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101193586 - EMERGE - UCPM-2024-KAPP-PV

Comprehensive Multi-Risk Assessment Platform for Needs Prioritization and Planning

EMERGE WBP Instruction Manual

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Planning Platform**

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EMERGE WBP Instruction Manual

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September 30, 2026

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1 Platform overview

To access the EMERGE platform, the user shall complete the form in Figure 1.1 with username and password and click on the “Login” button. Once entered, the platform displays the main page of the web tool (see Figure 1.2), consisting of a series of buttons surrounding a map centred on the area of the project interest, i.e. the cross-border region of North Macedonia, Albania, and Greece. The latter is also divided into municipalities and colour coded:

- purple for Albania;
- yellow for North Macedonia;
- blue for Greece.



Figure 1.1: Login page.

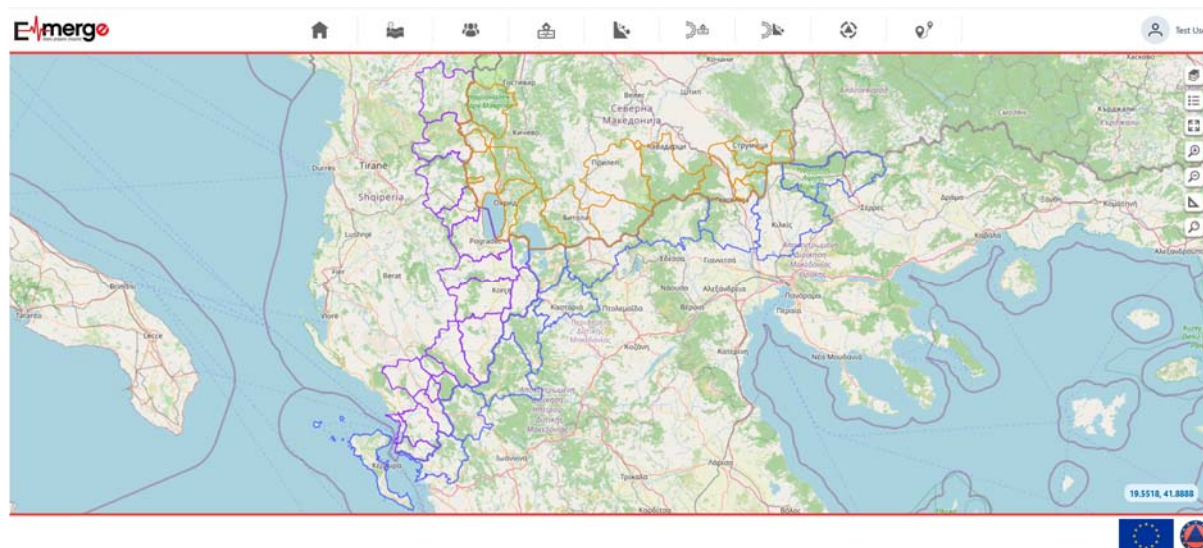


Figure 1.2: Homepage.

The map is fully zoomable and pannable using either the mouse or the tools available in the right-hand toolbar. The toolbar includes several buttons, the functions of which are described in Table 1.1. Each button is active when highlighted in red and inactive when it returns to white.

Additional buttons are available at the top of the map. They allow the user to open tabs where he can: (i) enable or disable layers associated with exposure and hazard data, (ii) calculate and visualize earthquake and landslide damage scenarios, (iii) assess post-disaster needs following a specific event scenario, and (iv) calculate alternative routes for rescuers while avoiding infrastructures (in this case, bridges) damaged by an event. The functionality of each tab is described in detail in the following sections. Lastly, the user can access the user menu by clicking on the user icon at the top right of the web-tool. This menu consists of two items: “Settings”, which allows numeric labels over geometries to be shown or hidden and their size to be adjusted, and “Logout”, which exits the platform and redirects the user to the login screen.

Table 1.1: Toolbar features.

Icon	Name	Function
	Layer Tree	It opens the Layers window, which displays the currently active layers and allows the user to deactivate, reactivate, or permanently remove them. From this panel, the user can also download the selected layers (except for the “Routing” layers) in CSV or Shapefile (GeoJSON) format, packaged in a .zip file.
	Legend	It opens the panel displaying the legend of the active layers.
	Zoom extent	It allows the user to return to the default zoom level.
	Zoom in	It allows the user to zoom in on the map.
	Zoom out	It allows the user to zoom out on the map.
	Measure distance	It allows the user to draw a route by clicking on two or more points on the map. Once the route has been defined, a double-click opens a pop-up window displaying the route length in kilometres.
	Search	It opens the Search window, which provides two search options: by municipality or by coordinates. Coordinates must be entered using the WGS84 (EPSG:4326) reference system.

2 The platform functions

All platform functions are accessible through tab icons located at the top of the page, a brief description of which is provided in Table 2.1.

In the following paragraphs, instead, we define the functionality of each tab in Table 2.1, except for the **Home** tab.

Table 2.1: Tab icons.

Icon	Name	Function
	Home	It opens a side panel containing an overview of the platform, a button to download the web tool user manual, a list of the acronyms used throughout the platform, and the logos of the consortium partners with links to their official websites.
	Base layers	It includes background and reference layers that do not fall within the scope of the other sections. From this panel, users can also upload one or more custom base layers in CSV or shapefile (GeoJSON) format.
	Exposure layers	It allows the user to enable or disable the exposure database layers for residential, commercial, and industrial buildings, as well as hospitals, schools, and bridges within the project area, and the social vulnerability layer. It also allows the user to upload custom exposure data by completing a predefined template for each asset type.
	Seismic hazard	It allows the user to enable or disable the layers associated with seismic hazard maps and shakemaps expressed in terms of Peak Ground Acceleration (PGA).
	Landslide hazard	It allows the user to enable or disable the layers associated with landslide hazard maps and shakemaps expressed in terms of Peak Ground Displacement (PGD).
	Earthquake scenario	It allows the user to generate real-time damage scenarios by providing either event parameters or PGA shakemaps as input, and to visualize the results of pre-calculated damage scenarios for eleven historical events that affected the project's cross-border region.
	Landslide scenario	It allows the user to enable or disable the landslide risk map layers and to generate real-time damage scenarios using PGD shakemaps as input.

	Post-disaster needs	It allows the user to enable or disable layers showing casualties, injured people, and resources (e.g., shelters, search and rescue teams, etc.), including available resources and resource gaps, associated with a specific event represented by a previously calculated scenario.
	Routing	It allows the user to define alternative emergency routes that avoid infrastructures (in this case, bridges) that may become unusable due to damage caused by a seismic event.

2.1 Base Layers

Once the user clicks the corresponding icon (see Table 2.1), the **Base Layers** panel opens on the left side of the web tool. The panel is divided into two sections: *Base Layers* and *Upload custom base layer* (see Figure 2.1).

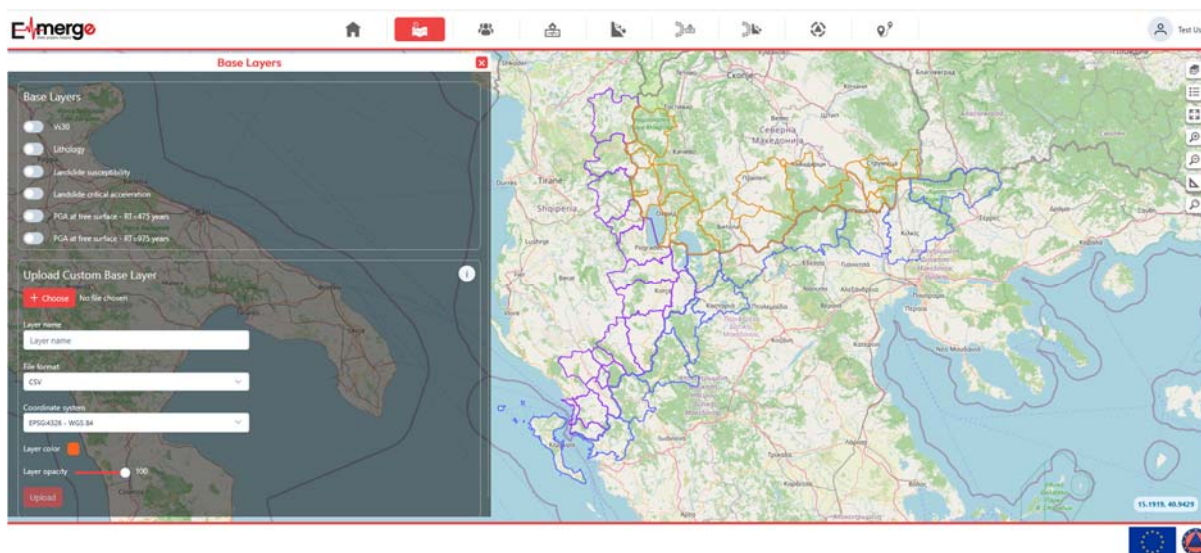


Figure 2.1: **Base Layers** panel and its constituent sections.

The *Base Layers* section is dedicated to layers derived from the CRISIS platform that, due to their characteristics, cannot be included in the other tabs of the EMERGE platform, but are nevertheless related to the calculation of the data displayed in the **Hazard** tabs (see §2.3 and §2.4). With the exception of the Vs30 layer, derived from USGS (earthquake.usgs.gov/data/vs30/), all other layers refer to landslide hazard and are the following:

- Lithology;
- Landslide susceptibility;
- Landslide critical acceleration;
- PGA at free surface – RT = 475 years;
- PGA at free surface – RT = 975 years.

The lithology and landslide susceptibility maps for the cross-border region of Greece, North Macedonia, and Albania are based on the *Pan-European Landslide Susceptibility Map*, version 2 (ELSUS v2) (Wilde et al., 2018).

The landslide critical acceleration values are also based on ELSUS v2 (Wilde et al., 2018) and are derived through engineering judgement. The suggested critical acceleration values are consistent with those proposed in the HAZUS methodology for landslide hazard evaluation (NIBS, 2004; Pitilakis et al., 2009).

The PGA surface maps for return periods (RT) of 475 years and 975 years are derived from the European Seismic Hazard Model (ESHM2020; Danciu et al., 2021), considering the soil factor based on the Vs30 map. Figure 2.2 shows the activation of the Vs30 layer together with its legend.

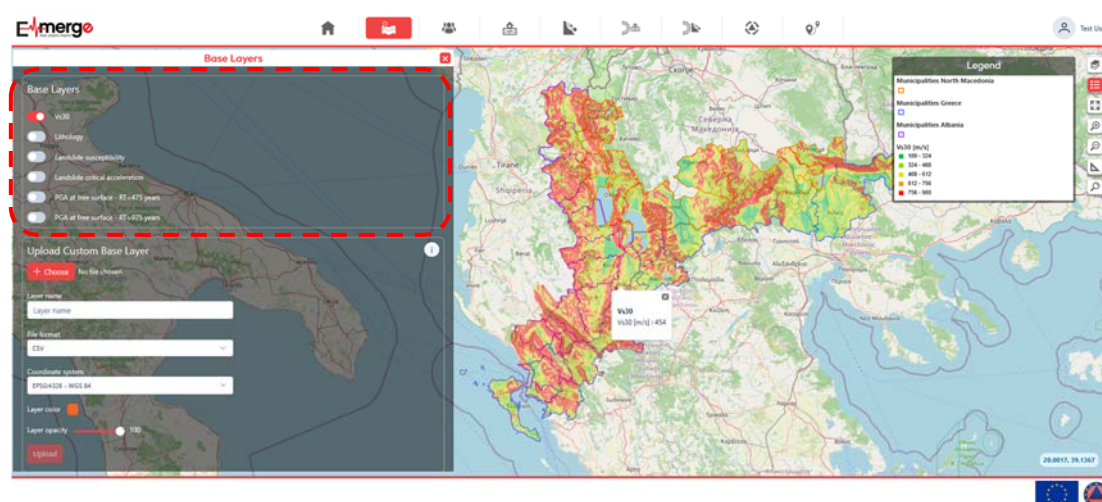


Figure 2.2: Activation of the Vs30 layer (USGS), with the corresponding legend and Vs30 value displayed for the selected location.

The *Upload custom base layer* section allows the user to upload his own custom layer to the platform (e.g., available national civil protection resources, social vulnerability, etc.). By clicking the “i” icon, located in the upper-right corner of the section, the user can access detailed information and instructions on how to correctly upload a custom layer (see Figure 2.3). To upload a layer, the user has to select the desired file using the “Choose” button and provide the required information, including the layer name, format (either CSV or GeoJSON), coordinate reference system, colour, and opacity with which the layer will be displayed on the platform.

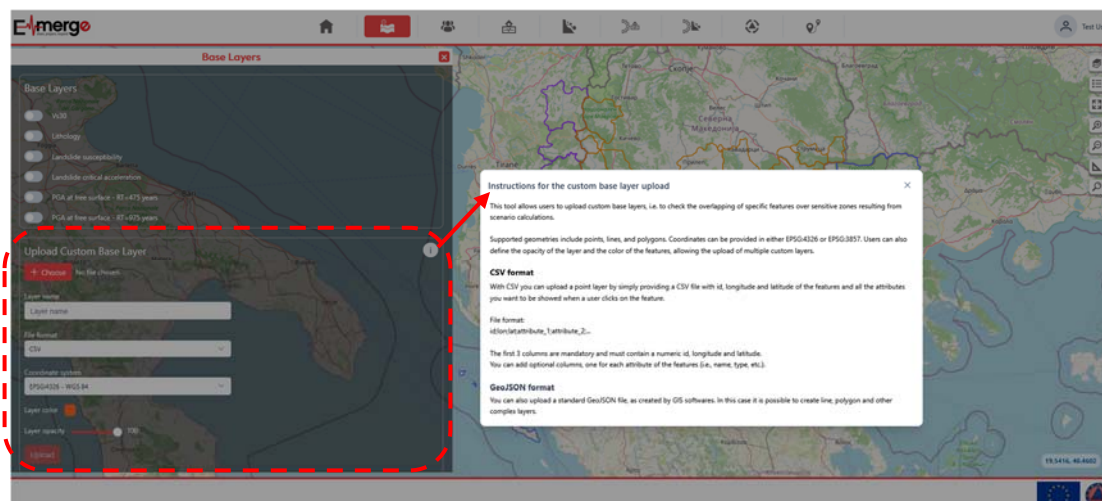


Figure 2.3: Panel opened by clicking the "i" button in the *Upload Custom Base Layer* section, providing detailed information and instructions on how to correctly upload a custom layer.

All layers activated in this panel are also listed in the **Layers** window, which can be opened by clicking the "Layer Tree" button (see Table 1.1) in the toolbar on the right side of the map (see Figure 2.4). From the **Layers** window, the user can download activated layers, temporarily hide them by deselecting them, or permanently remove them by clicking the "x" button next to the corresponding layer. Deleting a layer from the **Layers** window automatically deactivates the corresponding layer in the **Base Layers** panel.

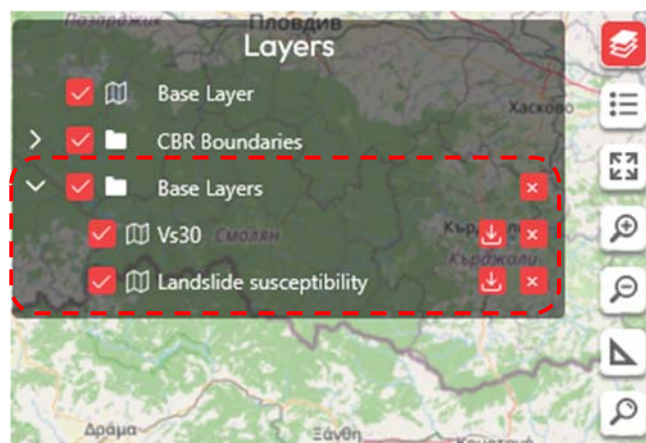


Figure 2.4: List of activated base layers in the **Layers** window.

2.2 Exposure

Once the user clicks the corresponding icon (see Table 2.1), the **Exposure** panel opens on the left side of the web tool. The panel is divided into two sections: *Exposure Layers* and *Upload Custom Exposure* (see Figure 2.5). The layers available for visualization on the map are provided within the *Exposure Layers* section of the panel, which includes both the exposure database layers and the social vulnerability scenario layers. The exposure database layers include residential, commercial, and industrial buildings, as well as hospitals, schools, and bridges across the cross-border region of Greece, North

Macedonia, and Albania. The exposure data are available at different levels of spatial detail: information related to residential, commercial, and industrial buildings is aggregated at the municipal level, whereas data concerning hospitals, schools, and bridges are provided for each individual asset. The user can activate or deactivate one or more exposure layers simultaneously, allowing the corresponding assets to be displayed or hidden on the map. By clicking on any displayed feature, the corresponding information stored in the exposure database is displayed directly on the map interface, as illustrated in Figure 2.6

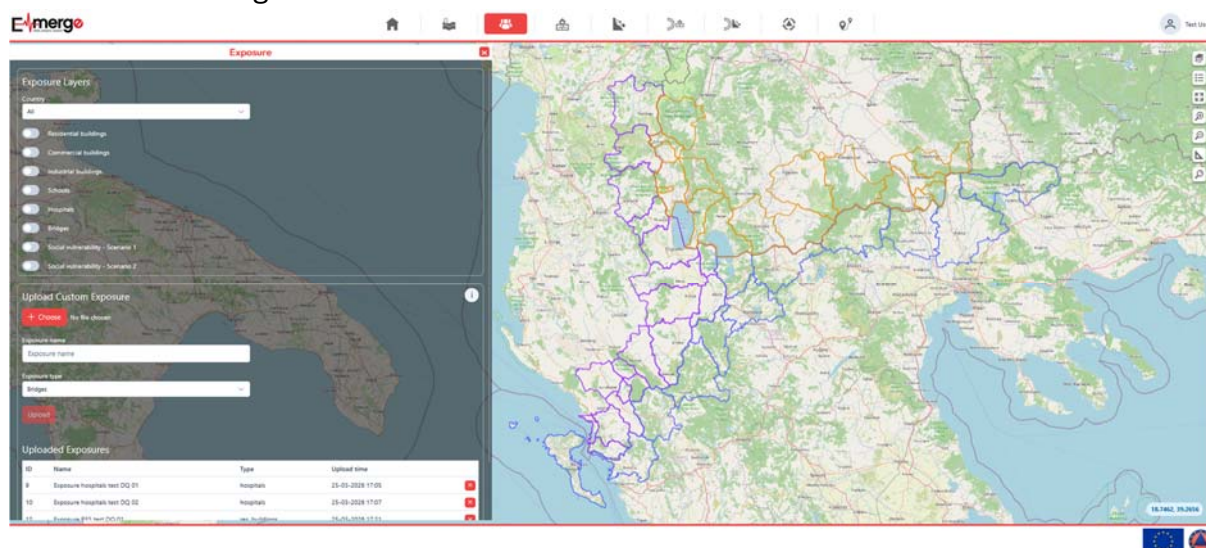


Figure 2.5: **Exposure** panel and its constituent sections.

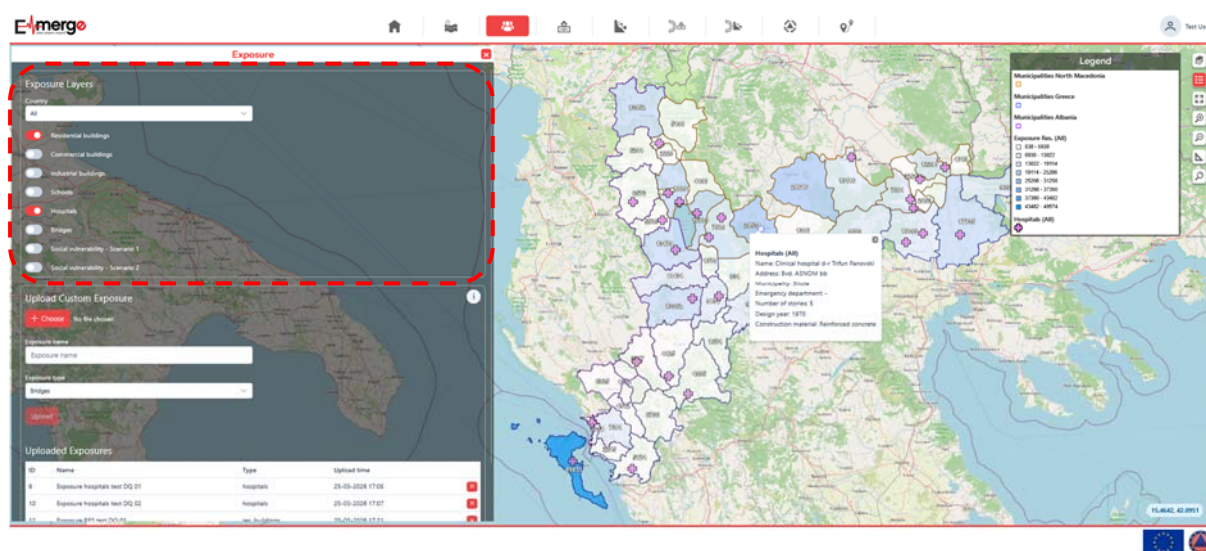


Figure 2.6: Selection of exposure database layers (i.e., residential buildings and hospitals), visualization of the corresponding database information for a selected hospital, and display of the legend associated with the selected layers.

Following the exposure database layers, the *Exposure Layers* section includes the available social vulnerability scenario layers. The social vulnerability assessment was performed using the Social Vulnerability Index (SoVI) framework proposed by Cutter et al. (2003), which quantifies the susceptibility of a population to the adverse impacts of

natural hazards based on a set of socio-economic and demographic indicators. A total of 35 indicators were selected according to the local social context and the availability of census data and grouped into seven thematic dimensions: Population, Education, Economy, Health, Infrastructure, Habitat, and Governance & Institutional Capacity. The results are provided under two weighting scenarios:

- **Scenario 1** represents the spatial distribution of the SoVI across the cross-border municipalities using a harmonized weighting scheme for the importance of the indicators within each thematic group, combined with country-specific weights for data quality.
- **Scenario 2** represents the spatial distribution of the SoVI across the cross-border municipalities based on country-specific weighting schemes applied to both the importance of the indicators within each thematic group and the data quality category.

Figure 2.7 shows the activation of the Social Vulnerability – Scenario 1 layer for the entire project area and the corresponding legend. By clicking on a municipality, the corresponding SoVI value for the selected scenario is displayed on the screen.

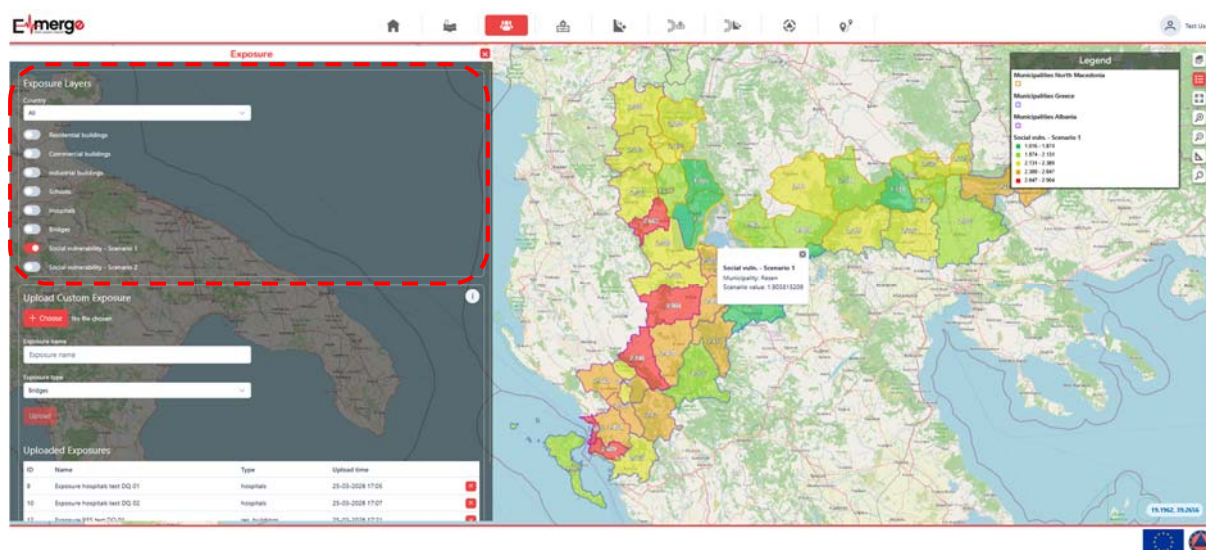


Figure 2.7: Selection of the Social Vulnerability Scenario 1 layer and visualization of its corresponding legend and the SoVI value for the selected municipality.

The platform also enables users to upload custom exposure datasets through the *Upload Custom Exposure* section located after the *Exposure Layers* section. To do so, the user should first complete a predefined CSV template. A dedicated template is available for each asset type and can be downloaded from the window opened by clicking the "i" button located on the right side of the *Upload Custom Exposure* section and then selecting the desired asset category (see Figure 2.8). The same window also provides a detailed description of all the fields included in each template. Once the template has been completed, the user can upload the dataset by clicking the "Choose" button to select the CSV file, entering a name in the "Exposure Name" field, selecting the appropriate asset category from the "Exposure Type" drop-down menu, and clicking

“Upload”. After the upload is completed, the file is validated for the correctness of the entered data and the dataset is added as a new entry in the “Uploaded Exposure” table (see Figure 2.9). Selecting a row in the table and clicking the “Show exposure layer” button, which appears below the table after selecting the exposure to be displayed, shows the corresponding exposure layer on the map. Clicking the “x” icon at the end of a row permanently removes the uploaded dataset from the platform.

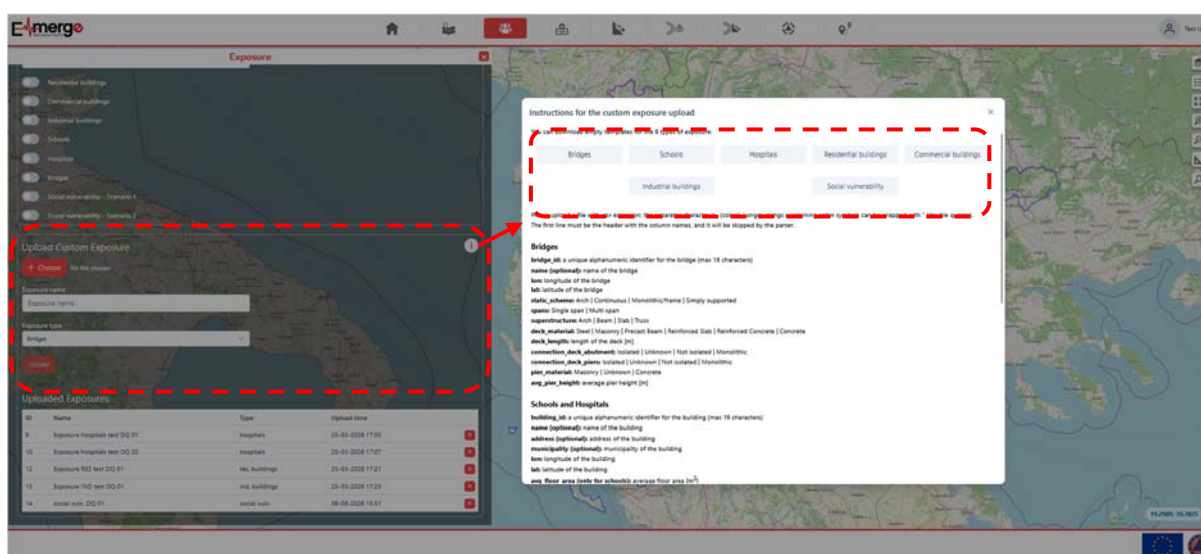


Figure 2.8: Panel opened via the “i” button in the *Upload Custom Exposure* section, providing downloadable templates for custom exposure datasets and descriptions of their required fields.

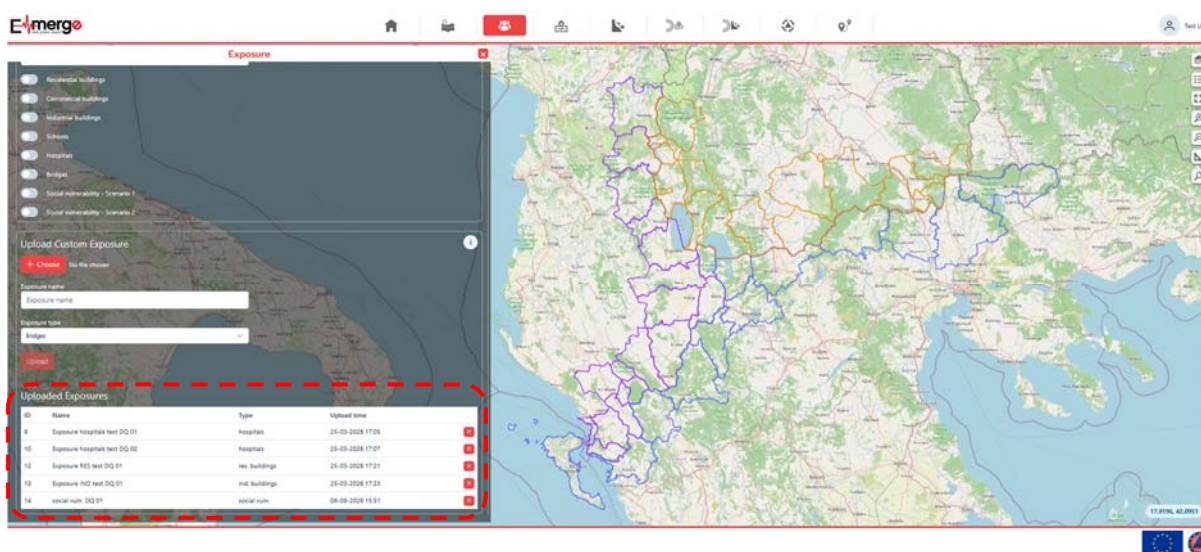


Figure 2.9: “Upload Exposure” table.

All layers activated in the **Exposure** panel are also listed in the **Layers** window, which can be opened by clicking the “Layer Tree” button (see Table 1.1) in the toolbar on the right side of the map (see Figure 2.10). From the **Layers** window, the user can download activated layers, temporarily hide them by deselecting them, or permanently remove them by clicking the “x” button next to the corresponding layer. Deleting a layer from the **Layers** window automatically deactivates the corresponding layer in the **Exposure** panel.

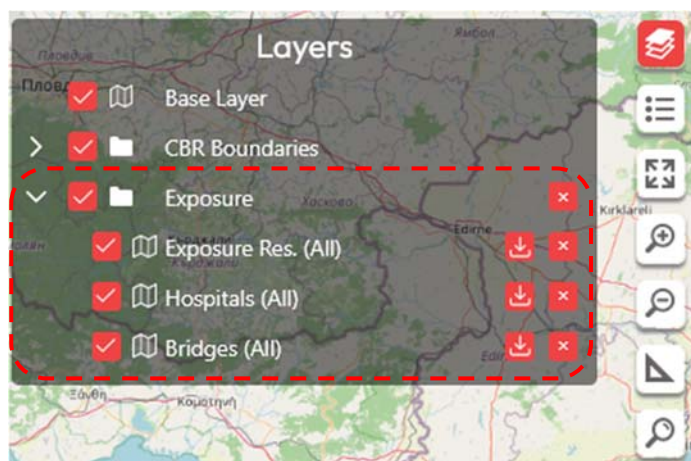


Figure 2.10: List of activated exposure layers in the **Layers** window.

2.3 Seismic Hazard

After clicking the corresponding icon (see Table 2.1), the **Seismic Hazard** panel opens on the left side of the web tool. The panel consists of two sections: *Hazard Layers* and *ShakeMap Service* (see Figure 2.11).

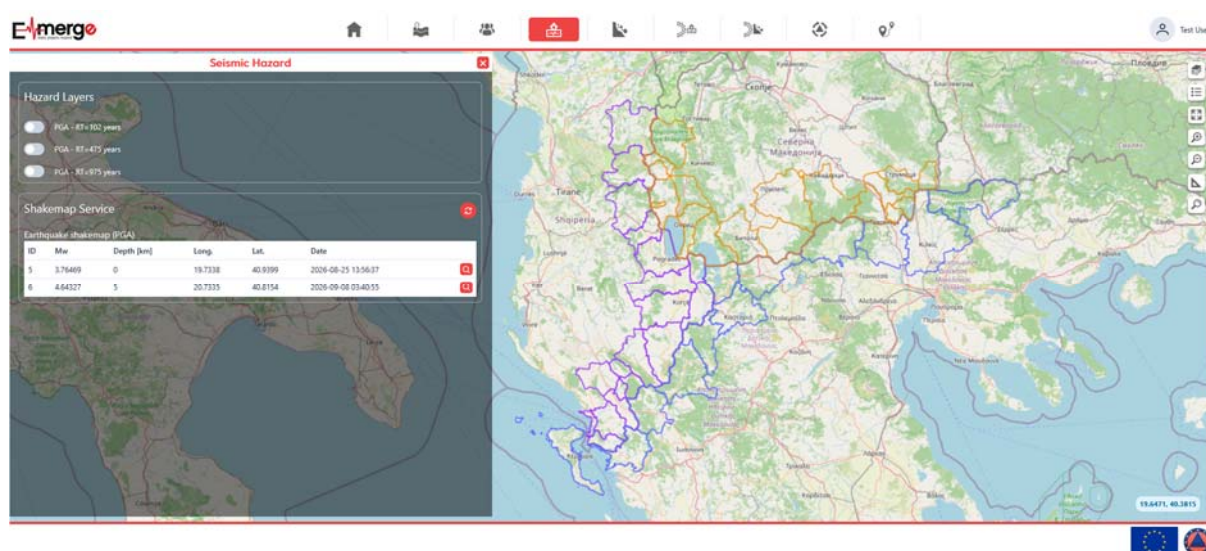


Figure 2.11: **Seismic Hazard** panel and its constituent sections.

The *Hazard Layers* section provides access to the following seismic hazard maps derived from the ESHM2020 (Danciu et al., 2021):

- PGA – RT = 102 years;
- PGA – RT = 475 years;
- PGA – RT = 975 years.

As an example, Figure 2.12 shows the seismic hazard map corresponding to a RT of 475 years, together with its associated legend. Once a hazard layer has been activated, the user can click anywhere on the map to display the PGA value associated with the selected location, as illustrated in Figure 2.12.

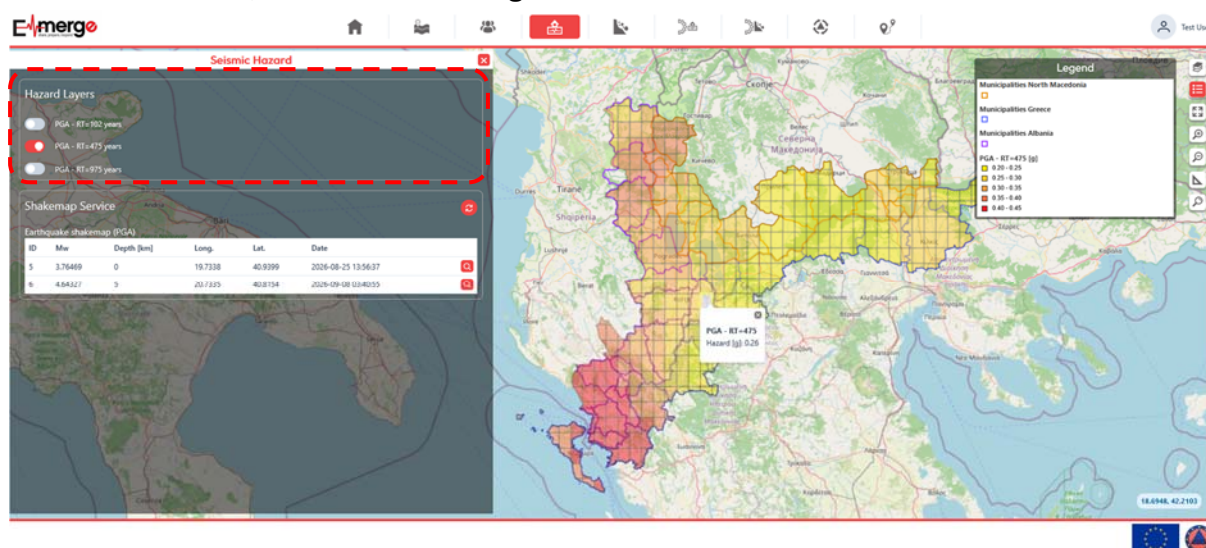


Figure 2.12: Seismic hazard map for a RT of 475 years, showing the corresponding legend and the PGA value at the selected location.

The *ShakeMap Service* section allows the user to visualize shakemaps generated for earthquakes occurring within the CBR. These shakemaps are produced using data collected from the strong-motion networks operating in the CBR and are subsequently used as input for the Near Real-Time (NRT) scenario assessment.

Available shakemaps are listed in the “Earthquake ShakeMap (PGA)” table. Each row corresponds to a single shakemap and reports the following information: shakemap ID; event magnitude; epicentre coordinates (longitude, latitude, and depth); event date, and time.

The shakemap ID is used to retrieve the corresponding shakemap during the NRT scenario computation. By selecting a row in the table, the corresponding shakemap is displayed on the map (see Figure 2.13). As for the seismic hazard maps, clicking anywhere on the displayed shakemap opens a pop-up window showing the PGA value at the selected location.

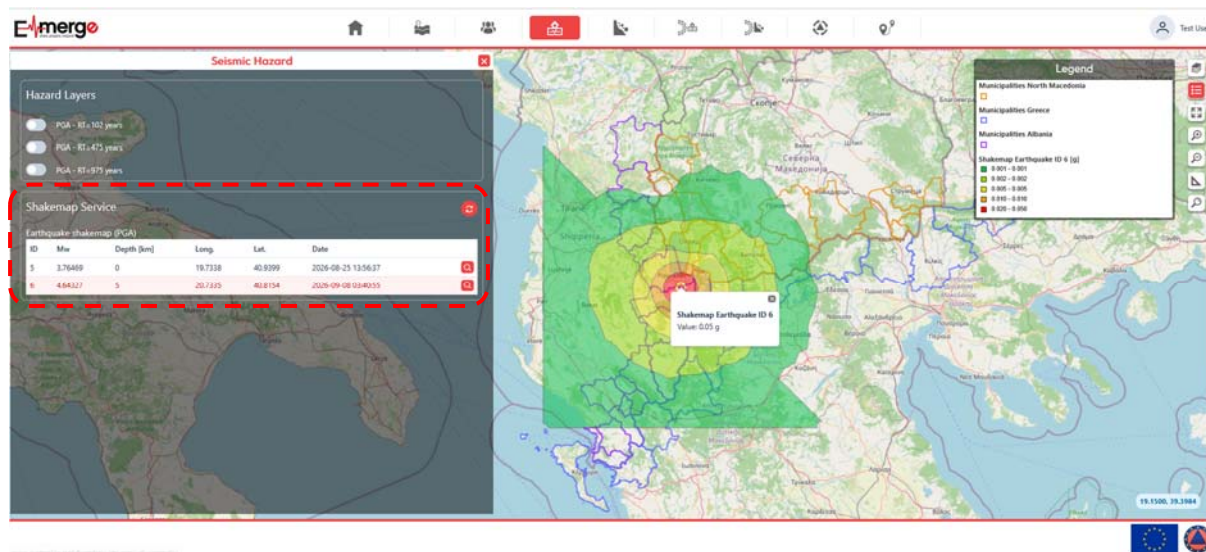


Figure 2.13: Shakemap showing the PGA value at the selected location and the corresponding legend.

All layers activated in the **Seismic Hazard** panel are also listed in the **Layers** window, which can be opened by clicking the “Layer Tree” button (see Table 1.1) in the toolbar on the right side of the map (see Figure 2.14). From the **Layers** window, the user can download activated layers, temporarily hide them by deselecting them, or permanently remove them by clicking the “x” button next to the corresponding layer. Deleting a layer from the **Layers** window automatically deactivates the corresponding layer in the **Seismic Hazard** panel.

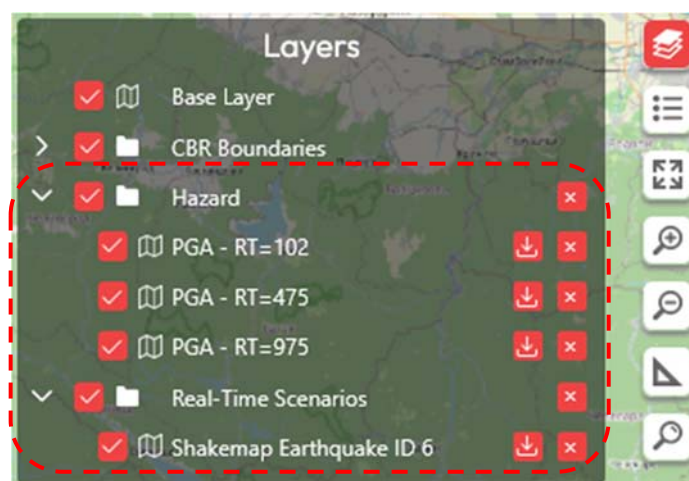


Figure 2.14: List of activated seismic hazard layers in the **Layers** window.

2.4 Landslide Hazard

After clicking on the corresponding icon (see Table 2.1), the **Landslide Hazard** panel opens on the left side of the web tool. The panel consists of two sections: *Hazard Layers* and *ShakeMap Service* (Figure 2.15).

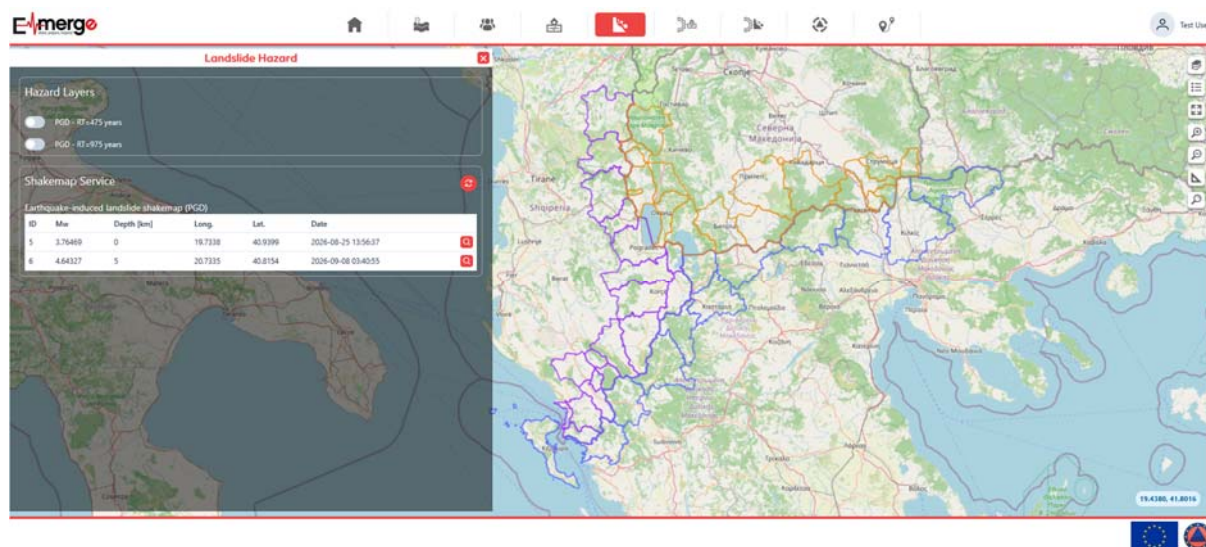


Figure 2.15: **Landslide Hazard** panel and its constituent sections.

The *Hazard Layers* section provides access to the following hazard map layers for the cross-border region (Figure 2.16):

- PGD - RT=475 years;
- PGD - RT=975 years.

The PGD maps for RT=475 years and RT=975 years are derived from an analytical relationship proposed by Fotopoulou & Pitilakis (2015):

$$\ln(\text{PGD}) = -2.965 + 20217 \times \ln(\text{PGA}) - 6.583 \times k_y + 0.535 \times M \pm \varepsilon \times 0.72$$

where:

- PGA is the peak ground acceleration at the ground surface in g, available for both periods in the tab **Base Layers** (see §2.1);
- k_y is the yield or critical acceleration ratio/g;
- M is the earthquake magnitude, i.e.: M=6 (RT=475 years) and M=7 (RT=975 years);
- ε is the standard normal variant with zero mean and unit standard deviation.

Once one layer is activated, the user can click on the map and get information about the surrounding of the clicked point, as reported in Figure 2.16.

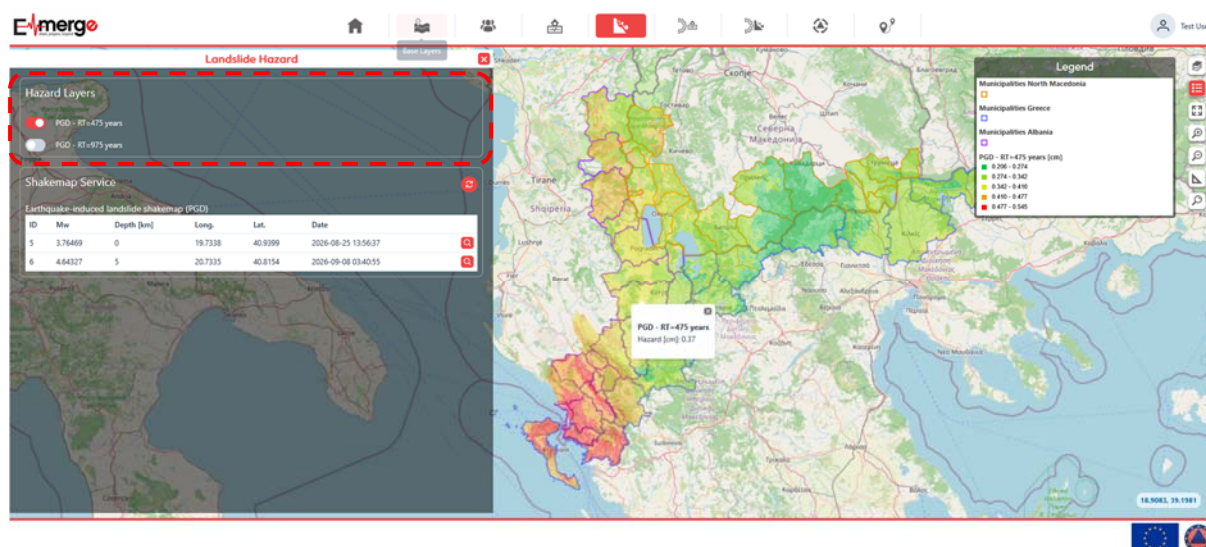


Figure 2.16: Landslide hazard map for a RT of 475 years, showing the corresponding legend and the PGD value at the selected location.

The *ShakeMap Service* section allows the user to visualize earthquake-induced landslide shakemaps in PGD generated from the one in PGA (see §2.3) related to earthquakes occurring within the CBR.

Available shakemaps are listed in the “Earthquake-induced landslide shakeMap (PGD)” table. Each row corresponds to a single shakemap and reports the following information: shakemap ID; event magnitude; epicentre coordinates (longitude, latitude, and depth); event date, and time.

The shakemap ID is used to retrieve the corresponding shakemap during the NRT scenario computation. By selecting a row in the table, the corresponding shakemap is displayed on the map (see Figure 2.17). As for the hazard maps in PGD, clicking anywhere on the displayed shakemap opens a pop-up window showing the PGD value at the selected location.

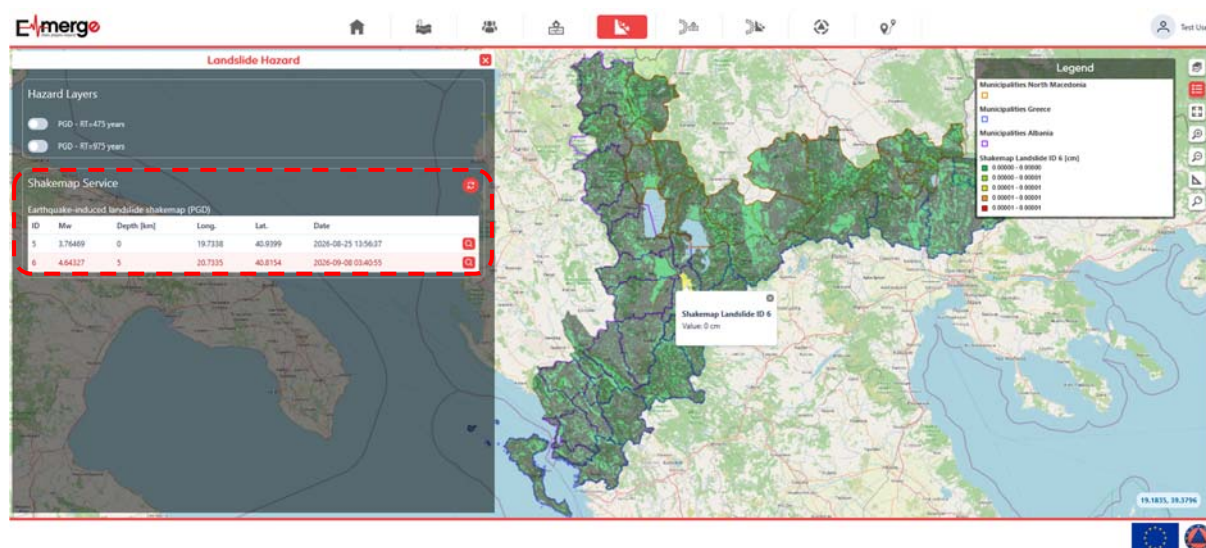


Figure 2.17: Shakemap showing the PGD value at the selected location and the corresponding legend.

All layers activated in the **Landslide Hazard** panel are also listed in the **Layers** window, which can be opened by clicking the “Layer Tree” button (see Table 1.1) in the toolbar on the right side of the map (see Figure 2.18). From the **Layers** window, the user can download activated layers, temporarily hide them by deselecting them, or permanently remove them by clicking the “x” button next to the corresponding layer. Deleting a layer from the **Layers** window automatically deactivates the corresponding layer in the **Landslide Hazard** panel.

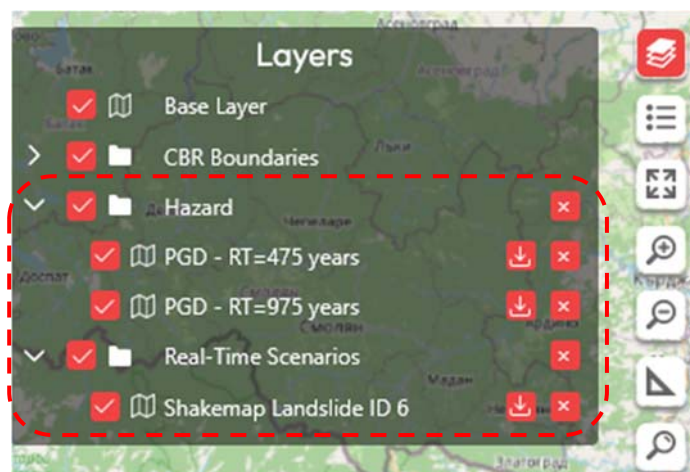


Figure 2.18: List of activated seismic hazard layers in the **Layers** window.

2.5 Earthquake Scenario

After clicking on the corresponding icon (see Table 2.1), the **Earthquake Scenario** panel opens on the left-hand side of the web tool. The panel is divided into two sections: *Real-time Scenarios* and *Historical Scenarios* (see Figure 2.19).

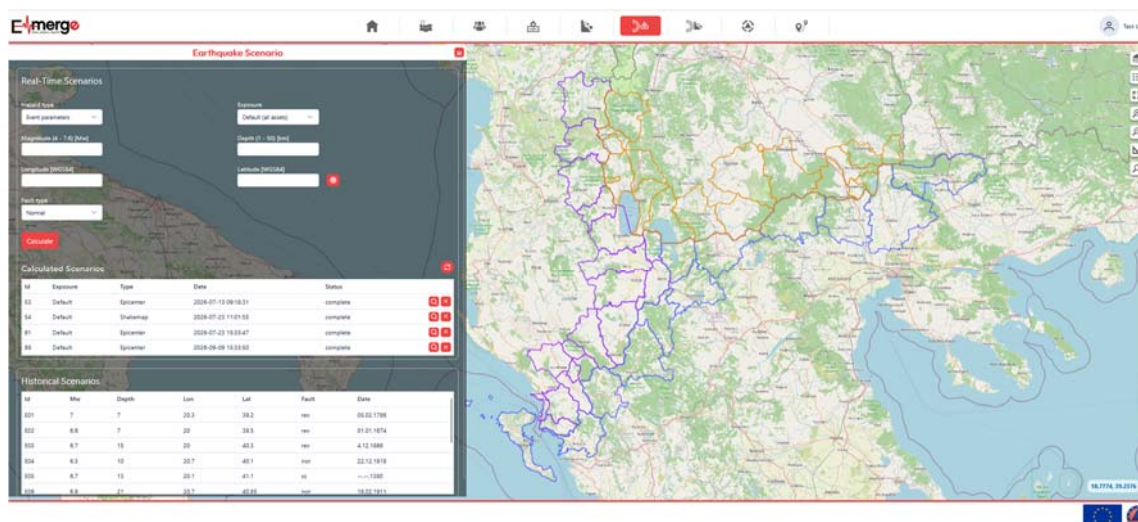


Figure 2.19: **Earthquake Scenario** panel and its constituent sections.

In the *Real-Time Scenarios* section, the user can perform a real-time damage scenario either by entering the parameters of the seismic event or by using one of the PGA

shakemaps available in the **Earthquake Hazard** tab in the *Shakemap Service* area. The desired option can be selected from the “Hazard Type” drop-down menu. Depending on this, the fields that the user has to complete vary.

If “Shakemap” is selected from the “Hazard Type” drop-down menu, the damage scenario is calculated after specifying the following fields (see Figure 2.20(a)):

- “Exposure”: The user can choose whether to calculate the damage scenario using the exposure dataset for all assets available by default on the platform or by selecting a previously uploaded exposure dataset from the corresponding drop-down menu.
- “Shakemap ID”: identifier of the shakemap to be used for the calculation.

If “Event parameters” is selected from the “Hazard Type” drop-down menu, the damage scenario is calculated after completing the following fields (Figure 2.20(b)):

- “Magnitude (4-7.6) [Mw]”: magnitude of the seismic event. The damage scenario calculation is available for events with $4 \leq Mw \leq 7.6$.
- “Exposure”: the user can choose whether to calculate the damage scenario using the exposure dataset available by default on the platform or by selecting, from the corresponding drop-down menu, an exposure dataset previously uploaded by the user.
- “Depth (1-50) [km]”: depth of the earthquake hypocentre. The damage scenario calculation is available for depths ranging from 1 km to 50 km ($1 \text{ km} \leq D \leq 50 \text{ km}$).
- “Longitude” and “Latitude” [WGS84]: the epicentre can be located by entering its geographical coordinates according to the WGS84 reference system. Alternatively, the epicentre can be positioned directly on the map by clicking the “Select epicentre coordinates on map” button next to the “Latitude” field. Once the epicentre has been positioned on the map, its longitude and latitude are automatically displayed in the corresponding fields.
- “Fault type”: the fault mechanism can be selected from the drop-down menu, with the following options available: “Normal”, “Reverse”, and “Lateral Strike-Slip”.

After completing the required fields, the user can click the “Calculate” button to launch the scenario calculation. At the same time, the newly launched scenario is added to the “Calculated scenarios” table, where the user can also monitor the calculation status. Once the calculation has been completed and the corresponding scenario has been selected, additional fields are displayed below the table (see Figure 2.20(c)), allowing the user to define the results to be visualized, i.e.:

- “Result type”: the user can select the asset category for which the damage scenario is to be displayed from the corresponding drop-down menu. The available categories are: “Residential buildings”, “Commercial buildings”, “Industrial buildings”, “Bridges”, “Schools”, and “Hospitals”.
- “Damage State”: The available damage states depend on the selected asset category. For buildings, five damage states are considered: “DS1” (Slight

Damage), “DS2” (Moderate Damage), “DS3” (Severe Damage), “DS4” (Very Severe Damage), and “DS5” (Collapse). For residential, commercial, and industrial buildings, the “Mean Damage” option is also available, together with the option to select the building material from the corresponding drop-down menu, as these categories are considered as aggregates at the municipal level. For bridges, two damage states are considered: “DS1” and “DS2”, representing the slight damage and the complete damage, respectively.

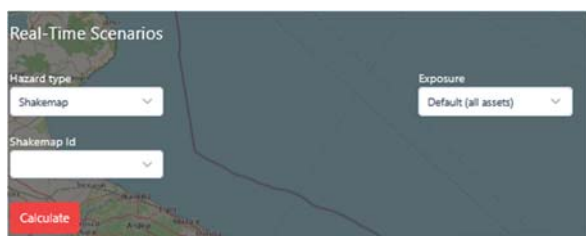
Each row in the “Calculated Scenarios” table can be deleted by clicking the “x” button, while the “Lens” button opens a window displaying a summary of all the parameters used to calculate the earthquake scenario (Figure 2.20(c)).

Figure 2.21 shows an example of a damage scenario calculation obtained by selecting “Event Parameters” under “Hazard Type”, with “Residential Buildings” and “Bridges” selected from the “Result Type” drop-down menu. For residential buildings, “Mean Damage” and “Total” were selected for “Damage State” and “Material”, respectively, while “DS1” was selected as the damage state for bridges. The figure also includes the corresponding legend, which identifies the symbology and values associated with the activated layers. If the user wishes to know the probability of reaching the activated damage layer for a specific element, he needs to simply click on it and a label with the required information will appear on the map, as shown in Figure 2.21. Furthermore, all activated layers displayed on the map are listed below the “Add Layer” button (see Figure 2.21), where they can be removed and deactivated from the map.

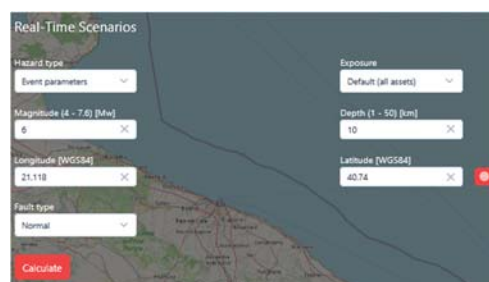
The real-time damage scenarios calculated using the input parameters are based on the Ground Motion Prediction Equation (GMPE) proposed by Akkar et al. (2014), with site amplification effects accounted for according to the V_s30 map proposed by the USGS (<https://earthquake.usgs.gov/data/vs30/>).

Furthermore, the real-time damage scenarios include only those elements in the exposure database for which the PGA value is greater than 1%g.

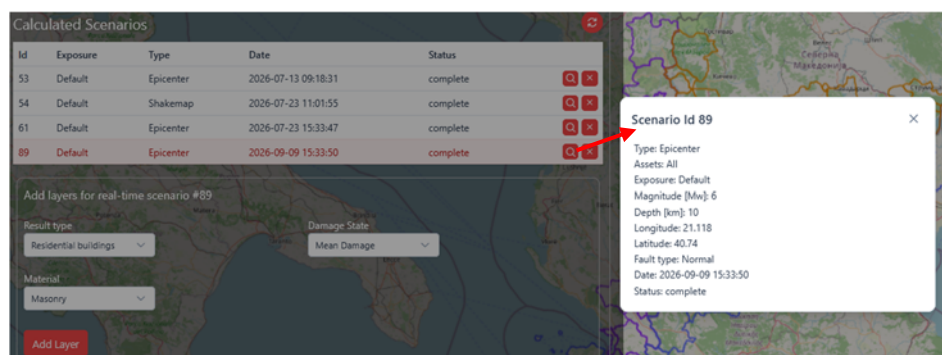
Regarding the map legend, the probability ranges associated with the different damage states are dynamically defined for each scenario. Specifically, the minimum and maximum values of each probability range are determined based on the minimum and maximum probabilities of reaching the corresponding damage state calculated for the selected scenario.



(a)



(b)



(c)

Figure 2.20: (a) Fields to be filled out when the “Shakemap” is selected from the “Hazard Type” drop down menu; (b) Fields to be filled out when the “Event parameters” is selected from the “Hazard Type” drop down menu; and (c) “Calculated Scenarios” table .

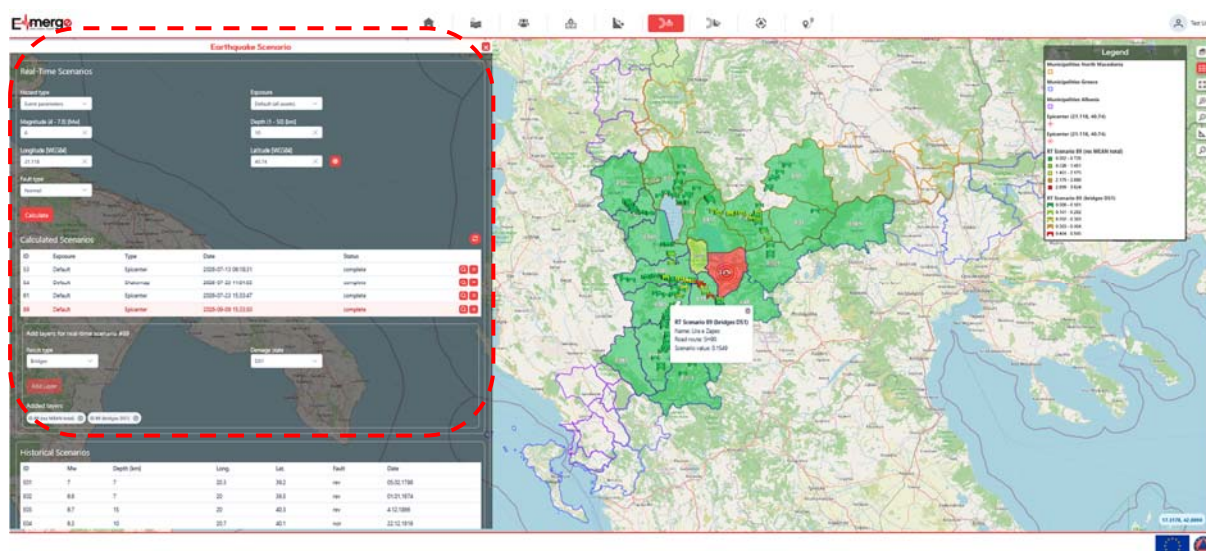


Figure 2.21: Real-time scenario for “Residential Buildings” and “Bridges” based on “Event Parameters”, including the layer legend and a pop-up displaying the probability of the selected bridge reaching the DS1 limit state.

The *Historical Scenario* section contains a table listing the eleven most significant historical events that affected the cross-border region, together with their main characteristics, including magnitude, epicentre depth and coordinates (longitude and latitude), fault type, and date.

As for the real-time scenarios calculated using input parameters, the damage scenarios associated with each historical event are calculated using the GMPE proposed by Akkar et al. (2014), with site amplification effects accounted for using the Vs30 map proposed by the USGS (<https://earthquake.usgs.gov/data/vs30/>). Furthermore, the real-time damage scenarios include only those elements in the exposure database for which the PGA value is greater than 1%g.

By selecting one of the events listed in the table, the corresponding epicentre is displayed on the map, while the “Result Type”, “Damage State”, and “Material” fields appear below the table (see Figure 2.22). As in the real-time scenario, the “Material” field

is available only for residential, commercial, and industrial buildings. For these building categories, which are considered as aggregates at the municipal level, the user can also select “Mean Damage” under “Damage State”. Once the required fields have been completed, the user can click the “Add Layer” button to display the corresponding calculated damage scenario on the map, as shown in Figure 2.22. The figure presents the results of the Historical Scenario E06 calculation, with “Residential Buildings” and “Schools” selected from the “Result Type” drop-down menu. For residential buildings, “Mean Damage” and “Total” were selected for “Damage State” and “Material”, respectively, while “DS3” was selected as the damage state for schools. The figure also includes the legend and a pop-up displaying the probability of the selected school reaching the DS3 limit state. As for the real-time scenario, all activated layers displayed on the map are listed below the “Add Layer” button (see Figure 2.22), allowing the user to remove and deactivate them from the map.

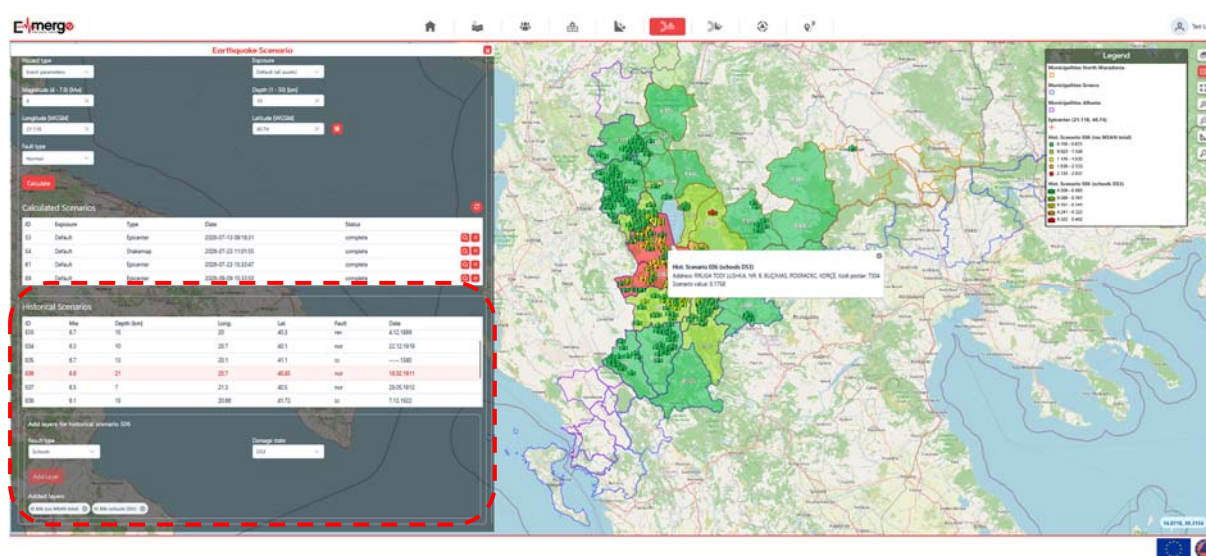


Figure 2.22: Historical scenario E06 for “Residential Buildings” and “Bridges”, including the layer legend and a pop-up displaying the probability of the selected school reaching the DS3 limit state.

All layers activated in the **Earthquake Scenario** panel are also listed in the **Layers** window, which can be opened by clicking the “Layer Tree” button (see Table 1.1) in the toolbar on the right side of the map (see Figure 2.18). From the **Layers** window, the user can download activated layers, temporarily hide them by deselecting them, or permanently remove them by clicking the “x” button next to the corresponding layer. Deleting a layer from the Layers window automatically deactivates the corresponding layer in the **Earthquake Scenario** panel.

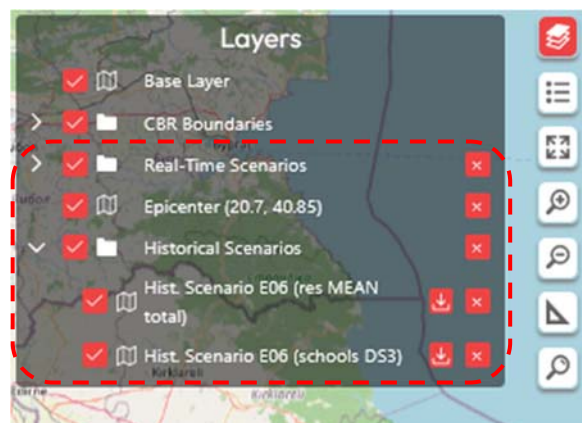


Figure 2.23: List of activated earthquake scenario layers in the **Layers** window.

2.6 Landslide scenario

After clicking on the corresponding icon (see Table 2.1), the **Landslide Scenario** panel opens on the left side of the web tool. The panel consists of two sections: *Return period Scenarios* and *Real-time Scenarios* (see Figure 2.24).

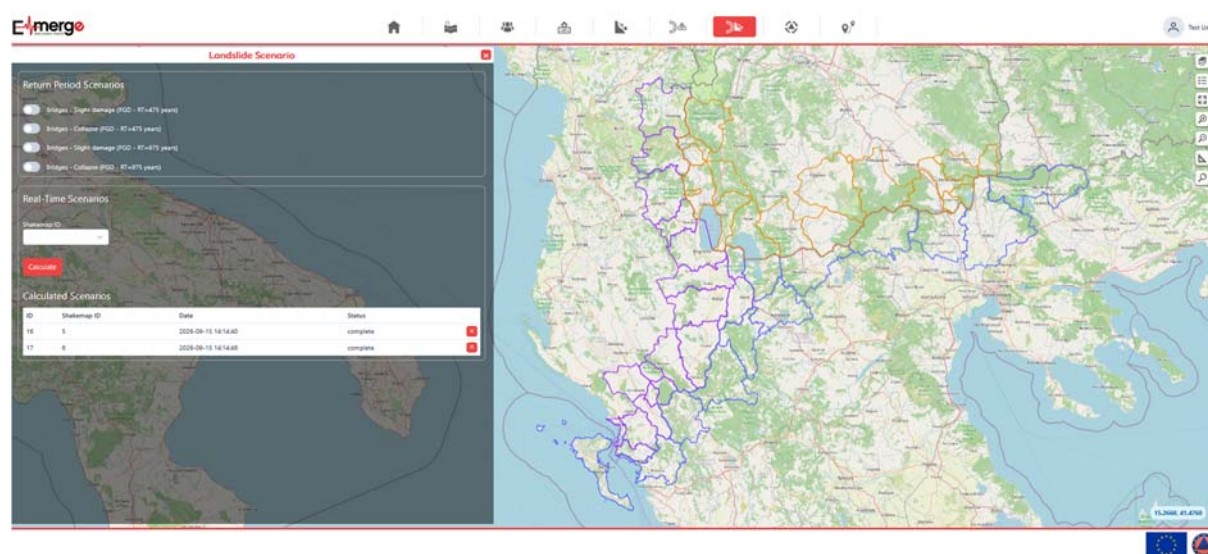


Figure 2.24: **Landslide Scenario** panel and its constituent sections.

The *Return period Scenarios* section provides access to the following landslide risk map layers for the cross-border region:

- Bridges – Slight damage (PGD – RT = 475 years);
- Bridges – Collapse (PGD – RT = 475 years);
- Bridges – Slight damage (PGD – RT = 975 years);
- Bridges – Collapse (PGD – RT = 975 years).

The landslide risk for bridges has been defined using the fragility curves due to ground failure proposed by HAZUS (NIBS, 2004) and considering seismic events triggering landslides with RT=475 years and RT=975 years, respectively. The landslide risk has not been calculated for all the bridges in the exposure database but for a part of them,

selected based on their position and importance in terms of cross-border connection (see Table 2.2). In addition, the legend associated with each of the landslide risk scenario maps for bridges is defined based on the minimum and maximum values of the probability of reaching a given damage level resulting from the calculation. Figure 2.25 shows the landslide risk scenario for bridges, considering collapse as the damage level and a seismic event triggering the landslide with a $RT=475$ years. Figure 2.25 also reports the legend associated with the scenario and the probability of reaching the considered damage state for a selected bridge.

Table 2.2: Selected bridges for the landslide risk scenario.

	Name	Bridge_id	middle_point _coord_lat	middle_point_c oord_lon	hazus_cl	Total len	Total Width	No. of spans
Greece	Telonio Kakavia -1	M1	39.910496	20.365309	HWB3	15	9	1
	Gefira Agion - Potamos Gormos	M3	39.896614	20.543840	HWB19	150	9	5
	Sarantaporos - Spiliotopoulou	M4	40.187189	20.800897	HWB2	210	9	6
	Aetomilitsa	M5	40.236049	20.872800	HWB19	100	7	3
	Telonio Evzoni -1	M6	41.101861	22.566405	HWB3	10	7	1
	Krystalopigi-1	M9	40.5933019	21.0656523	HWB3	12	8	1
Albania	Ura Kardhiqit	56	40.1499165	20.09437648	HWB7	265.2	13.5	5
	Ura e Librazhdit	152	41.1805822	20.31138717	HWB7	177	12.4	5
	Ura ne km96.160(Quksi Nr.2)	1088	41.0866608	20.4511677	HWB7	110	12.5	5
	Ura e re Gajdarit	1122	39.8798866	20.03356079	HBW14	105	11.9	3
	Ura e Bushtrices	1086	41.0992568	20.44275731	HWB7	104.4	12.5	5
	Ura Kseriaja	1100	39.9069196	20.34127546	HWB7	90	9	5
	Ura Murashi Nr.2	1075	41.1820179	20.2736929	HWB7	83.2	9.9	4
	Ura Hotolisht(paralel me h/udhen)	1079	41.1361514	20.39424415	HWB7	82.1	9.5	7
	Ura e re e Bogazit	1121	39.7170602	20.12438563	HWB7	81.9	12.5	
	Ura e Trenit	1107	40.655051	20.95470935	HWB7	80	11.5	3
	Ura e Petranit	860	40.2080571	20.41515408	HWB6	76	4.5	4
	Ura e Libonikut 2	1109	40.7106919	20.71241959	HWB7	75	13.5	3
	Ura e Cerenecit	255	41.520873	20.4179533	HWB6	71.4	6	4
	Ure mbikalim Bulqize	253	41.4992077	20.21479712	HBW11	24.5	13	2
N. Macedonia	Struga	40776392	41.1835	20.6783	HWB3	30	10.6	1
	Bitola -Medjtlja	188469300	40.9699	21.3958	HWB3	7.1	8.2	1
	Ohrid	194459404	41.1306	20.818	HWB9	24.3	8.2	2
	Bitola	225073520	41.07	21.1428	HWB10	81.1	13.6	4
	Gevgelija - Bogorodica -1	334632006	41.1486	22.5238	HWB2	235.8	13.6	10
	Gevgelija - Bogorodica -2	433067008	41.3465	22.3733	HWB2	504.9	13.6	12
	Mavrovo i Rostusha	900000044	41.72013	20.82931	HWB22	107.8	9.65	5
	Debar- Blato	900000202	41.52202	20.56653	HWB9	70	8.2	2

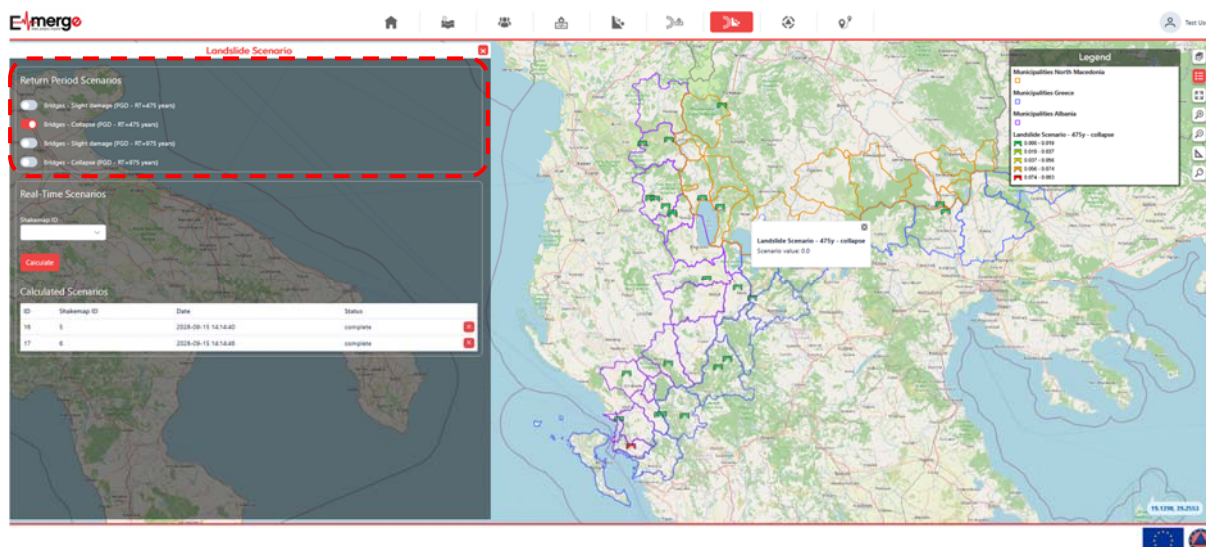


Figure 2.25: Landslide risk scenario for bridges, considering collapse as the damage state and a seismic event with a RT of 475 years as the landslide trigger. The figure also shows the legend associated with the scenario and the probability of reaching the considered damage state for a selected bridge.

The *Real-Time Scenario* section allows users to calculate the bridge risk scenario using one of the earthquake-induced landslide shakemaps (PGD) available in the **Landslide Hazard** tab of the table in the “Shakemap Service” area. The shakemap of interest can be selected by its corresponding shakemap ID from the drop-down menu. The scenario calculation is started by clicking the “Calculate” button. Once the calculation has been initiated, the scenario is added as a new row to the “Calculated Scenarios” table. The table columns provide the following information:

- Calculation ID: identifier of the calculation;
- Shakemap ID: identifier of the shakemap used for the calculation;
- Calculation Date: date and time when the calculation was performed;
- Status: current status of the calculation.

When the calculation status becomes “Complete”, the corresponding calculation layers can be displayed. To do so, the user has to: (i) select the row corresponding to the scenario of interest in the “Calculated Scenarios” table, (ii) choose the desired damage state from the “Damage State” drop-down menu, either “Slight Damage” or “Complete damage”, and (iii) click the “Add Layer button”. Figure 2.26 shows a landslide risk scenario for bridges calculated using one of the earthquake-induced landslide shakemaps (PGD) available in the **Landslide Hazard** panel. The figure also shows the legend associated with the scenario and the probability of reaching the considered damage state for a selected bridge. All activated layers are also listed below the “Add Layer” button (see Figure 2.26), where they can be removed and deactivated from the map.

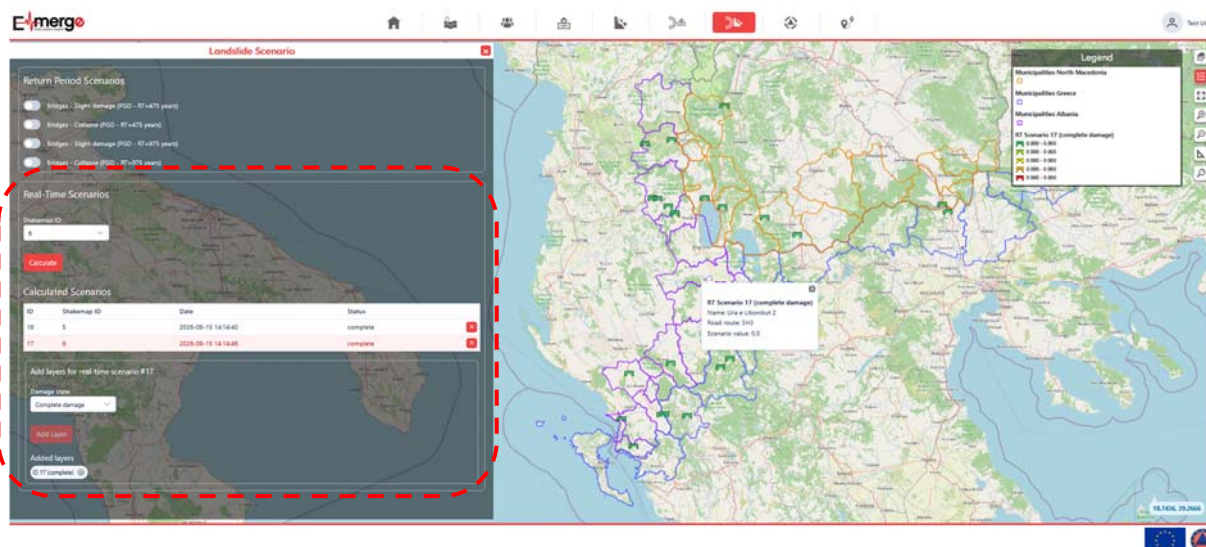


Figure 2.26: Landslide risk scenario for bridges based on an earthquake-induced landslide shakemap (PGD), including the legend and a pop-up showing the probability of the selected bridge reaching the considered damage state.

All layers activated in the **Landslide Scenario** panel are also listed in the **Layers** window, which can be opened by clicking the “Layer Tree” button (see Table 1.1) in the toolbar on the right side of the map (see Figure 2.27). From the **Layers** window, the user can download activated layers, temporarily hide them by deselecting them, or permanently remove them by clicking the “x” button next to the corresponding layer. Deleting a layer from the **Layers** window automatically deactivates the corresponding layer in the **Landslide Scenario** panel.

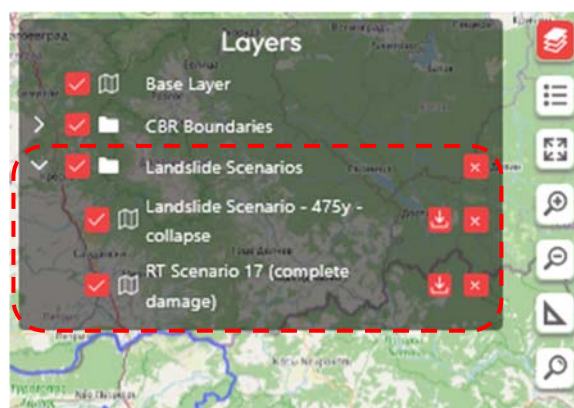


Figure 2.27: List of landslide risk scenario layers activated in the **Layers** window.

2.7 Post-Disaster Needs

After clicking on the corresponding icon (see Table 2.1), the **Post-Disaster Needs** panel opens on the left side of the web tool (see Figure 2.28).

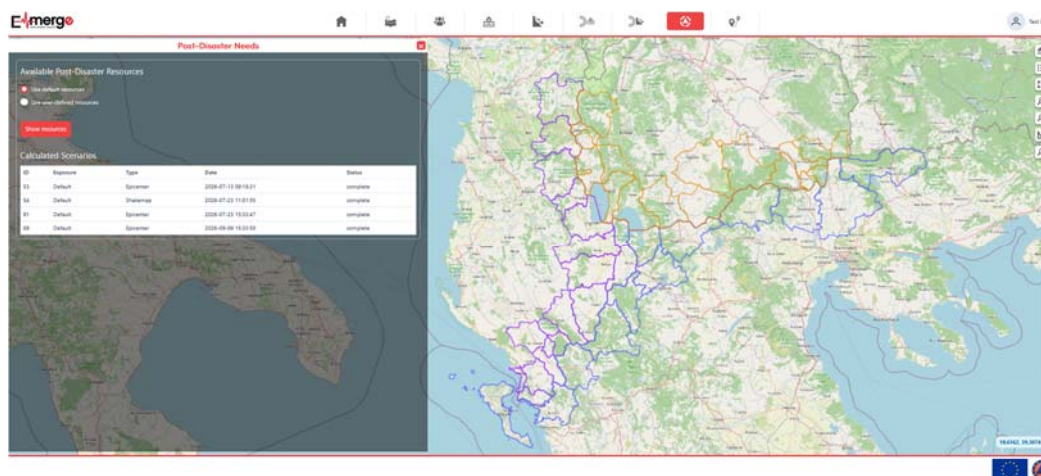
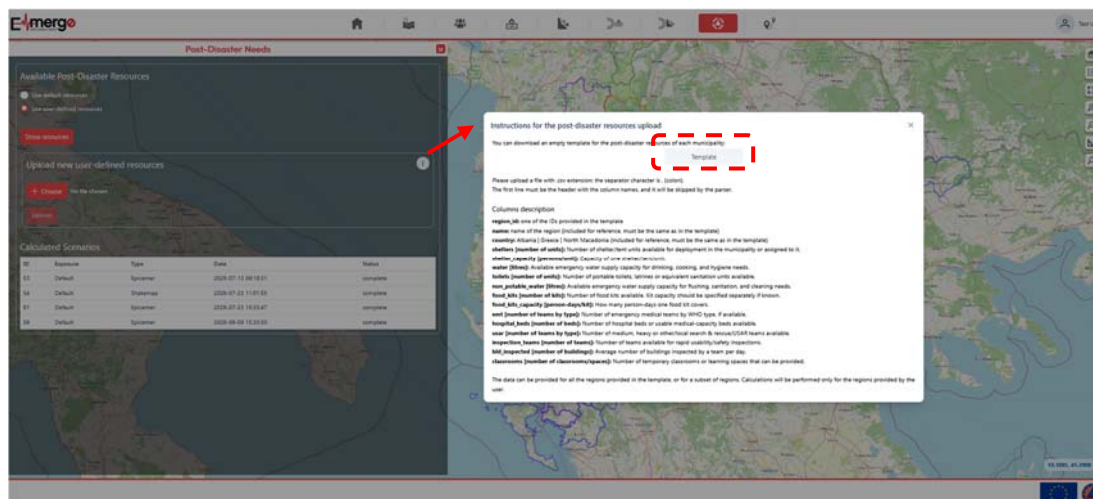


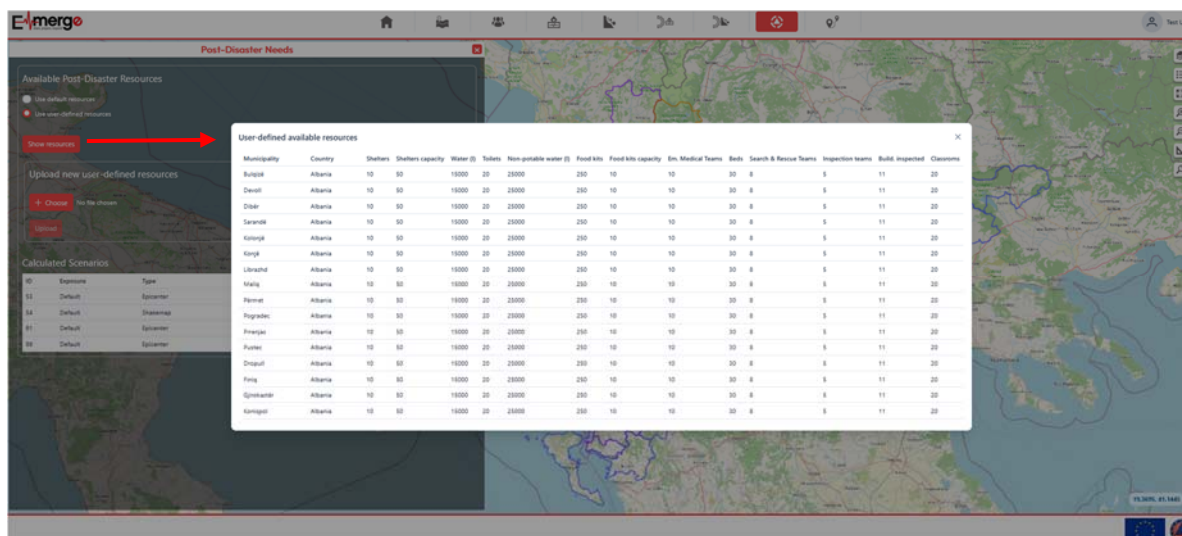
Figure 2.28: **Post-Disaster Needs** panel.

The first step is to specify which resources are available to the Civil Protection authorities of North Macedonia, Greece, and Albania within the CBR municipalities. To this end, the user can choose between two options:

- “Use default resources”: by selecting this option, the predefined resources available on the platform are used to calculate the post-disaster needs. The list of available resources can be displayed in tabular format by clicking the “Show resources” button.
- “Use user-defined resources”: this option allows the user to define and use a custom set of available resources by uploading a CSV file, either for all CBR municipalities or for a specific subset of municipalities. The uploaded file must comply with a predefined template, which can be downloaded from the pop-up window that appears when the user clicks the “i” button in the upper-right corner of the “Upload new user-defined resources” section. The same window provides a detailed description of the different columns included in the file (Figure 2.29(a)). Once the CSV file has been completed according to the required format, the user can select it by clicking the “Choose” button and upload it using the “Upload” button. The uploaded resources can then be viewed in tabular format by clicking the “Show resources” button. (see Figure 2.29(b)).



(a)



(b)

Figure 2.29 (a) Panel opened via the “i” button in the “Upload new user-defined resources” section, providing the downloadable template for custom resources and a description of the CSV fields; (b) Table showing the user-defined resources uploaded by the user and displayed in tabular format by clicking the “Show resources” button.

After defining the available resources, the user can proceed to visualize the results for the previously calculated scenarios. In the “Calculated Scenarios” table, the user has to select the scenario of interest. The results are then displayed in terms of required resources and resource gaps, i.e., the difference between the resources available and those required as a consequence of the event. The results can be accessed directly on the platform either in tabular format or on the map, or downloaded as CSV. To view the results in tabular format, the user can click the “Show table results (needs)” or “Show table results (gap)” button, depending on whether the required resources or the corresponding resource gaps are to be displayed (see Figure 2.30).

To download the results in CSV format, the user can click on the “Download CSV results” button, where an expanded set of indicators is available.

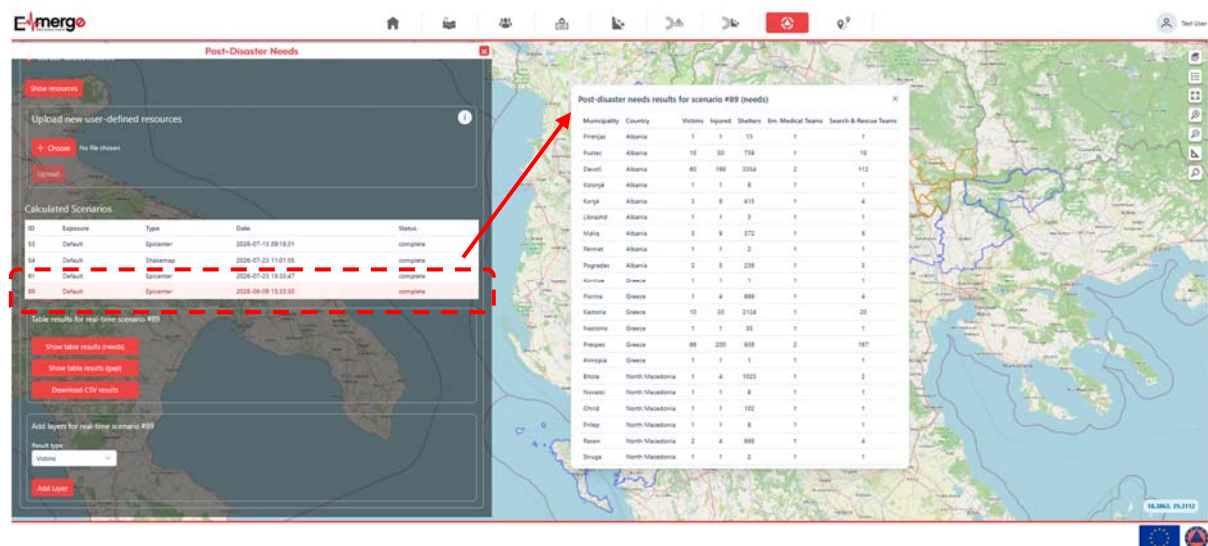
To visualize the results on the map as a layer, the user has to select the desired indicator from the “Result Type” drop-down menu and click the “Add Layers” button. The available indicators include:

- Victims;
- Injured;
- Shelters;
- Emergency Medical Teams (EMT);
- Search & Rescue Teams.

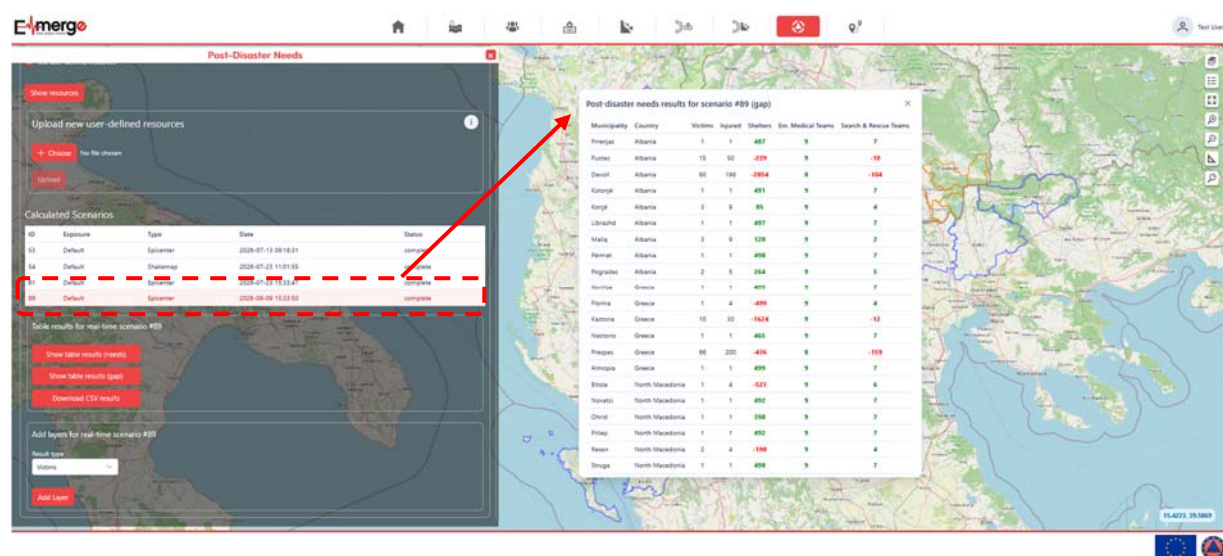
These indicators are calculated for all CBR municipalities where the $PGA > 0.01g$.

All activated layers are also listed below the “Add Layer” button, where they can be removed and deactivated from the map.

As an example, Figure 2.31(a) and Figure 2.31(b) show, respectively, the impact of the event in terms of the number of victims and the number of shelters required, based on the previously calculated scenario selected by the user.

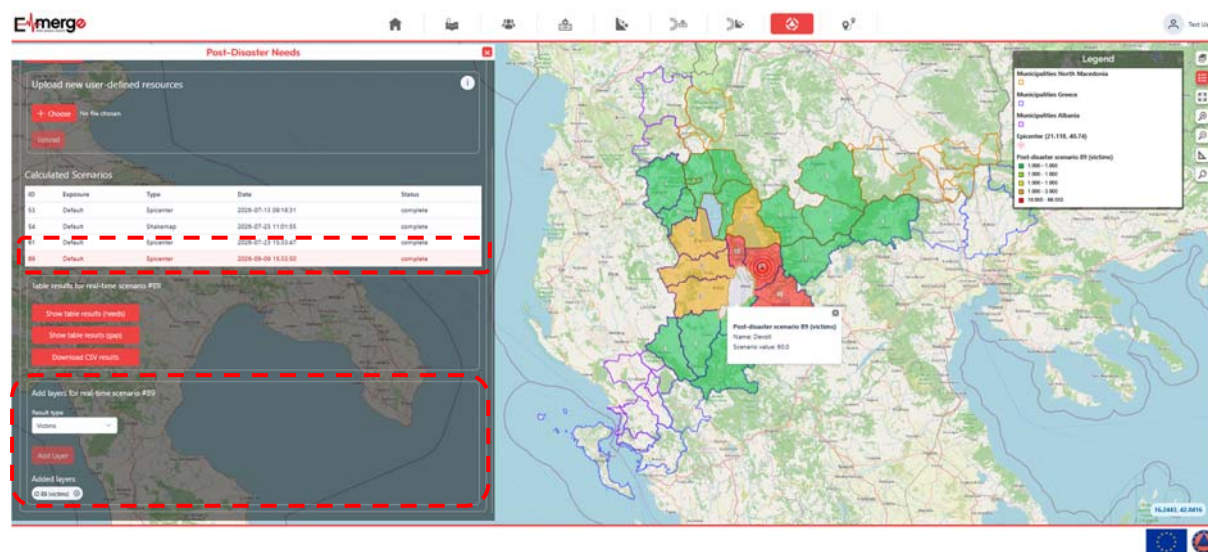


(a)

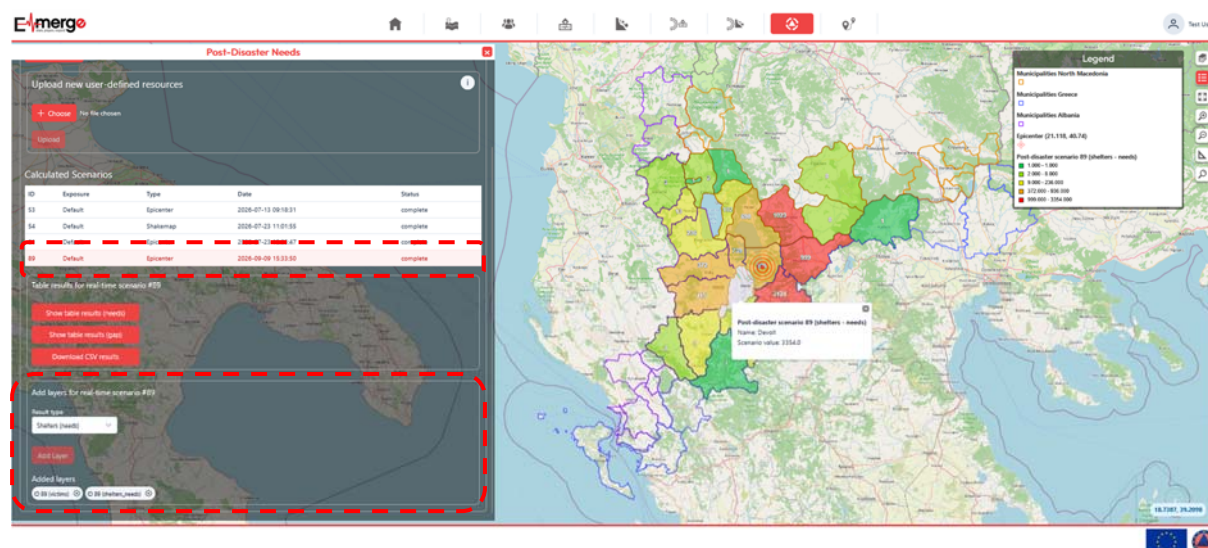


(b)

Figure 2.30 Table showing (a) the available resources and (b) the potential resource gap (highlighted in red) resulting from the event, based on a previously calculated scenario selected by the user.



(a)



(b)

Figure 2.31: (a) The number of victims and (b) the number of shelters required for the selected scenario, with relevant legends and pop-ups showing these numbers for a selected municipality.

All layers activated in the **Post-Disaster Needs** panel are also listed in the **Layers** window, which can be opened by clicking the “Layer Tree” button (see Table 1.1) in the toolbar on the right side of the map (see Figure 2.27). From the **Layers** window, the user can download activated layers, temporarily hide them by deselecting them, or permanently remove them by clicking the “x” button next to the corresponding layer. Deleting a layer from the **Layers** window automatically deactivates the corresponding layer in the **Post-Disaster Needs** panel.

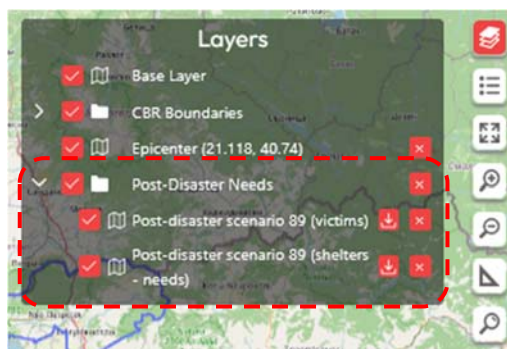


Figure 2.32: List of post-disaster needs layers activated in the **Layers** window.

2.8 Routing

After clicking on the corresponding icon (see Table 2.1), the **Routing** panel opens on the left side of the web tool (see Figure 2.28).

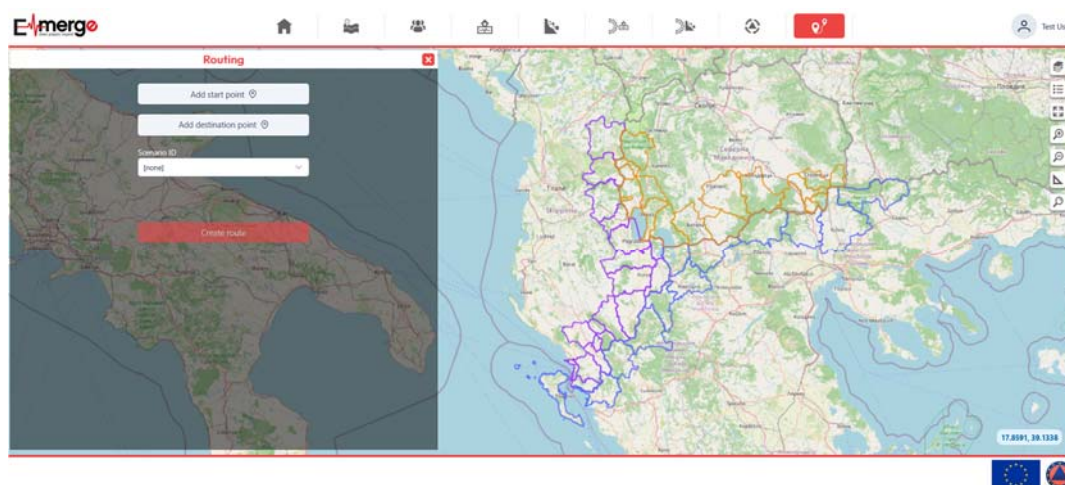


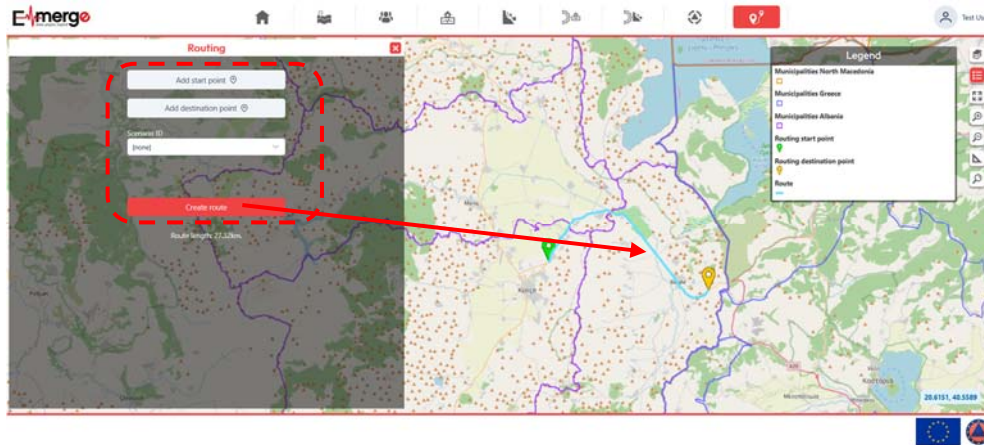
Figure 2.33: The **Routing** panel.

The **Routing** panel (Figure 2.33) enables the user to identify the most suitable route for emergency response operations while avoiding transportation infrastructures (in this case bridges/viaducts) that may be unusable following a seismic event.

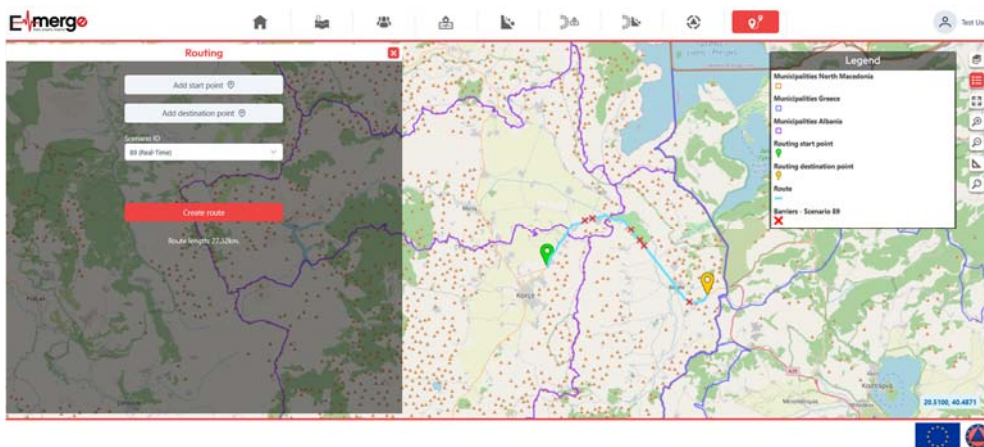
A route is defined by selecting its starting point and destination on the map using the “Add start point” and “Add destination point” buttons, respectively, and then clicking the “Create route” button (Figure 2.34(a)). To assess whether the selected route is affected by damaged infrastructure, the user must first load a previously computed earthquake scenario by entering its identifier in the “Scenario ID” field (Figure 2.34(b)). If one or more bridges along the selected route are identified as damaged as a result of the event, clicking the “Create route” button again automatically triggers the computation and display of the shortest alternative route that avoids the affected infrastructure (Figure 2.34(c)).

All layers activated in the **Routing** panel are also listed in the **Layers** window, which can be opened by clicking the “Layer Tree” button (see Table 1.1) in the toolbar on the right side of the map (see Figure 2.35). From the **Layers** window, the user can download

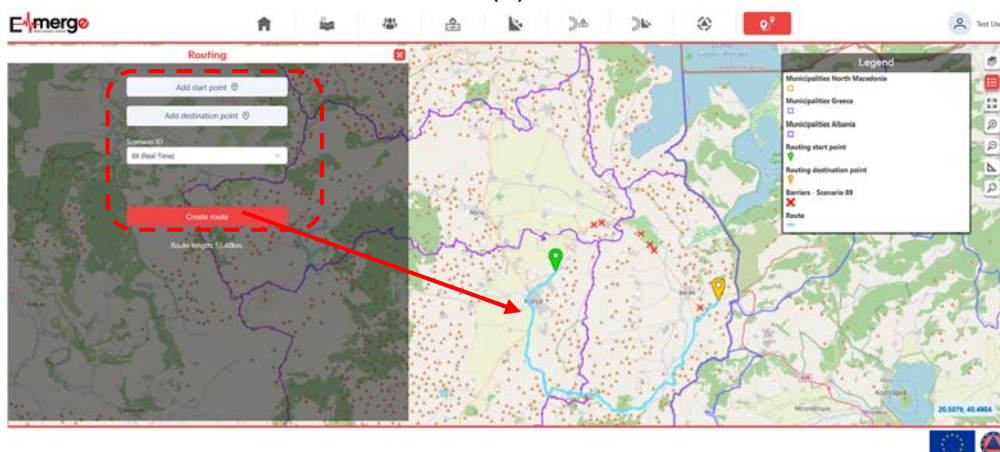
activated layers, temporarily hide them by deselecting them, or permanently remove them by clicking the “x” button next to the corresponding layer. Deleting a layer from the **Layers** window automatically deactivates the corresponding layer in the **Routing** panel.



(a)



(b)



(c)

Figure 2.34: (a) Definition of the route start (green marker) and destination (yellow marker) points on the map and corresponding shortest route; (b) Loading of a previously computed scenario using its ID and identification of the bridges damaged as a result of the corresponding seismic event; (c) Shortest alternative route between the selected

start and destination points, avoiding one or more bridges damaged following a seismic event.

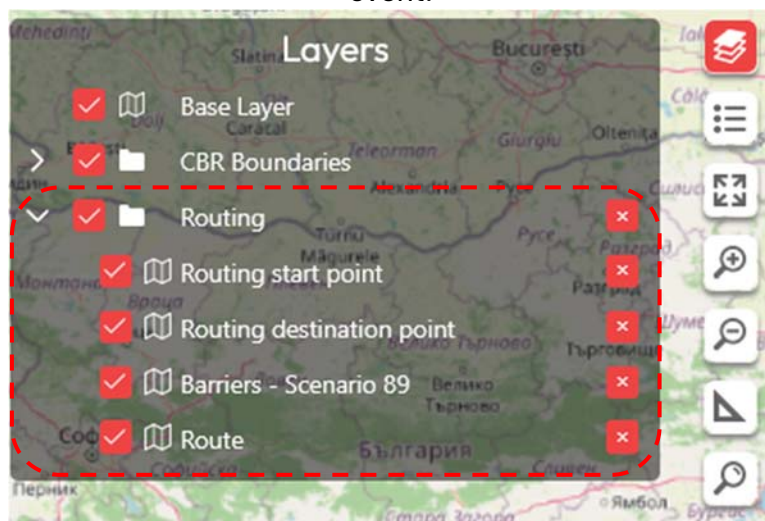


Figure 2.35: List of routing layers activated in the **Layers** window.

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