are also some editing and visualization commands for projects at the left side of the **Calculation parameters** area. The following is a description of these commands:

- 
Add a visualization file: A dialogue box is displayed with this command which allows user to search in the file system a layer (ShapeFile files) or a grid (ame files) to be loaded in the current Project being edited. Keyboard accelerator **Insert**.

-  **Calculation assistant:** The calculation assistant is a wizard-type window that guides user step by step to configure the project for estimation of losses, visualization of results and files or results exports. The operation of the assistant and its main features are described below under  **Calculation assistant and post-processing**.
-  **Visualization of vulnerability curves:** with this command it is possible to display the visualization window of vulnerability curves and vulnerability curve libraries. The complete description of the use mode of this window is found under  **Special windows**.  section
-  **Start loss estimate:** By clicking on this control, **Calculation assistant**  is displayed in the calculation estimation stage and starts automatically the process. The control subroutine verifies whether the project being edited has all necessary parameters configured to start the process and generates a warning if it does not have the minimum calculation parameters. The operation of the assistant and its main features are described below under **Calculation assistant and post-processing**  Calculation assistant and post-processing
-  **Unlock project:** Eliminates all result files associated with the project and restarts it to recalculate loss estimate.
-  **See PML curve:** shows the visualization window of the PML curve associated with the loss estimate of the Project being edited. The complete description of the use mode of this window is found under  **Special windows**.

Data explorer

The quick search and load area allows user to configure quick search directories where hazard files or exposure shares are stored. This area is formed by a visualization tree which shows the  icon (see Figure 45), that represents each of the files selected by the user; each file drops down two new items (identified also with ) **Hazard and Shapes**. The existing files in the system folder are individually written into the system folders.

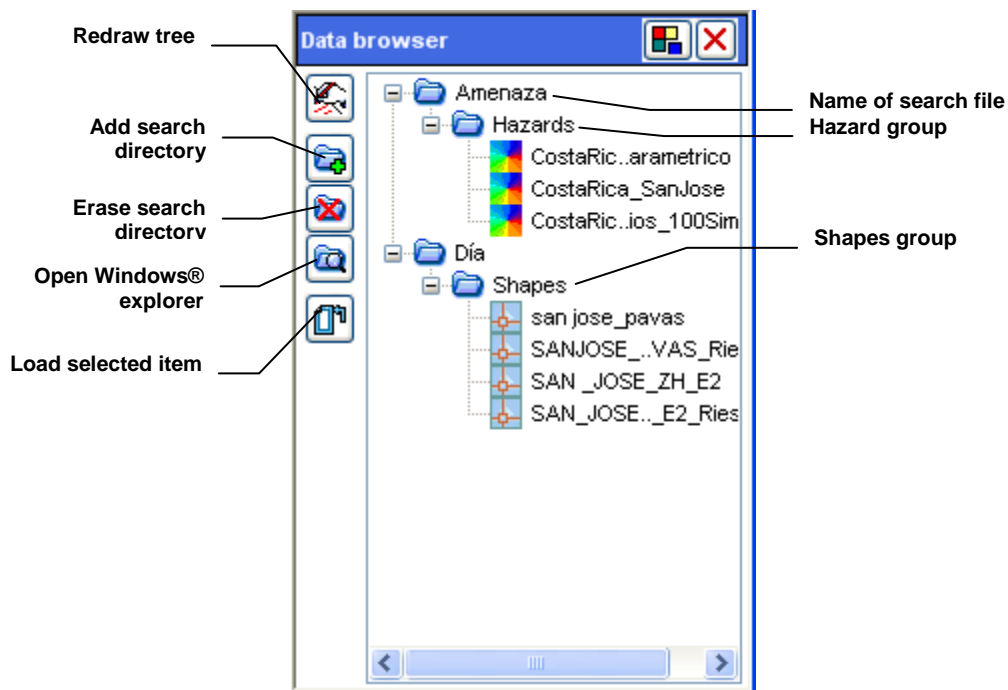







Figure 45 Data explorer

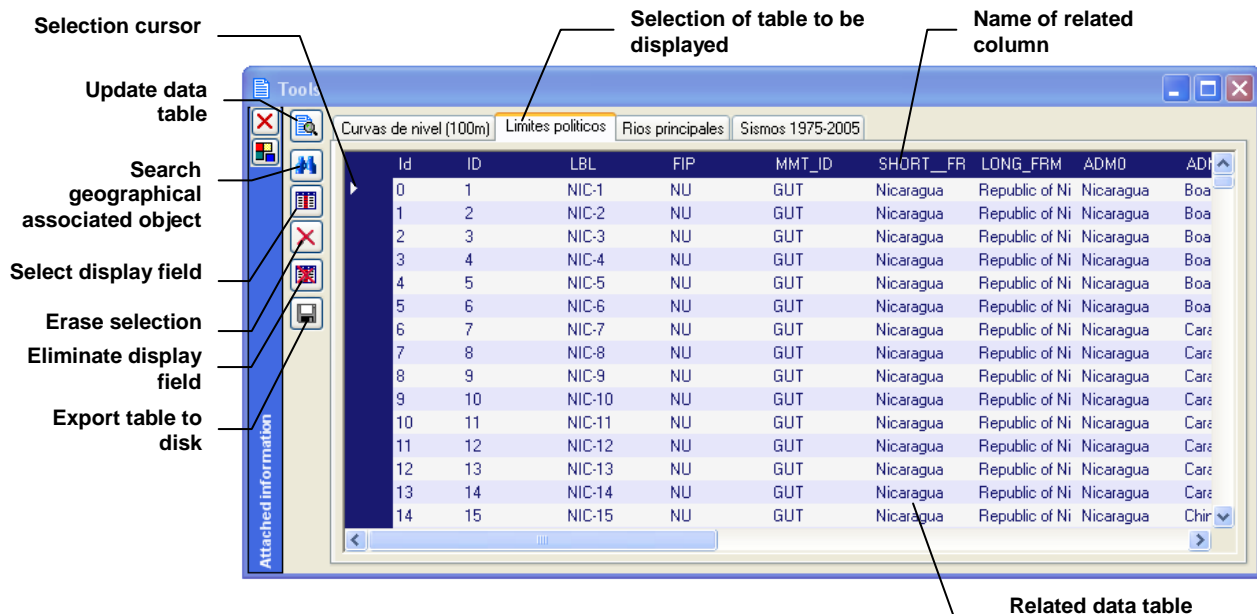
The command explorer has several edition commands located at the left of the visualization tree. These commands are used similarly as most of the system commands, and are applied over the selected element of the visualization tree. The command description is the following:

-  **Redraw tree:** Redraws and updates data exploration tree. It is used to view the last changes generated in each exploration directory.
-  **Add search directory:** Displays a search window and system directory selection. By clicking on **Accept**, the directory is added to the list of exploration directories.
-  **Erase search directory:** Erases the selected directory from the data exploration list.
-  **Open explorer:** Starts a new window in the Windows® explorer of the selected directory in the exploration tree.

-  **Load file to project:** Adds the selected file to the current project being edited.

Linked data

Each file of information for exposure (ShapeFile) may have information attached to each object. This information is displayed in the window of related records (see Figure 46), in a grid, each column indicates the additional linked data, while each row corresponds to an object of the associated ShapeFile. The system automatically creates a folder for each of the layers that are added to the current project being edited and each one of them is identified with the name of the ShapeFile. The data stored in the table cannot be altered directly by the user, new columns can be created following certain conditions or formulas imposed by the user in the **Field calculation** window (see **Calculation assistant and post-processing**  Calculation assistant and post-processing).



Selection cursor

Update data table

Search geographical associated object

Select display field

Erase selection

Eliminate display field

Export table to disk


Selection of table to be displayed


Name of related column

Id	ID	LBL	FIP	MMT_ID	SHORT_FR	LONG_FRM	ADMD	ADI
0	1	NIC-1	NU	GUT	Nicaragua	Republic of Ni	Nicaragua	Boa
1	2	NIC-2	NU	GUT	Nicaragua	Republic of Ni	Nicaragua	Boa
2	3	NIC-3	NU	GUT	Nicaragua	Republic of Ni	Nicaragua	Boa
3	4	NIC-4	NU	GUT	Nicaragua	Republic of Ni	Nicaragua	Boa
4	5	NIC-5	NU	GUT	Nicaragua	Republic of Ni	Nicaragua	Boa
5	6	NIC-6	NU	GUT	Nicaragua	Republic of Ni	Nicaragua	Boa
6	7	NIC-7	NU	GUT	Nicaragua	Republic of Ni	Nicaragua	Carc
7	8	NIC-8	NU	GUT	Nicaragua	Republic of Ni	Nicaragua	Carc
8	9	NIC-9	NU	GUT	Nicaragua	Republic of Ni	Nicaragua	Carc
9	10	NIC-10	NU	GUT	Nicaragua	Republic of Ni	Nicaragua	Carc
10	11	NIC-11	NU	GUT	Nicaragua	Republic of Ni	Nicaragua	Carc
11	12	NIC-12	NU	GUT	Nicaragua	Republic of Ni	Nicaragua	Carc
12	13	NIC-13	NU	GUT	Nicaragua	Republic of Ni	Nicaragua	Carc
13	14	NIC-14	NU	GUT	Nicaragua	Republic of Ni	Nicaragua	Carc
14	15	NIC-15	NU	GUT	Nicaragua	Republic of Ni	Nicaragua	Chir





Related data table

Figure 46 Visualizaton window of related records

Each record visualization table is designed to display only the information of objects visible in the current view of the project being edited (visualization filter.) To select a field in the data table click on the column 0 (unnamed column and all blue), whereupon the cursor () of table changes position (see Figure 46) . On the left side of the associated table associated there is a series of visualization and export commands for the active table. Below is a description of each available command:


-  **Update table with visible objects:** When the view of the project being edited is changed, the table is not automatically updated. Clicking on this command the table is

updated and only you will only see the objects visible in the current view of the project being.




-  **Search an associated object:** with this command **CAPRA-GIS** searches in the current view current field of the data table (location of the table cursor), the system zooms on an object and checks it as selected (see DATA LINKED TO OBJECTS).
-  **Relate field to background:** When clicking on this element, a popup menu is displayed with the name of each of the columns of the current table. If you click on one of the menu items, the layer to use that linked data is configured.
-  **Erase current selection:** This command deselects Project selected objects. (see DATA LINKED TO OBJECTS).
-  **Erase column from the table:** When this command is selected, a popup menu is displayed with the name of each of the columns. Click on one of these columns and the current table will be eliminated.





NOTE: The changes made on a table such as elimination of fields, will only be stored in the source ShapeFile when the project is stored.

-  **Export table:** By clicking on this command, a popup menu is displayed with two options. **Export table with current view** makes a copy of the current table (only available fields), to be stored in disk as text formats (*.csv), Microsoft Access (*.mdb) and dBase IV (*.dbf). The **Export shapes with all fields** option makes a complete copy of the table being displayed (irrelevant of the visibility of the graphic object) of the ShapeFile including the graphic file (*.shp), index file (*.shx) and all additional information files (such as *.xlm) belonging to the ShapeFile of origin of the current table).

Calculation assistant and post-processing






The calculation and post-processing assistant is a window that has the greatest number of functions used by **CAPRA-GIS**. It is a window formed by series of frameworks sorted in order of processing, controlled by a navigation tree and three control buttons. As you progress through the assistant using **Next**  button, the controls at the right of the window change, progressing in the Visualization tree, and with the **Previous**  command it goes back. With **Cancel**  you close the calculation and post-processing window.

As you progress through the assistant, the navigation tree highlights the stage of the assistant. The navigation tree has two types of icons: the , icon, shows that that the toolkit is enabled, while the  icon indicates that it is not possible to enter that type of tools (disabled). Generally,

disabled tools occur when the loss estimate has not been calculated (**Results** kit) or the project is not completely configured to start calculation (**Calculation** kit). It may be possible to access directly to a toolkit, buy clicking on one of the enable items of the navigation tree. The operating descriptions for each toolkit.

CONFIGURATION KIT

This kit gathers the controls used to perform the configuration of the project for loss estimate. Its purpose is to replace more generally the configuration tree of **Calculation parameters** (see calculation Parameters). The configuration set has two different views according to the method used for calculated losses on selected exposures (see Figure 47 and Figure 48).

The configuration process starts with the analysis type selection to perform in box 1. **Select type of analysis**, if the selection is done **by unique scenario** the window as that shown in Figure 47 is configured. In box 2 **site effects** it is possible to load site effect files, with the  button, a window of site effects selection is displayed for user to select the correct file. The  button eliminates the selected file from the list, and the  button eliminates completely all files in the list. Box 3 **Estimation exposure** shows a selectable list with available ShapeFiles from the **source files** (that match with the hazard files available in the current project); when selecting the source file, the list with available sceneries in the hazard file is loaded (**Available sceneries**) where an item in the list must be selected, and then with the  button **Search** associate the vulnerability file to the selected hazard. By clicking on the  button, the visualization window for vulnerability function files is started.

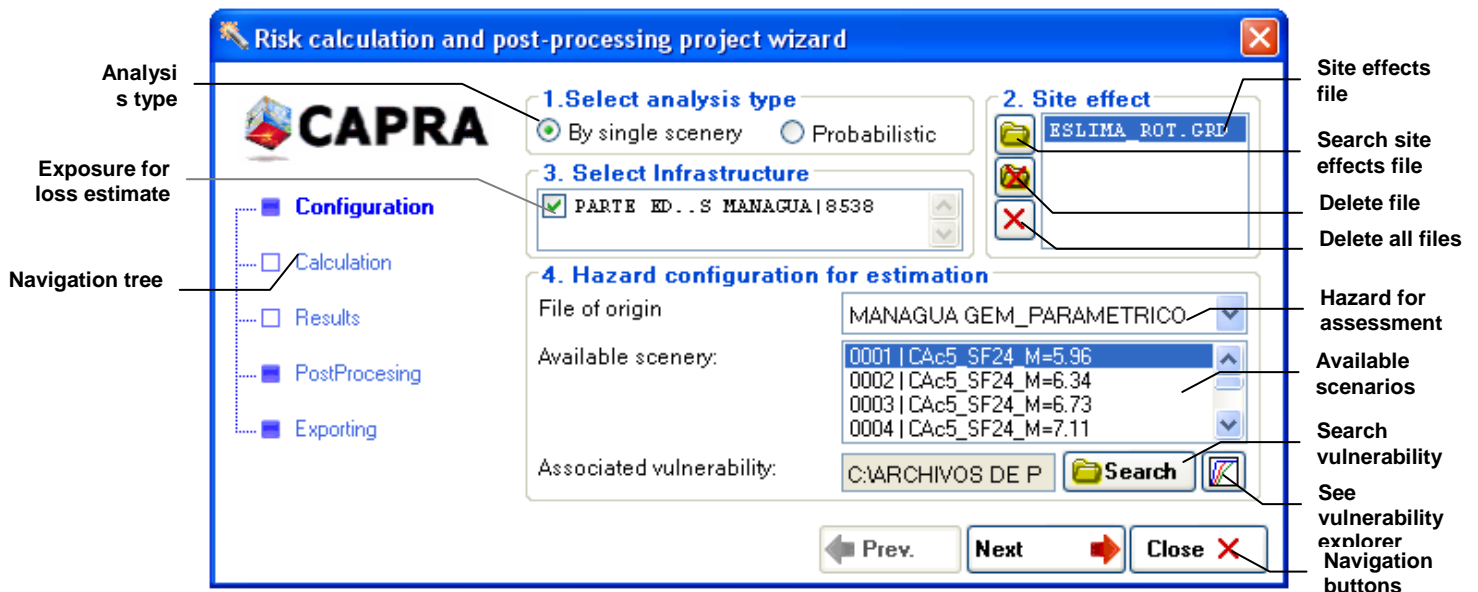







Figure 47 Calculation assistant, calculation configuration set (Only scenario mode)

If you select as analysis type in box 1 **Select analysis type, Probabilistic** area 4 changes as shown in Figure 48. The configuration process up to step 3 is identical to that described for the **By unique scenario**. Area 4 **Configure temporalities** a table having as rows each of the available hazard files in the project being edited is shown. Each row is formed by two fixed columns **Hazard** that contain the file name *.ame and **Vulnerability** with the name of the vulnerability file related. It has also a series of additional columns with combinations of temporalities. To select that hazard occurs in a given temporality, click on the selection box until the selection appears in bold; to deselect, click again twice until the selection disappears. The buttons at the left of the temporalities table have the associated editing commands:  adds a new temporality to the table,  eliminates the last temporality of the table,  starts the search window to select a vulnerability file of the active hazard (the row where the cursor  is located) and  shows the visualization window for vulnerability functions.

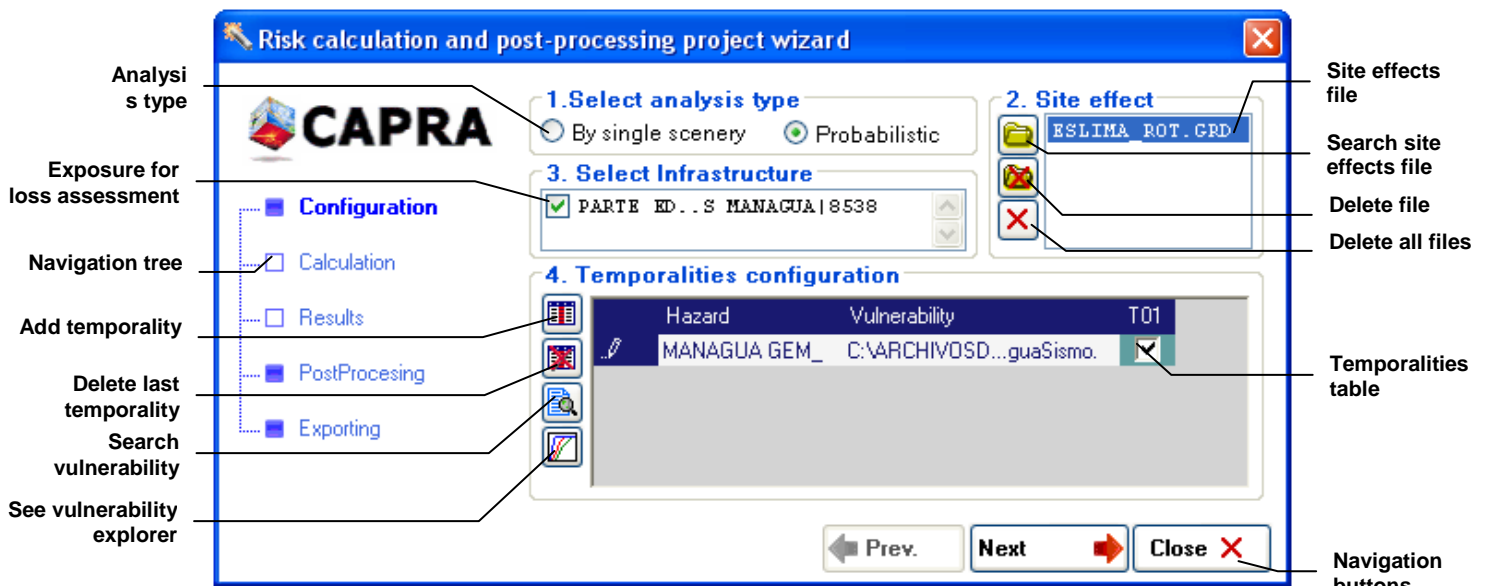







Figure 48 Calculation assistant, calculation configuration set (Probabilistic Mode)

 **NOTE:** If you click on a temporality already selected, the control will display an intermediate step of the selection box (check in gray), this step is taken as the selected box; to disable this element, the selection box must be empty.

 **NOTE:** The changes made on any configuration parameter of loss estimate are stored in the Project only when you click on the **Next**  button or by direct change in the toolkit by the Navigation tree.

CALCULATION SET

If the project configuration has the minimum defined parameters, you may proceed to start loss estimate. The calculation set window is formed by (see Figure 49) **Configuration report** which contains all the related information of configuration parameters for calculation and results obtained; this report is located in the same file where the Project is stored, under the same name but with the *.log extension; at the left of the set, there are two available commands: with  it is possible to view the file in the text editor related for the *.log type files and with  you re-write the file showing the last not updated changes.

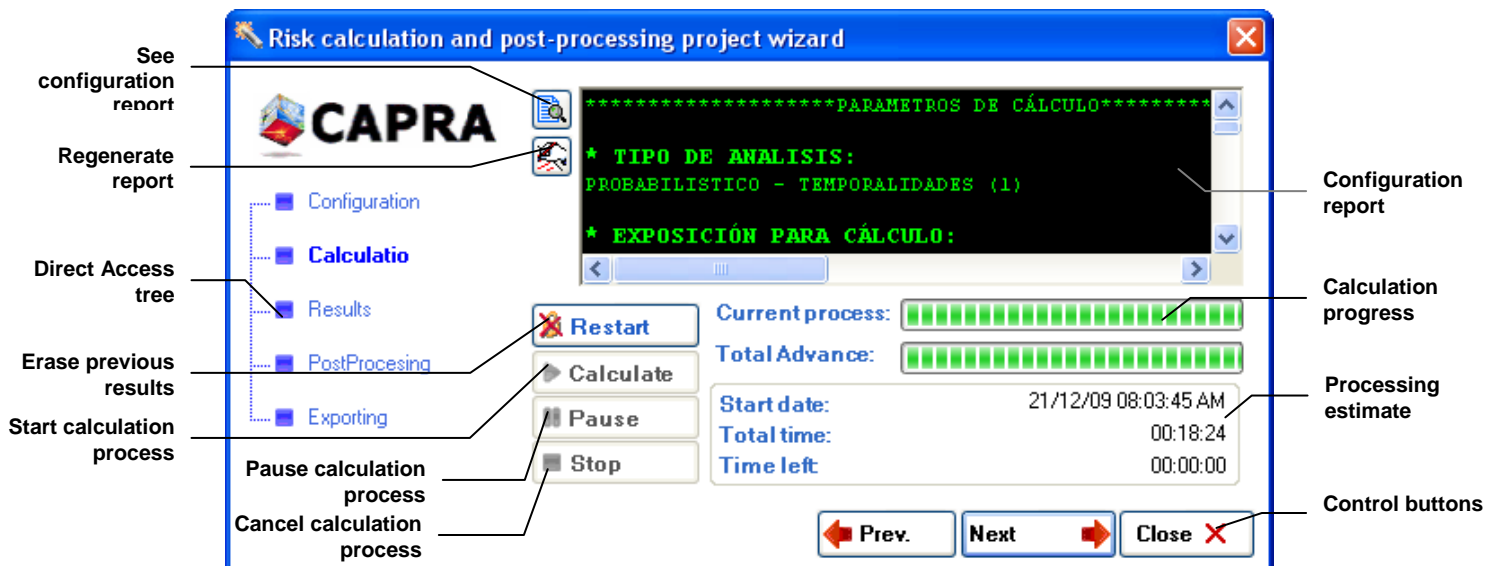







Figure 49 Calculation assistant, calculation set

At the bottom there are the control commands to calculate loss estimates, with the  **Reset** button, the files related with the previous run of the project are erased (see Calculation parameters). If the Project is unlocked and with the configuration necessary to start the loss estimate, the  **Calculation** button starts the calculation of loss estimate. A calculation process may take from minutes to hours to complete, and requires a huge memory and system processor, therefore if you wish to stop the calculation in order to be able to use the system, click on  **Pause**, thus releasing the processor temporarily; to reactivate the calculation process, click on  **Continue**. To cancel definitely the calculation process, click on the  **Stop** button.

The right of the control buttons shows a series of objects designed to view the calculation progress and to estimate the time required to complete the process. The top progress bar shows the progress of the current task, while the bottom progress bar shows the estimate process timing (see Figure 49).

RESULTS SET

This section displays the statistical visualization control of results generated by loss estimate. You may produce graphs similarly as they are produced in STATISTICS, with some additional parameters and functions. The process of generation of statistical graphs of results starts when you select the results file in the **Results** field; once the results file has been selected from the **Analysis data** list, complete it with the names of the available columns in the results table. If you select an element from the **analysis data** list, it automatically generates the frequency graph and static data are updated (Maximum, Minimum, Average and standard Deviation).

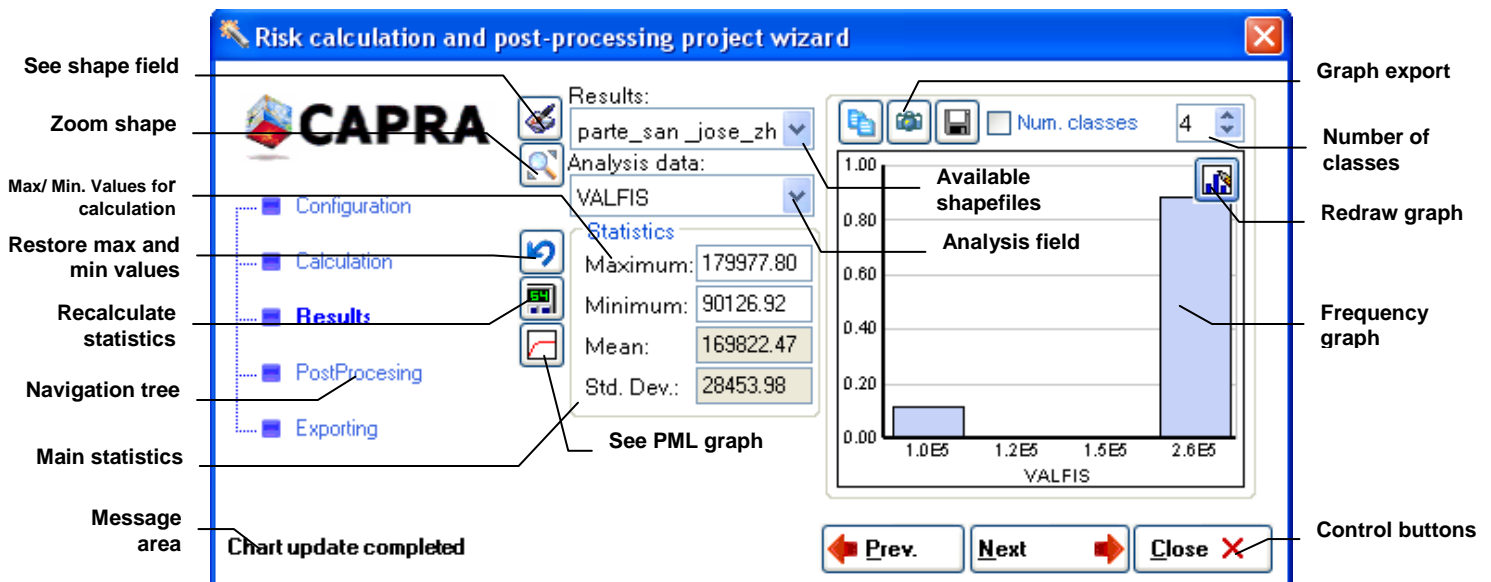







Figure 50 Calculation assistant, results set

It is possible to change the calculation limit of frequencies by entering the new limits in the **Maximum, Minimum and Number of classes**. At the left, there are the visualization commands and edition described below:

-  **View field:** Is established as background filed for the calculation infrastructure shapefile, and the result is selected in the **Analysis data** field.
-  **Zoom on infrastructure shape:** Zooms adjusting the view such that the related infrastructure shape be completely visible.
-  **Restore maximum and minimum values:** Rewrites the **Maximum and Minimum** values from the results table.
-  **Recalculate statistics:** Recalculates statistics according to the parameters configured in **Maximum and Minimum**.
-  **See results window PML:** Displays the PML window of results for the Project being edited (see VISUALIZATION OF THE PML).

The frequency graph may be exported graphically (🖨️), data copy (📄) and export to a plain text file (📁), these commands are located at the top of the frequency graph.

POST-PROCESSING SET

The post-processing tools allow the creation of new fields in the shapefile tables loaded in the project. The main function of these fields is to calculate summaries or geographical statistic value and fields derived from others. The system is divided in four main groups (see Figure 51): additional tables, result grouping and creation of fields.

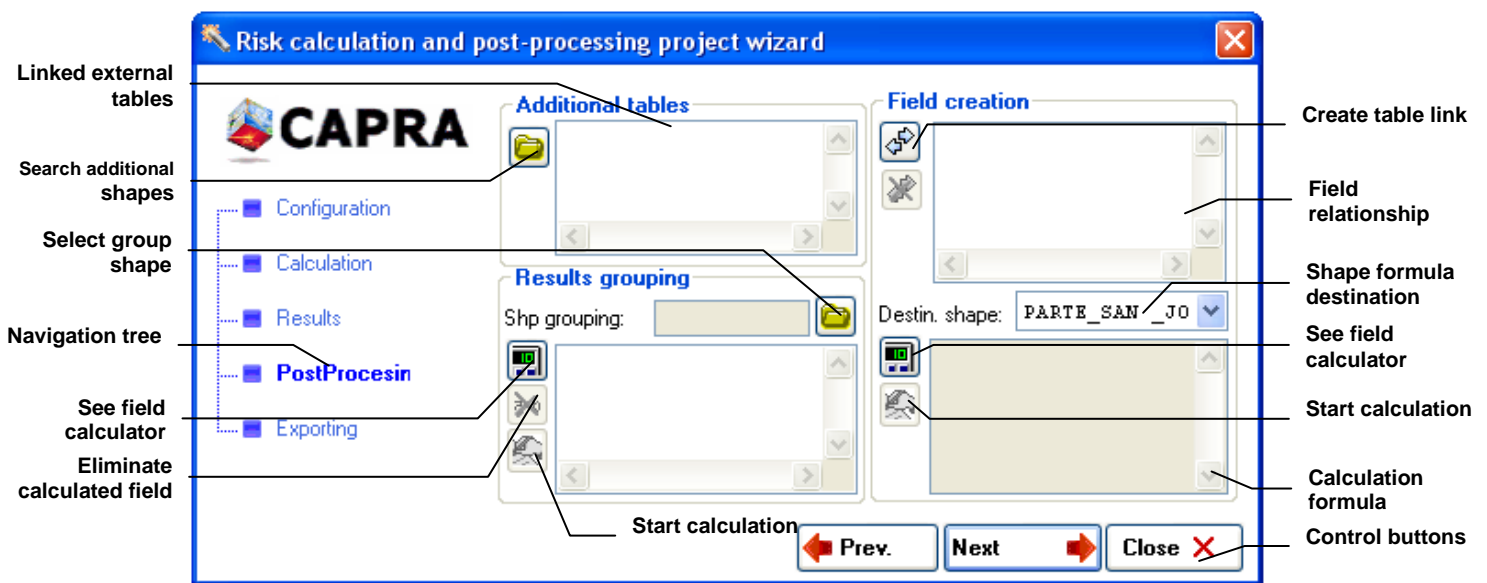


Figure 51 Calculation assistant, post-processing set

Additional tables

With this list and the 📁 command, it is possible to upload new dBase files (*.dbf) to the post-processing system. By clicking on 📁 a search window and dBase file selection is displayed (*.dbf). This indicates that the calculation routines may use the related fields of these additional tables.

Results grouping

Allows the creation of a new field based on a formula and a grouping shape. It is the tool used to create regional statistical summaries to local events or answers. Figure 52 shows a typical example of the information grouping process; part a) shows a Departmental geographical region, Municipalities and location of hospitals. Two new fields are created by a grouping process by Department, one with the number of municipalities in each Department, part b) and the number of hospitals by Department (part c).

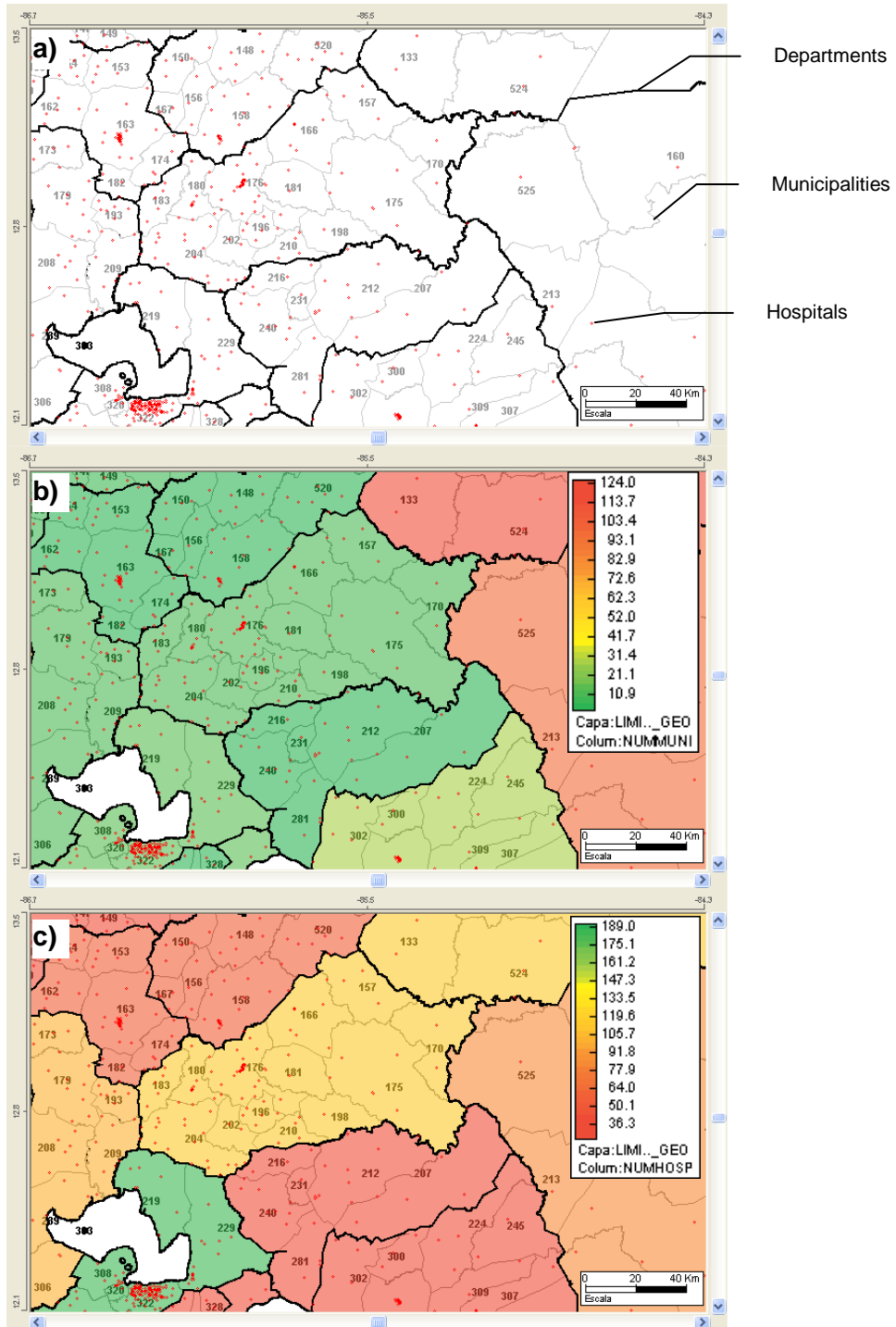









Figure 52 Results grouping. a) Individual information. b) Number of municipalities by department, and c) Number of hospitals by department

The creation process of grouped results starts by clicking on , which asks you user to select a grouping ShapeFile file, corresponding to the set of objects of the limits of the individual objects locales inside them. Once the grouping ShapeFile has been selected, you may create one or several fields in the grouping file by activating the command , which displays the function generation window among tables (see Section). There are several specialized windows inside **CAPRA-GIS**, each one of them is designed to perform a specific task within the calculation subroutines, or simply for you to view information. Below is a description of the main windows present in the system.

FUNCTION GENERATION WINDOW AMONG TABLES. The process can be repeated several times to create the number of column that you wish. With the  command, it is possible to cancel the selected calculation equation. When the creation of calculation equations is completed, click on the  command. The calculation process may take several minutes depending on the complexity of the grouping ShapeFile and individual ShapeFiles.

 **NOTE:** It is only possible to use statistical functions for tables different to the grouping ShapeFile, since the relationship among tables is geographical.

Creation of new fields

With this tool you can create new fields to the table being edited, according to an equation or formula created by you. New fields can be created through functions that use data in the source table or data of other tables. To be able to use fields of other tables, it is necessary to create a link method among tables; to do this, use the  command located at the left of the **Field Creation** area, where the window shown in Figure 53 is displayed. To eliminate a relationship, select from the list and then press the  button to the left of the vinculation field list.

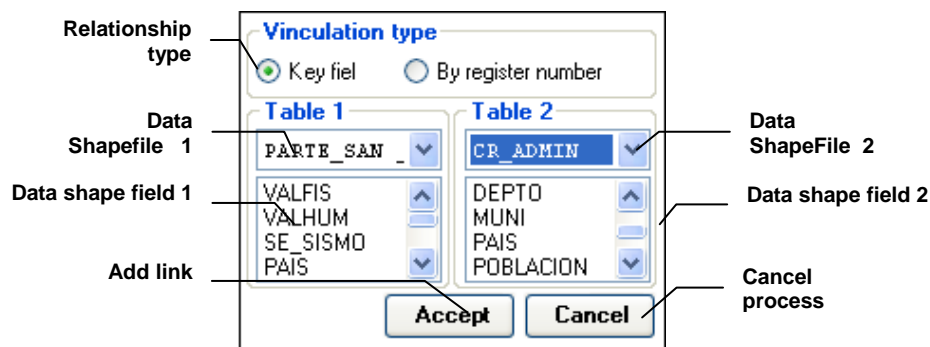



Figure 53 Assignment window and creation of relationships among linked data

The relationship among tables may be by **Field** or **by number of record** (see Figure 53). The relationship by field indicates that each record in a table has an associated record in the other

table, and that the identification key corresponds to the value of the field selected in **Table 1** and **Table 2**, irrelevant of the order where they are located. When **By number of record** is selected, each record in **Table 1** has an equivalent record in **Table 2**, in the same location counting from the first record in the table. According to the mode of use of the window in Figure 53, the type of link must be selected first, and then select **Table 1** of the existing dropdown list and then **Table 2**. Each time the source table is changed, the field list is updated indicating the name of available fields. To create the field link, select it in each list.




In the creation process of a new calculated field, select the destination table from the **destination Shape** dropdown list that contains the available shapes in the current project being edited. Then, create the generation formula by clicking on the  command and configuring an equation as described above. There are several specialized windows within **CAPRA-GIS**, and each of them is designed to perform a specific task within the calculation subroutines, or simply for user to view information. The following is a description of the main windows present in the system.

FUNCTION GENERATION WINDOWS AMONG TABLES. To start the process, click on 

EXPORT SET

With the export tools it is possible to generate files in different formats for Hazard files (*.ame) and ShapeFiles (*.shp). The export control is divided in two sections (vertical buttons), the **AME** section (see Figure 54) contains the export methods for hazards and the **SHAPE** section (see Figure 55) contains the rasterization of shapes.

Export of hazard files

A hazard file can be exported calculating a map by return time or simply a scenario of same; for any of the methods, select from the top part of the dropdown list (**Hazard (AME)**) that contains the files loaded in the current project, and there you select the hazard file to which exportation is intended. The first method is located at the top of the export set, the process starts when you select or add the return periods you wish to generate; to do this, you can use the tools available at the left of the **Return list (years)**; the  command switches return selection, the  command allows to select all returns, and the  command activates a text box to add a new return period. Now, choose the density of the output grid configuring text boxes **Grid X** and **Grid Y**, the default units are in Km but these can be changed to grades selecting the **Use grade** box. The parameter **Curve Point** controls the quality of the output file and its resolution. **Intensities** controls the overall generation (All intensities) of the output file or with influence of only the selected intensity. The last stage is the selection of the output format from a list of approximately 20 available formats. The available formats include georeferenced formats, text format and graphic formats. To make an export, click on **Start**, this dropdown a selection window of output directory where the resulting files will be stored. The process may take several minutes depending on the resolution configuration given by the user, number of return periods selected and format of the output files.

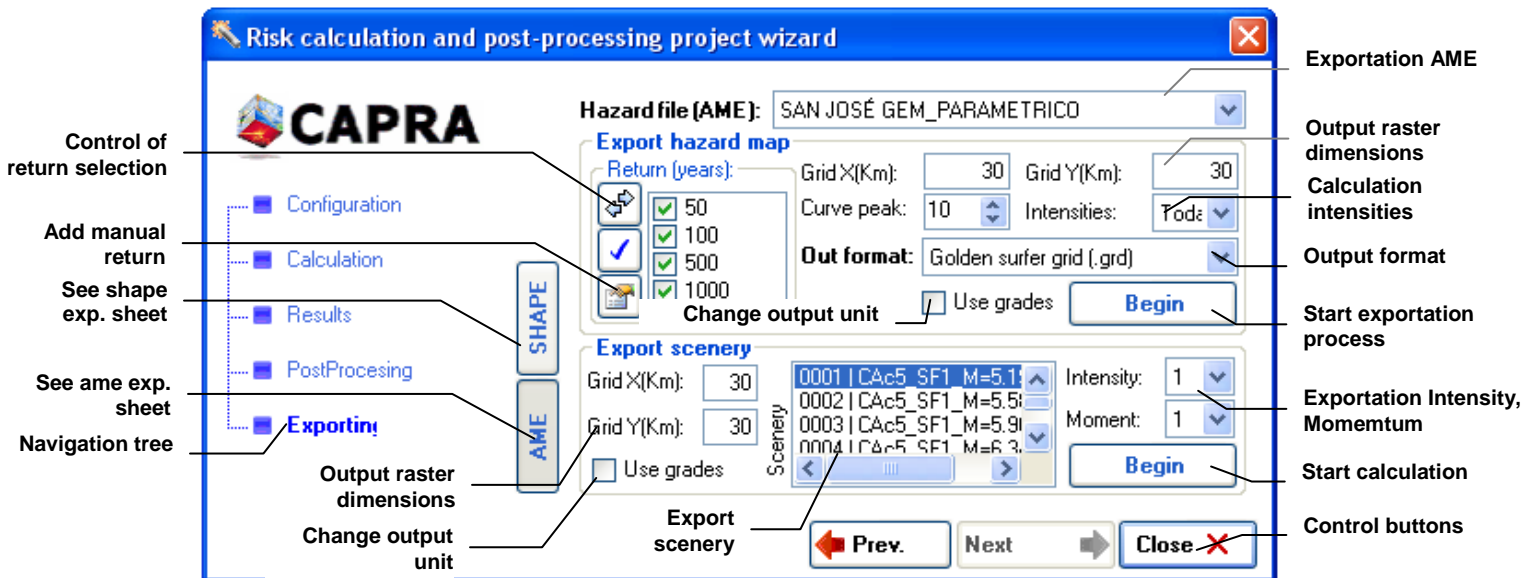


Figure 54 Calculation assistant, exportation set (*.ame files)

At the bottom of Figure 54 there are the controls for exporting scenarios of a hazard file. The process consists in selecting the **Scenario, Intensity and Momentum** of the exportation hazard, then the density of the output grid in **Grid X** and **Grid Y**, the default units are in Km but these can be changed to grades if the **use grade** banner is activated. To perform export, click on **Start**, and this dropdown a selection window of the output file where the resulting file will be stored. The output format for exportation of sceneries is unique and is of the Golden Surfer grid (*.grd) type.

Rasterization of Shapes

When the **SHAPE** button is activated, the window is configured as shown in Figure 55. The rasterization process consists in converting a Shape file in a defined density grid that shows some field of the data base of the system. The process consists in selecting a Shape loaded to the project being edited from the **Shape** list. Once the exportation shapefile of exportation is selected, the **Field to export** list shows the fields available in the linked data. Now, select the exportation field and the density you wish from the file in **Grid X** and **Grid Y**, the default units are in Km but these can be changed to grades selecting the **Use grade** box. To perform export, click on **Start**, and this dropdown a selection window of the output file where the resulting file will be stored. The output format for exportation of sceneries is unique and is of the Golden Surfer grid (*.grd) type.

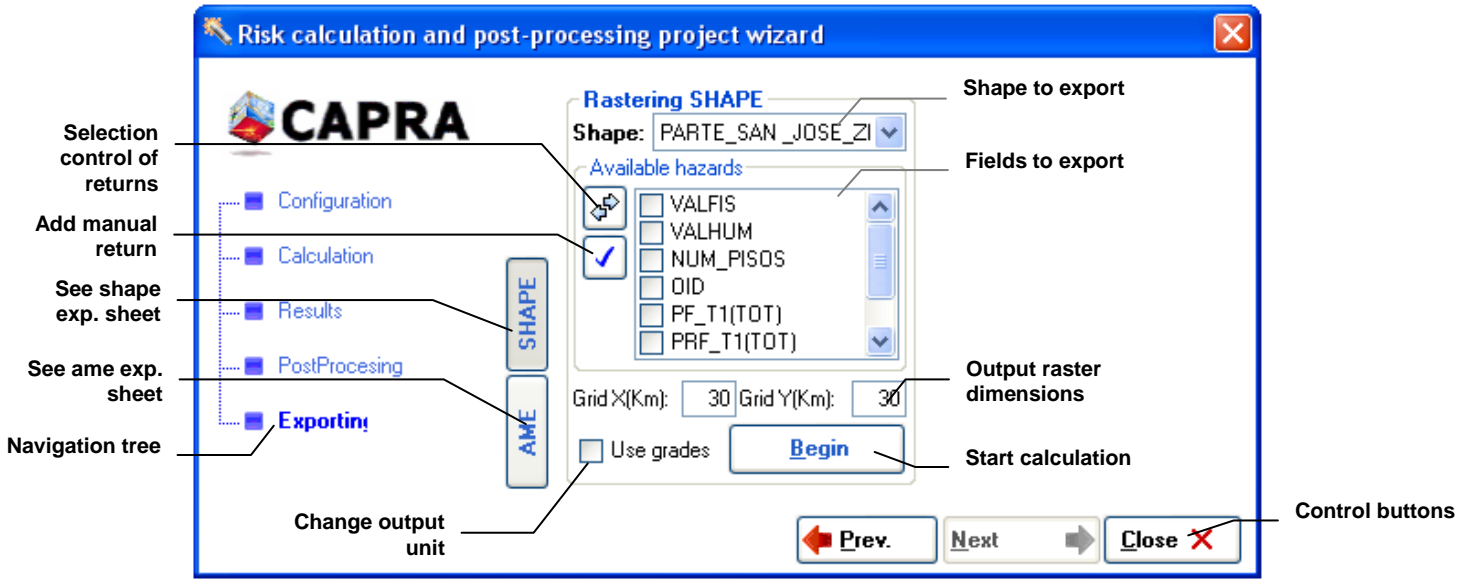


Figure 55 Calculation assistant, exportation set (*.shp files)

Figure 56 shows the result of the rasterization process of an exposure shapefile. As grid intensity rises for calculation, a raster with a better resolution is obtained, but increases the necessary time for exportation.






Figure 56 Rasterization result of a shapefile. Left original shape and right generated raster

 **Special windows**

There are several specialized windows in **CAPRA-GIS**, each one of them is designed to perform a specific task within the calculation subroutines, or simply for you to view information. Below is a description of the main windows present in the system.

FUNCTION GENERATION WINDOW AMONG TABLES

This is a window used within the field generation routines and results grouping (see Results grouping and Creation of new fields). As can be seen in Figure 57, the window consists of a calculator with the basic calculation operations and certain statistical operations. At the top there are three commands: Erase formula , backspace in the last written parameter  and start creation of formula . With which the system verifies the validity of the name and starts the formula, enabling the operations control. The operation of the creation of a formula works similarly to a normal calculator, but depending on the type of formula used, first enters the field or the operator. To select a field from a table as calculation parameter, select it from the **Table** dropdown list, and the associated **Field**, and finally click on the **Enter** button. If the formula allows the use of statistical data, click on the statistics command you wish to use (kept pressed) and then select the field to which statistics will be applied. Once you have finished entering the formula, click on the **Accept** button and the system verifies the integrity of the written formula and generates an error message indicating where the error might be.

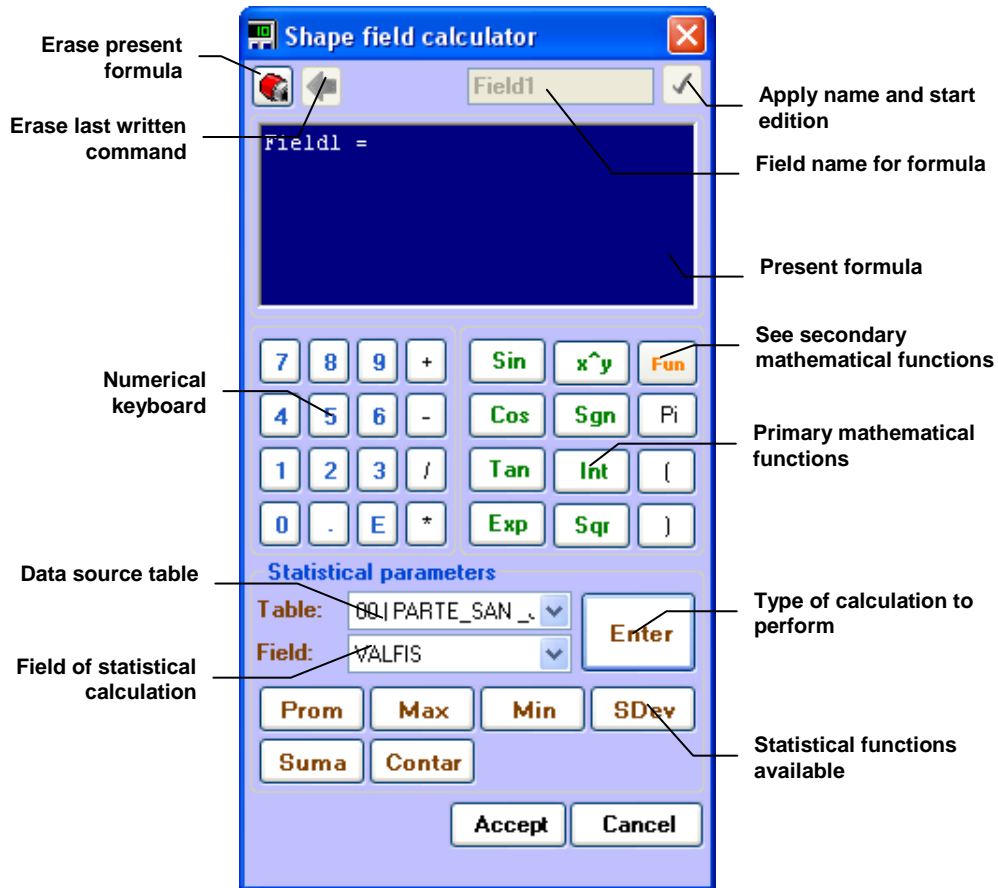


Figure 57 Field calculation window for linked data

The field calculation window has two modes of operation:




- **Group mode:** In this mode, the window only allows the use of statistical functions on the fields of data tables different to the input tables. You can apply mathematical functions to each of the results of these statistical functions. This is the mode used in the **Results grouping**
- **Normal mode:** Any function defined in the window can be used on any field of available tables, including statistical functions. This is the mode used in the Creation of new fields.

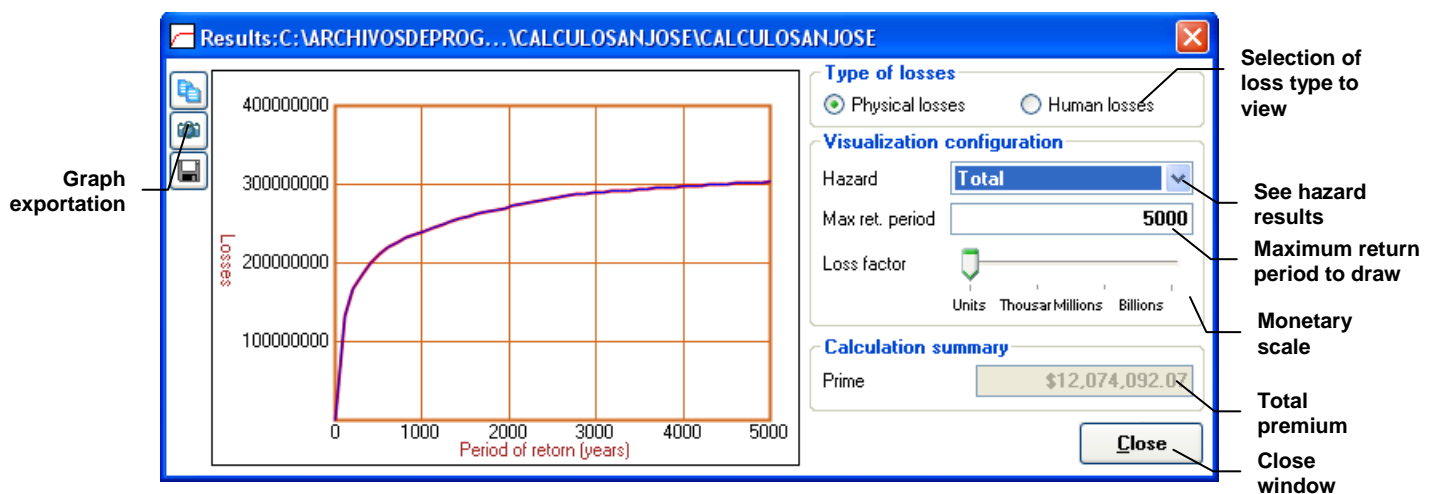
It is possible to use the keyboard to write the generation formula in the case of numerical values, arithmetic functions and **Enter** (intro). With the orange key **Fun** it is possible to Access to new mathematical functions superimposed to the original trigonometrical functions.

VISUALIZATION OF THE PML

This window shows the estimation loss curve associated with the calculation performed by use on the current Project being edited. It corresponds to the graphic visualization of files:

“_Humana.res” and “_Total.res” generated during the calculation of the Project (see CALCULATION SET).





In the **Type of Loss** area select the loss you wish to see: physical or human losses. The **Visualization configuration** groups drawing parameters of the graph as **Maximum return Period** (maximum value in X scale to draw) and **Loss factor** (format to use in Y scale), while the dropdown list shows available data. (In the case of temporalities, there is one for each temporality). With commands  **Copy data**,  **Copy image** and  **Save data** it is possible to export data from the PML curve to the clipboard (the first two commands) or to a plain text file.



VISUALIZATION OF VULNERABILITY CURVES

The vulnerability curves associated with an AME can be easily seen in this window. The visualization window has two presentation formats: expanded format, Figure 60 and compact format, Figure 59, but both modes have the same basic function, the main difference being in that in the expanded mode, it is possible to change the curve or vulnerability library being displayed, the direct access list to information and additional information of the file.

Compact mode

The compact mode is the default format of the visualization window of the vulnerability curves when browsing in the **Calculation parameters** tree. The window is displayed automatically if you place the cursor on the vulnerability functions file and keep it pressed for 10 seconds. The window has control visualization buttons located on the vulnerability curve graph. Each navigation command allows to the curves belonging to a vulnerability library ( see first curve,  see previous curve,  see next curve and see last curve ). The **Physical** and **Human** selection buttons allow alternation between the different types of vulnerability curves.

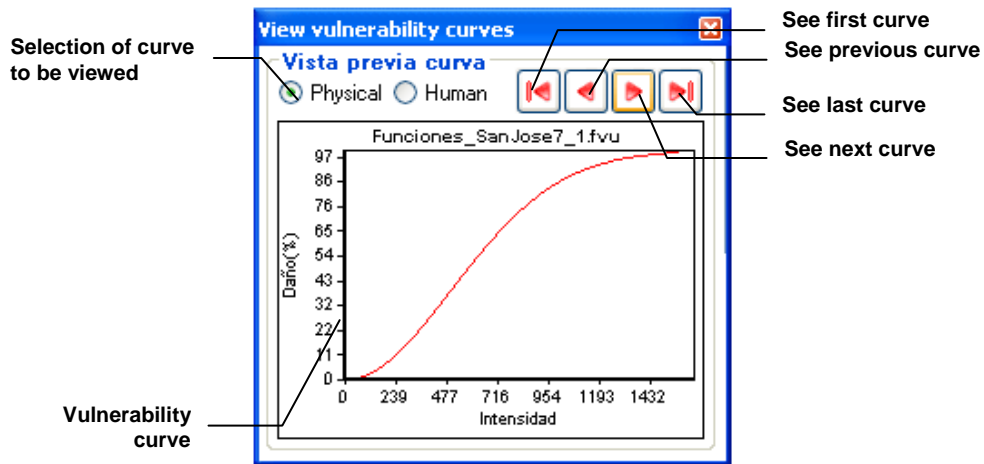



Figure 59 Vulnerability visualization window (compact mode)

Expanded mode

The extended mode displays all existing information in each vulnerability function. To display the extended window, click on the  button available in several parts of the main window.

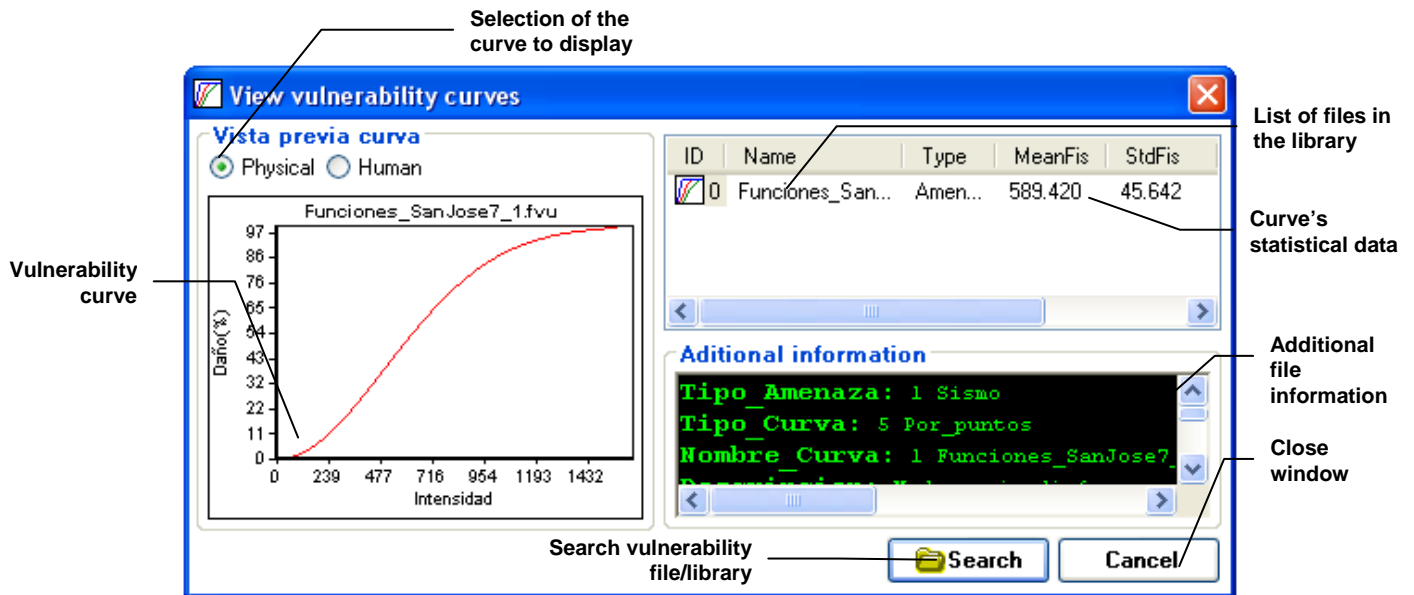



Figure 60 Vulnerability visualization window (expanded mode)

Once the window is displayed, select the file you wish to view, using the  **Search** command, which displays a search window and selection of the vulnerability file. Once the vulnerability file has been selected, it creates a list of all files included in the library, calculating basic statistical parameters as the mean, and standard deviation for each type of the vulnerability curve written

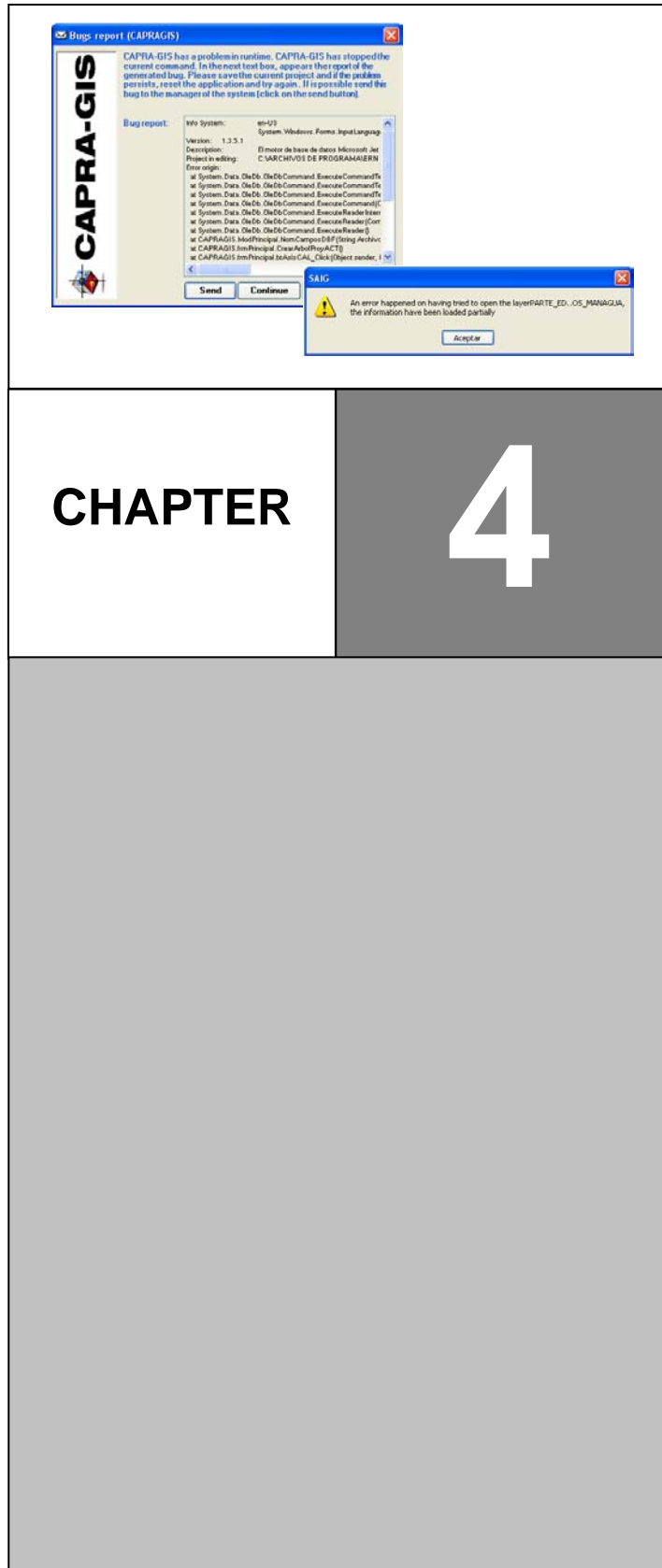


in the corresponding columns of the functions list. Every time the selected function is changed from the list, the drawn curve is updated and the related information of the selected curve is shown at the bottom.

PROBLEMS AND ERRORS

CHAPTER

4



Handling of non controlled errors

CAPRA-GIS is a system designed to have a high degree of interaction with the user, use of a considerable number of external calculation libraries and opening of an important number of different file types. This leads to the probability of occurrence of non controlled errors. As a ultimate control tool against the occurrence of these errors there is a global routine on errors (see Figure 61), which generates a report that you can use to report new errors to the system administrator.

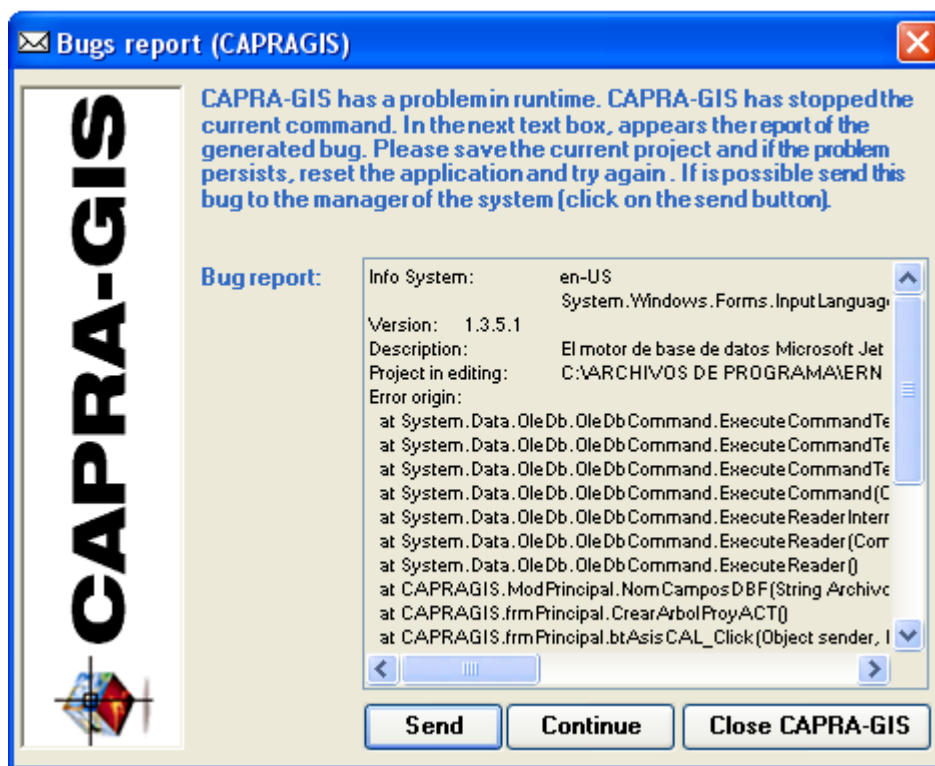


Figure 61 Management windows of non controlled errors

When the window of Figure 61 displays, the system automatically stops the execution of the function that generated the error. It is possible to display this window without generating an error, using the direct access in the **Help** menu of the application. There are three possible actions to be taken when the non controlled error is generated and the error management window is displayed:

- **Send:** When this command is activated, a new window of the used program starts as electronic mail server, thus being possible to send to the system administrator the log file

of the system and the additional information that you wish. The error window is not closed and no action is taken.

- **Continue:** Closes the error management window and resets the system to ensure that user has control on same.
- **Close CAPRA-GIS:** Ends the application trying to store changes made on the project being edited. This is the last alternative available if the system does not respond or if error is generated continuously.



NOTE: If errors occur continuously, it is recommended to uninstall the system and reinstall it, and to check whether there are available updates and download them.

Typical problems and their solutions

Due to the complexity and features that **CAPRA-GIS** has it may be possible the occurrence of repeated errors that may be attributed to the input file features or to empty files within system programming. Below is a brief description of some typical errors, their explanation and possible solution.

Table 1 Summary of possible errors and their solutions

ERROR	DESCRIPTION	SOLUTION
File not found when opening the file	The visualization Project stores the location address for used files. If a file is moved or its name is changed, the system will not be able to locate it and there will be problems when loading it	When a project is loaded in CAPRA-GIS , and the file is not found in disk, the system displays a search algorithm starting in the file where the Project is stored. If the algorithm does not find the file, a manual petition of file location is performed.
When a project is opened a partial opening warning is generated.	The source file has had important changes with regard to the original file used in the project.	If a file used in a project has considerable changes, when trying to open it there are inconsistencies in the Project. It is recommended that you make a copy of the files before making important changes or exporting the Project to a directory or .zip file to store all files in the original state.
Problems occur when importing a shapefile	The shape format is an standard format without many changes, but the attached data format (.dbf) has important limitations that may cause errors.	Check that the .dbf file has a short name if possible, and also the field names. Special characters (as ñ) may also cause importation problems. It is always necessary to check that the .dbf file format be of the dBase IV type.
An error occurs when	CAPRA-GIS needs to create	The names of IDSHA314 and VISHA314 fields are

creating new columns	temporarily two columns on the shapefile.	reserved by the system and it is recommended not to use these names in related .dbf files.
New columns are created but they are not stored in the source file.	When creating new columns, the system makes a security copy of the base files.	The changes made on tables are only stored in disk when the Project is stored. If the project is not saved before closing it, the changes will be rejected.
A disk project cannot be stored	The dialogue box: Save as displays when trying to store a project.	If the feature of a project is read only, it prevents any overwrite on the file. To solve this problem, save the project in a new file or change the read-only feature.
An error occurs when assigning a field for a property	If the field is numerical, it is only possible to assign property fields.	There are cases where numbers are stored in text fields, to use this column, it is necessary to edit the data base and to convert the field in a numerical format.
An error is produced if a new CAPRA-GIS instance is attempted to start-	CAPRA-GIS is designed to work one at the time, since it shares processing files and libraries,	It is not possible to start the application twice on the same system, a possible solution is to create a copy of the installation directly and thus start two CAPRA-GIS applications.
An error occurs when trying to load a file to a project	Loading errors may be generated by input files for the project being edited.	Due to the complexity that the input files may have, there may occur loading errors. It is recommended that you check again the integrity of the file and retry.
The system does not start.	When double clicking on the application, the system does not start or generates errors.	It is possible that due to an inconsistency of the operating system loading errors occur. If your operating system is Windows Vista see Execution problems for Windows Vista™

CAPRA-GIS Programming/Update

The **CAPRA-GIS** code is designed and implemented under the Microsoft® NET platform. The code is written in VB.NET 2005. It is built around a graphic engine **SAIG**, which performs all data visualization tasks, and graphic interaction with the user. The **SAIG** code is implemented in a Windows® Forms project called **CAPRAGIS.vbproj**, responsible for making command interaction with the user, store projects, load files and configure runs.

SAIG is a class designed to view and interact with common geographical objects. It has basic geometrical objects such as dots, lines, polylines, circles and polygons. Each graphical entity may have a associated a data base field for determining its graphical features such as location with respect the center, background color, border color or amplification scale. It also has a complete interface of interaction with the user which allows to change its visualization areas and control its configuration. **SAIG** is designed to import directly and to manipulate ESRI ShapeFiles type object and ERN Hazards grids.

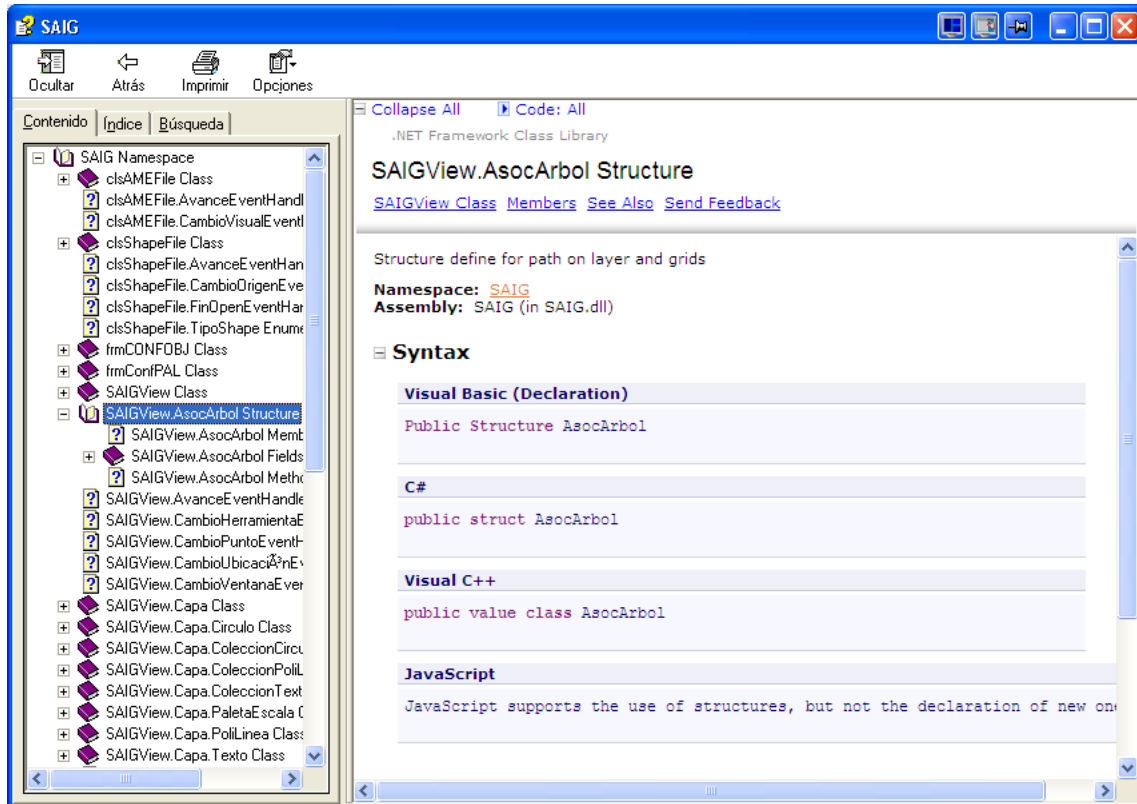


Figure 62 Typical window of graphic engine objects and main program

CAPRA's main code is open source and may be modified and upgraded by anyone. There is documentation the "CAPRA-GIS.chm" file, which has a complete description of the program objects and use example. The "SAIG.chm" file includes the description of the object structure for the SAIG graphic motor (see [Figure 62](#)).