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Italy – Croatia

Digital Plan

Interactive Map

Final Version 27/2/2026

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Specific objective Title	Promoting climate change adaptation and disaster risk prevention, resilience, taking into account eco-system based approaches.
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Work Package Title	Digitalization model of civil protection plans and IoT EDSS Platform Development
Activity Number	1.8.
Activity Title	Online interactive and dynamic map
Partner in Charge	LP - GAL Molise
Partners involved	All partners
Status	Final
Status	Public

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Italy – Croatia

Digital Plan

Index

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About Digital Plan Project

The main objective of the project is the digitalization of civil protection plans, already operatives in the territorial areas of competence of the PPs, to improve the capacity of local authorities to investigate the risks present, to define common operational methods of action in the event of a disaster and in particular to share all the emergency planning with other bodies and agencies in charge of rescue, for compress intervention times, and with the population.

Project relevance

The selected theme of digitalization of CP Plans represents a common interest for Italian and Croatian territories that present similar problems and demand common transnational solutions. Fragmentation of the area and different status of civil protection systems create heterogeneity in hazard handling. Yet, risks and disasters, sure enough, do not recognize state borders and other boundaries imposed by human conventions and treaties. Common risks affect the whole area and the need for a homogeneous, interoperable, and EU-integrated approach is a necessity. This means both homogenizing plans and procedures in the area and presenting common tools for civil protection plan digitalization.

Further to homogenization, such a plan, its accompanying capacity building and training, and its adoption by partners will strengthen the administrative and technical capacities of local authorities in managing hazardous and emergencies. Moreover, partners will benefit from the transnational process of exchange of know-how and from a common basis of knowledge and experience, which will help individual solutions for enhancing resilience in uniformly dealing with natural and man-

made hazards within the involved territories. By empowering territorial resilience, the project reduces overall Italian and Croatian programme area vulnerability through extensive information interchange in both vertical and horizontal directions.

The Digital Plan project will contribute to disaster risk reduction, and management efficiency both in the planning phase and in emergencies, collaborating in the building of resilience in the Adriatic region, through the strengthening of cross-border territorial cooperation with the help of innovative technologies both through DSS (Decision Support System) and through the integration of IoT (Internet of Things) sensors.

A poor sharing of emergency planning and management tools and the effects of forecast and ongoing climate change such as extreme weather events, floods, droughts, increased temperatures, and major snow events are a "powder keg" in the world of risk management and the emergency.

The cooperation between the territories of Italy and Croatia, with this project, supports the strengthening of resilience in all sectors of activity in the field of civil protection; then the focus risks of the project, chosen by the PPs, identify innovative technological tools and to support decisions, also with climate adaptation actions.

The territories of the PPs, given the short distances, also share the impacts of multiple extreme phenomena with meteorological or seismic forcing, for which it is essential to share knowledge, skills, and equipment in the event of disaster response, but also during the other phases of the resilience-building and contingency planning cycle.

Until now, the world of extreme events and climate change has been seen as two separate entities, but this is not correct. The main challenge derives from the assumption that good emergency response planning also makes it possible to identify and apply tools and climate adaptation actions.

This cross-border initiative is particularly needed while the entire Adriatic region is preparing to manage events related to climate change and the management of any emergency crises. Climate change mitigation and adaptation can only be achieved through an integrated approach of territorial cooperation and resilience building by endorsing the entire resilience cycle: planning and preparedness, prevention, response, mitigation, recovery, and adaptation towards a new equilibrium. The Deming cycle, the reference point of emergency planning (planning, execution, control, and adjustment), can be perfectly integrated into this cycle.

Finally, in the Sendai Framework for Disaster Risk Reduction (2015-2030), the project's actions support the ultimate goal of achieving results.

The 2015 Sendai Document and the United Nations International Strategy for Disaster Reduction emphasized the need to address disaster risk reduction and climate change adaptation in setting sustainable development goals.

The project with its actions goes precisely in this direction and specifically aims to improve the understanding of disaster risk, improve disaster preparedness for effective response and rebuild better in the recovery phase by setting some overall objectives in the project actions such as increasing entities with their disaster risk reduction strategies and increasing the availability of and access to multi-hazard early warning systems and disaster risk information and assessments.

WP1: Digitalization model of civil protection plans and IoT EDSS Platform Development

WP1 aims to develop a cross border model for civil protection plan digitalization. It will be based on a set of activities, starting from collection of data from civil protection plans, selecting the risks affecting the plans, the emergency flow charts, open data sources like public and private platforms, websites and webcams, to carry out at preliminary analysis of the needs of each individual PPs and to study the local civil protection plans. Furthermore, WP1 also focuses on the development of a scalable and capitalizable IT platform that can achieve several goals: (i) digitization of civil protection plans; (ii) access to geolocated open data sources and IoT sensors; (iii) manage synthetic georeferenced environmental data. Given the ongoing impact of climate change and its potential to increase the frequency and severity of extreme weather events, a key component of the platform will involve conducting multivariate statistical analyses.

Activity 1.8.: Online interactive and dynamic map

Starting: Period 2, month 7-12, 01/09/2024 - 28/02/2025

Ending: Period 3, Month 13-18, 01/03/2025 - 31/08/2025

A study phase will be conducted to analyze the data collected under WP1, which will be inserted into the platform. The data will be standardized and published on an interactive online map within the platform. LP1 will be responsible for developing the Interactive Map. The map will be accessible to all PPs through a private account and will include all the data gathered under WP1. The map will be tailored to the competencies area of the digitized civil protection plan. It will be online and publicly accessible, but citizens and interested stakeholders will not be able to interact with or

modify it. This will enable the public to more easily access the civil protection plans of the municipalities or public authorities involved.

D.1.8.1 Interactive Map:

The platform was created with the goal of digitalising the civil protection plans of project partners and making them consultable, manageable and interoperable through an interactive cartographic environment accessible from any browser. Thanks to a modular structure that provides two distinct access modes (public and authenticated) the platform serves both citizens and visitors who wish to freely browse the map and available documents, and accredited users who carry out data entry, classification and management activities.

The system is designed to be cloud-compliant, accessible from any device with a browser, and supports integration with Decision Support Systems (DSS) through dedicated APIs. The platform is available in Italian and English, with language switching possible at any time from the interface.

Platform Access

When opening the platform's main page, the user is presented with the login screen, which shows the access panel. At the top of the panel there is a language selector that allows the user to switch freely between Italian and English by clicking the respective buttons. The selected language is applied immediately across the entire interface.

Anyone wishing to explore the platform without registering can do so by clicking the button dedicated to the public map. This view requires no credentials and leads directly to the public cartographic environment, where it is possible to view the civil protection plans uploaded by partners, navigate

the map, apply thematic filters and consult attached documents, all in read-only mode. This mode is intended for anyone who wants to understand the territory, verify the coverage of plans or simply explore the available geographic data. Institutional users (project partners and their collaborators) access the platform via the authentication button, which initiates a secure OAuth2-based login flow. The system verifies the user's credentials and, once authenticated, automatically redirects them to the main section of the private platform, called Digitise Plan. Authentication is protected by an advanced security layer: credentials are never transmitted in plain text and access tokens contain both the user's roles and the identifier of their partner organisation. This ensures that each user can only view and modify data within their own area of responsibility, in accordance with the assigned administrative areas.

If a user attempts to access a section for which they do not have the necessary permissions, the platform displays a dedicated page informing them of the unauthorised access, without revealing sensitive information about the system.

Public Section - Explore Plans

The public section is the heart of the platform's open consultation. Accessible without registration, it presents the user with a two-panel interface: on the left are the navigation and filtering controls, on the right is the interactive geographic map.

The map is the starting point for data exploration. The user can navigate it freely with zoom and pan, and view the cartographic layers uploaded by project partners. Each geometric element (whether a point, a line or a polygon) represents a geographic piece of information belonging to a civil protection plan: a risk area, a strategic infrastructure, a gathering point, or any other element provided for by the thematic structure of the plan. Clicking on a map element allows the user to view its details: the element's name, its thematic and class membership, the reference plan and the associated informational attributes. The map supports the simultaneous overlay of multiple layers, offering an integrated view of the territory.

In the left side panel there is a catalogue exploration section, which allows users to browse the available layers through a tree structure organised by thematics and classes. Thematics represent the macro-thematic areas, such as hydrogeological risk, mobility, infrastructure, while classes are the more specific subdivisions within each thematic. The user can expand and collapse tree nodes to discover available layers, and select those they wish to display on the map simply by clicking on them. Selected layers appear in the lower section of the panel, which shows the list of active layers with the option to remove them individually or clear them all with a single click.

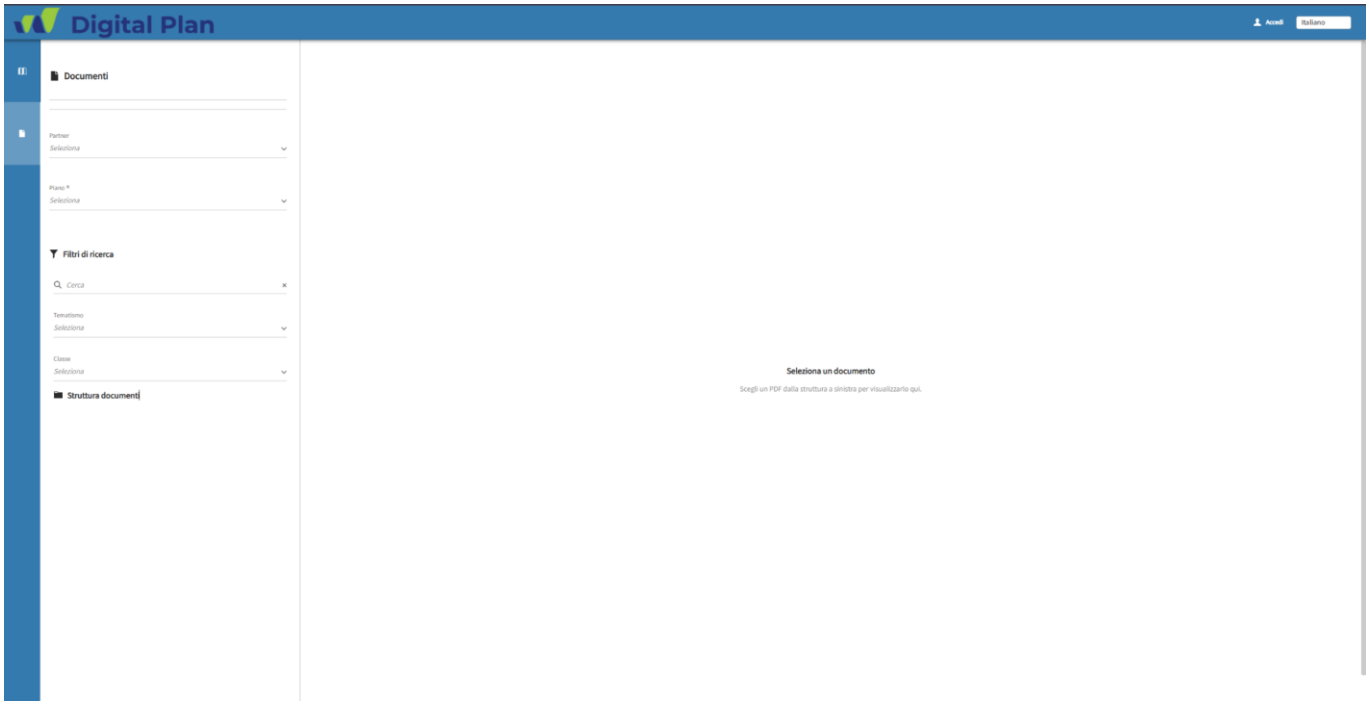
To facilitate the search among available layers, the panel provides a filter system whose components operate in combination. The user can search by free text (typing a name or keyword) or narrow results by selecting a specific thematic or class from the relevant dropdown menu. Filters update in real time as the user changes the selections and can be reset at any time via the reset button.

Public Section - Plan Documents

In addition to map consultation, the platform offers a section dedicated to the official documents associated with civil protection plans. This section is also accessible in public mode and allows anyone to consult the PDF files uploaded by partners, organised in a structured and searchable way.

To access the documents, the user must select the plan of interest through a dropdown menu listing all plans available on the platform. Once the plan is selected, the system automatically loads the associated document structure, showing the available documents in the side tree. Documents are organised according to the same thematic hierarchy used for cartographic layers: a tree structure with thematics and classes, within which the attached PDF files are found. There is also a general section that collects thematically unclassified documents, such as the plan's organisational chart, the list of reference contacts and introductory documents. Clicking on a document in the tree

immediately loads the PDF in the integrated viewer on the right side of the screen. There is no need to download the file to read it: the display is inline, convenient and immediate. For users who need to quickly find a specific document, the section offers a text search bar and two filtering menus for thematic and class. These tools allow the document tree content to be narrowed down to only the relevant files, making consultation efficient even when many documents are present.



Private Section

Once logged in, the user accesses the platform's reserved area, whose default entry point is the Digitise Plan section. The private area interface retains the two-panel structure already familiar from the public section, but enriched with write, edit and data management capabilities. Navigation between the different sections takes place via the platform's main menu, which shows only the entries accessible based on the authenticated user's role. The sections available to partner users

include Digitise Plan, Plan Documents, Catalogue Management, and, for users with elevated privileges, management of Users, Partners and Thematics and Classes.

Digitise Plan

The Digitise Plan section is the operational core of the platform for partner users. This is where the actual digitalisation process takes place: the insertion, modification and deletion of the geographic elements that make up each partner's civil protection plan.

The interface consists of a left side panel (containing plan selection controls, filters, the plan index and available actions) and the interactive map on the right, where inserted geometries are displayed in real time. To begin working, the user must select the civil protection plan they intend to work on, choosing from the plans available for their partner via a dropdown menu. It is possible to further narrow the plan index view by selecting a specific thematic and class, or by typing free search text in the dedicated bar. Active filters are visually indicated with a counter and can be reset with a single click. Below the filters, the panel shows the plan index: a navigable tree representing the complete structure of inserted geographic elements. The tree is organised on three hierarchical levels. The first level consists of thematics, the macro-thematic categories of the plan, such as hydrogeological risk, road network, reception points. Each thematic can be expanded by clicking on it, revealing its associated classes. The second level contains classes, which represent specific types within the thematic. Expanding a class gives access to the third level, composed of the geographic elements the user has inserted for that combination of thematic and class. If no elements are yet present, the system displays an informational message inviting the user to add some. Each element in the tree carries a map icon and its name or label; next to it, a quick action menu allows the user to edit the attribute data, view the geometry on the map or delete the element.

To insert a new element, the user clicks the “Add” button, available in the action bar at the top of the panel, provided a plan has already been selected. A guided modal window opens, requiring the user to complete three steps in sequence.

- In the first step the user chooses the thematic of membership: they select an entry from the dropdown menu listing all available thematics for their plan.
- In the second step the class is selected, which is only enabled after the thematic has been chosen, the list populates automatically with compatible classes.
- In the third step the user chooses the type of geometry to draw: point, line or polygon. The three types are presented as buttons with intuitive icons, and only one can be selected at a time.

After confirming the choices, the window closes and the platform enters drawing mode: the user can interact directly with the map to trace the desired geometry. Once the drawing is complete, the side panel shows a summary of the ongoing operation (selected plan, thematic, class and geometry type) and, if provided for by the plan structure, a dynamic form for entering the element's informational attributes. After filling in the required fields, the user saves the element via the save button, or cancels the operation.

To edit an already inserted element, the user can access the contextual action menu that appears next to each element in the tree. Selecting the edit option switches the panel to editing mode, showing the form pre-filled with the element's current values. The user can update the attribute data and save the changes.

Selecting the view geometry option instead centres the map on the element and highlights it, making its geographic position and shape immediately visible.

The Delete option in the contextual menu allows the user to permanently remove an element from the plan index. A confirmation is requested before deletion, to prevent accidental removal.

Catalogue Management

The Catalogue Management section is dedicated to the administration of support cartographic layers made available to users to facilitate operations in the Digitise Plan section. Unlike manually inserted geographic elements, catalogue layers are GIS files uploaded in batch (raster or vector) that serve as a reference layer for reading and contextualising the territory.

The section interface shows a navigation panel on the left containing a filter system and a catalogue tree, also organised by thematics and classes. On the right, the map displays the layers selected by the user. The catalogue tree lists, at three hierarchical levels, all the layers present: thematic, class and finally the name of the individual layer. Each layer visually indicates its processing status through a coloured indicator: a layer being loaded shows an animated progress icon with an informational tooltip; a layer in error shows a red warning icon. Only layers in the *published* state can be selected

and displayed on the map; the others, although listed, are not interactive until processing is complete.

To add a new layer to the catalogue, the user clicks the “Add Layer” button, which opens a modal window with a guided entry form. The layer name is mandatory and must be unique and descriptive, so as to make the layer recognisable in the catalogue tree. The description is optional and may contain additional information about the file's content or origin. Both thematic and class are mandatory: as in the Digitise Plan section, selection is cascaded, the thematic is chosen first, then the list of compatible classes populates automatically. At the bottom of the form there is the file upload area, with drag and drop support. Accepted formats are .zip (zipped shapefile), .geojson, .tiff, .tif and .gpkg. The maximum allowed size is 2 GB per file. If the user attempts to upload a file in an unsupported format or exceeding the size limit, the system immediately displays a specific error message, without proceeding with the upload. After filling in all mandatory fields and selecting the file, the user confirms the upload by clicking the “Save” button. The upload is asynchronous: the layer immediately appears in the catalogue tree in the “*loading*” or “*processing*” state, and is automatically updated as soon as the validation and publishing process on the server is complete.

Layers in a valid state can be renamed and have their description updated by accessing the edit function from the tree's contextual menu. A modal window opens with the name and description fields pre-filled, which the user can modify and save.

The view details function instead opens an information card for the layer showing: name, description, thematic, class, current status and the layer's unique identifier in the system. From the same card, if the user has the necessary permissions, they can switch to edit mode.

Deletion of a layer is available for all layers the user owns, including those in error. In this case too, a confirmation is presented before deletion.

Clicking on a published layer in the catalogue tree adds the layer to the map and makes it visible as a geographic layer. The user can select multiple layers simultaneously: each selected layer is overlaid

on the others on the map, allowing an integrated view. To deselect a layer, simply click on it again in the tree.

Plan Documents

In authenticated mode, the Plan Documents section gains write capabilities: in addition to the document consultation already available publicly, partner users can upload new documents, edit them and delete them.

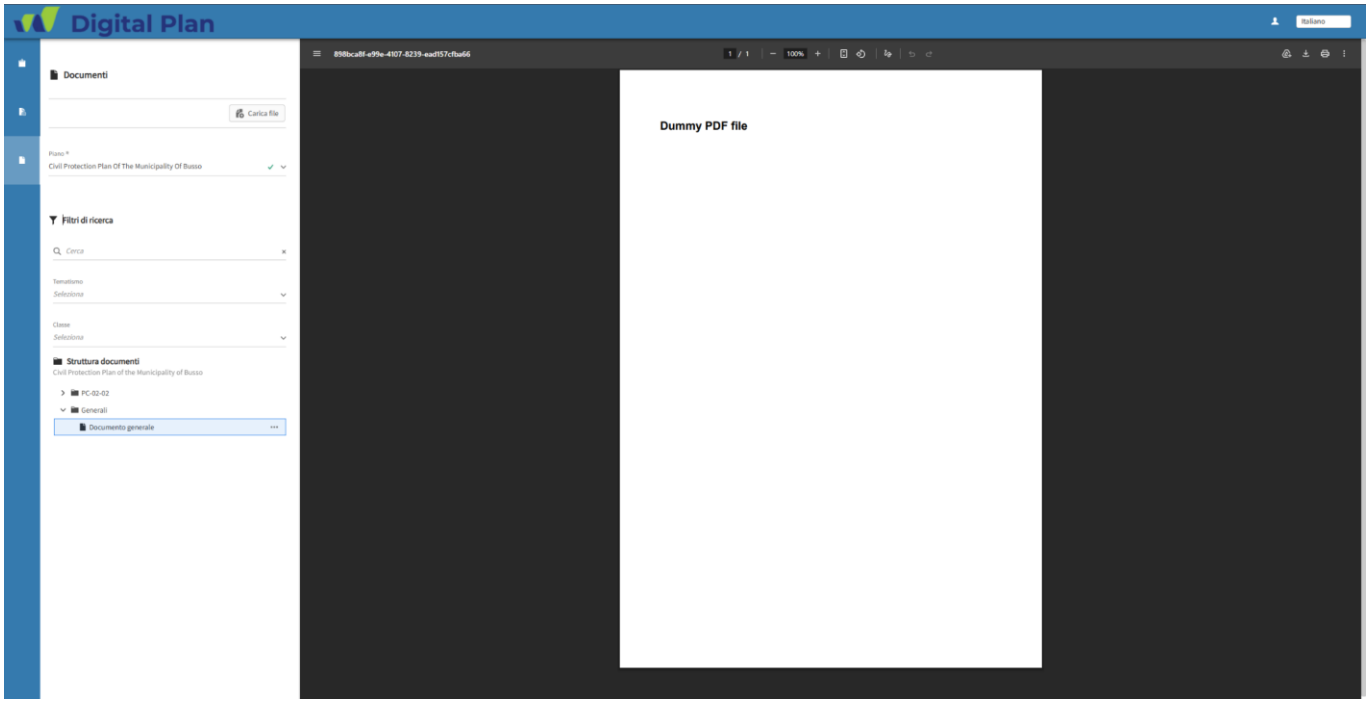
To add a document to a plan, the user, after selecting the reference plan, clicks the “Upload Document” button in the action bar. A modal window opens with a guided form.

The plan membership is already pre-selected and cannot be modified, to ensure the document is correctly associated. The user can then optionally indicate the thematic and class the document

relates to: this classification places it in the right position within the document tree. It is also possible to assign the document a custom descriptive name; if no name is provided, the file name is used. Finally, the user uploads the PDF file via drag and drop or by selecting it from the file system, the maximum accepted size is 50 MB. Once the upload is confirmed, the document immediately appears in the tree of the section corresponding to the plan and, if classified, in the appropriate thematic position.

For each document present in the tree, users with the appropriate permissions see a contextual action menu with edit and delete options. Editing allows updating the document's name and thematic classification, without needing to re-upload the file. Deletion requires a confirmation and permanently removes the document from the platform.

PDF viewing takes place in the right panel of the interface through an integrated viewer. Clicking on a document in the tree loads the file and makes it readable directly in the page, without needing to open external applications or download the file.



User Management

The User Management section is accessible to users with management privileges and allows administration of the people who have access to the platform. The interface presents a paginated tabular list of all registered users, with information on name, surname, email, user type, partner membership and special permissions.

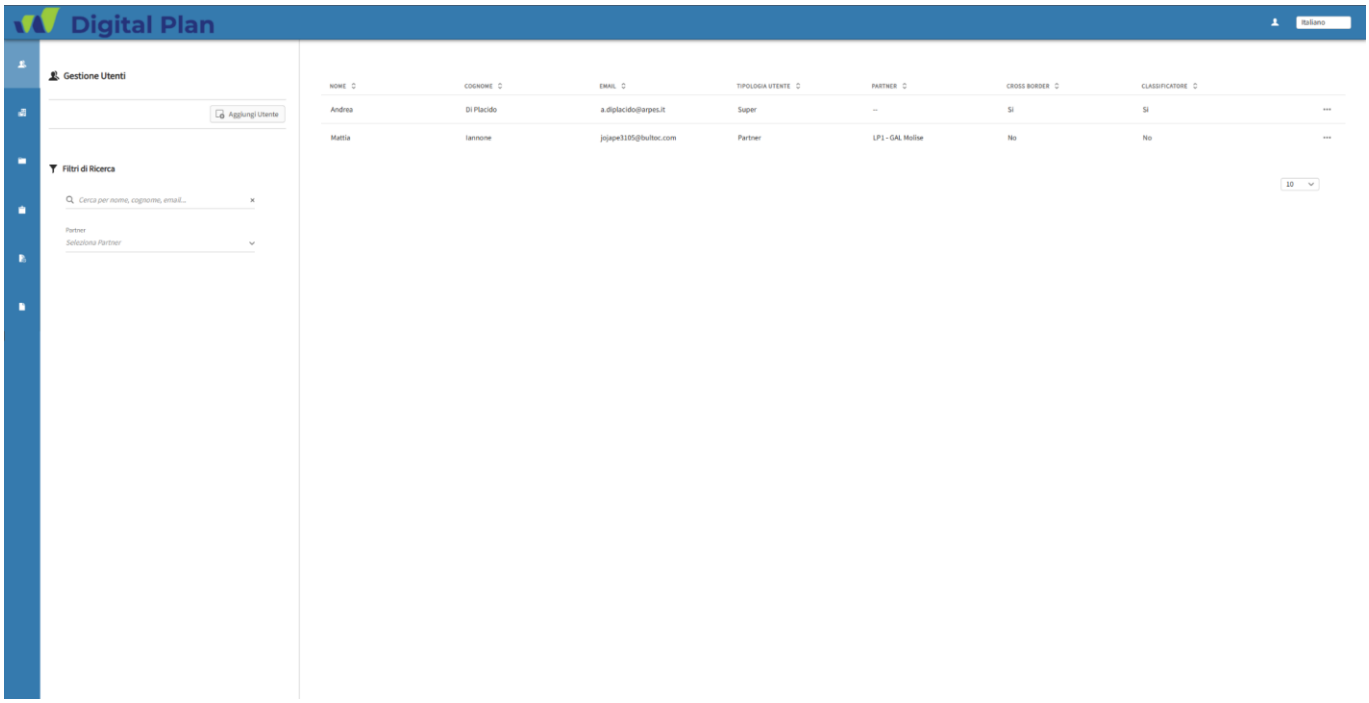
Above the table there is a search and filter panel that allows users to be searched by name or surname through a free text bar, and filtered by user type or partner membership via dropdown menus. The number of active filters is always visible, and a dedicated button allows all filters to be reset simultaneously.

To create a new user, the user clicks the dedicated button in the action bar, which opens a modal window with the registration form. Name and surname are mandatory fields. The email is mandatory and must be in the correct format, it will be used as the user's main identifier in the system. Date of birth is optional. User type is mandatory and is selected from a dropdown menu listing the available types. Partner membership is mandatory for all non-Super Administrator users and is chosen from the list of registered partners.

Two toggles are also available to assign special permissions. The first "*Crossborder Permissions*" enables the user to manage and insert content shared among all partners. The second "*Classifier*" enables specific functions related to data classification, reserved for figures with particular responsibilities in the project. Both toggles are only visible to users with sufficient access level to modify them.

Each row in the table has a contextual action menu with edit and delete options. Editing reopens the form pre-filled with the user's current data, allowing any field to be updated, including special

permissions. Deletion, after confirmation, permanently removes the user from the platform. A view details function is also available, which opens a read-only card with all the user's information, useful for a quick consultation without the risk of accidental changes. The table columns are sortable by clicking the corresponding header: it is possible to sort by name, surname, email, user type or partner, both in ascending and descending order. When there are many users, the table is paginated and shows a selector for the number of items per page and controls for navigating between pages.



Partner Management

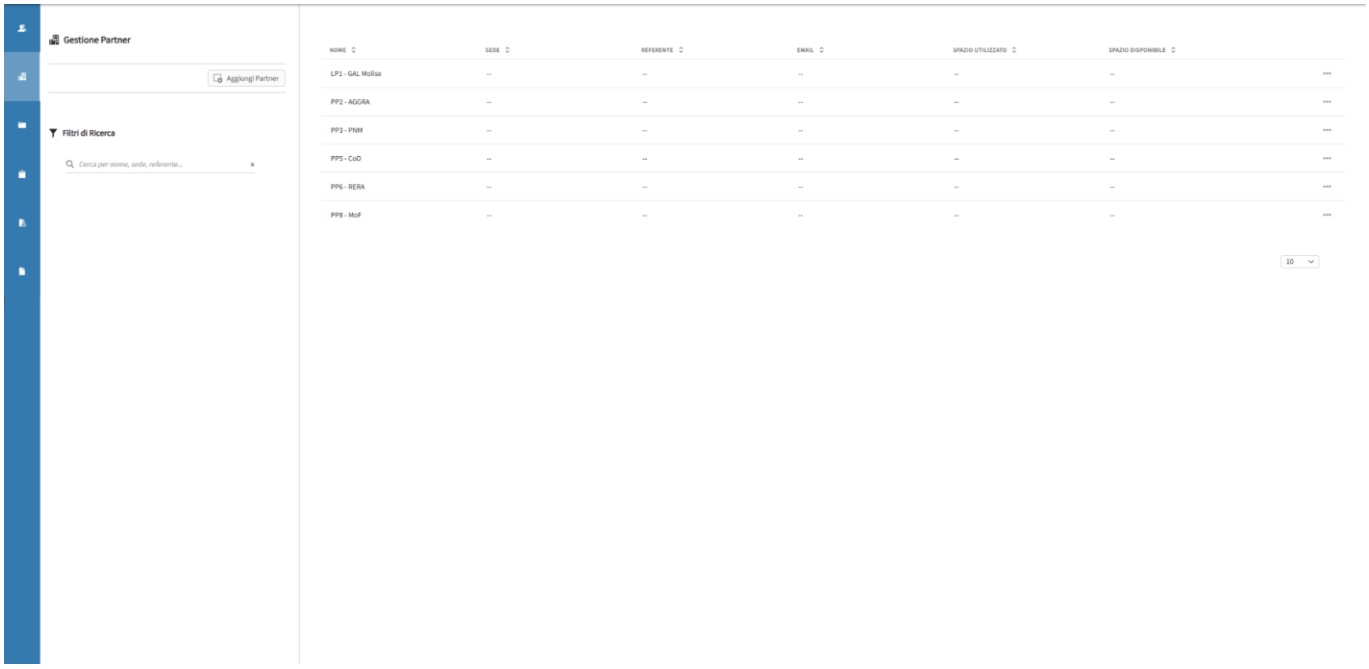
The Partner Management section is reserved for users with the Super Administrator role and allows the creation, modification and deletion of project partners registered on the platform. Each partner corresponds to an administration or body participating in the project, and its configuration

determines the administrative area of competence for managing cartographic and documentary data.

The interface shows a paginated table with all registered partners, each with key information: name, headquarters, contact person and email address. Partners can be searched by name using the search bar, and the table can be sorted by each column. Clicking the add button opens the creation modal window. Partner name and headquarters are mandatory and identify the organisation and its location respectively. The contact person is mandatory, while the contact email is used for official communications relating to the partner.

The most operationally relevant field is the administrative area: this is a file in .zip or .geojson format that defines the geographic boundary of the partner's area of competence. This file is mandatory for partner creation, as the system uses it to limit the user's operations to their own jurisdiction. The file can have a maximum size of 50 MB.

Clicking on a table row opens the partner detail card in read-only mode, with all information and a reference to the current administrative area file. From this card it is possible to switch to edit mode, which allows all fields to be updated including the administrative area file, in this case the current file is shown with the option to replace or delete it before uploading a new one. Partner deletion, available from the table's contextual menu, is irreversible.



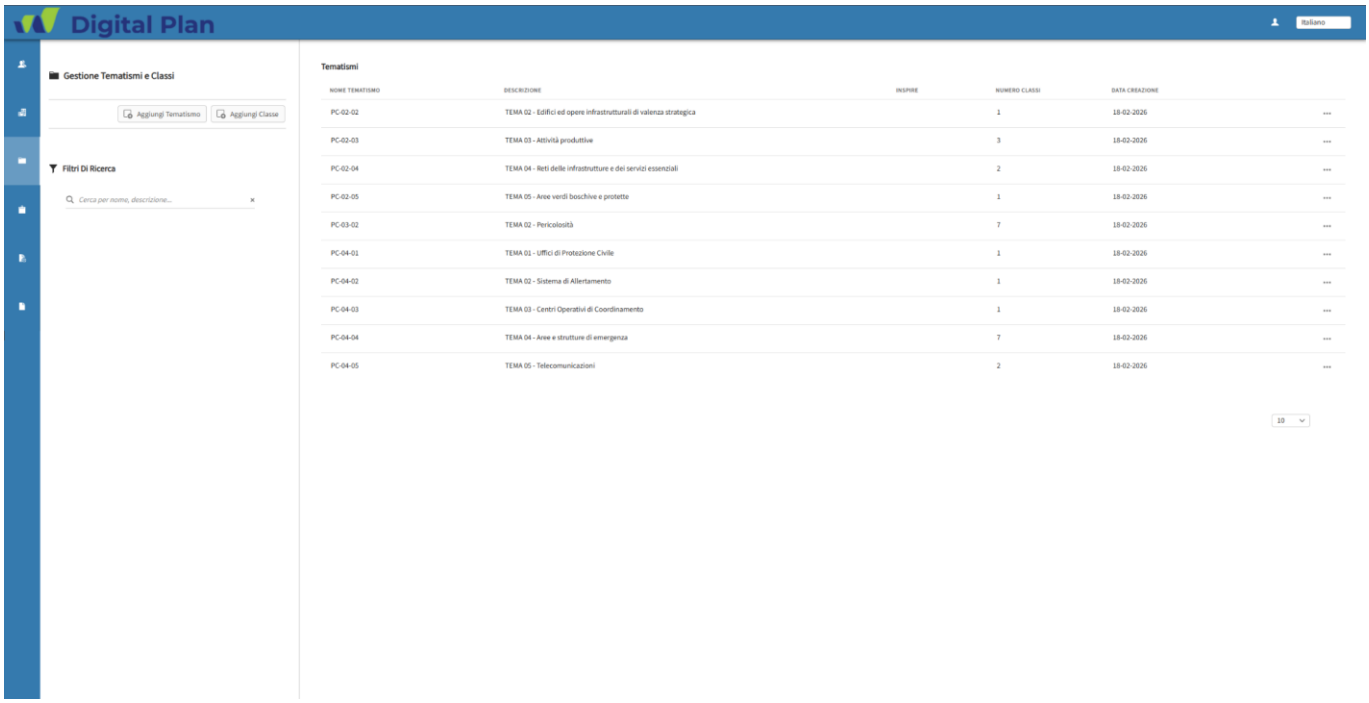
Thematics and Classes Management

The Thematics and Classes Management section is accessible to users with the thematic write role and allows the definition of the classification structure that organises all platform content, cartographic layers, plan geographic elements and documents. Any change to the thematic structure is immediately reflected across all platform sections that use it.

The interface presents a paginated table that can be viewed in two modes: the main mode lists all available thematics; clicking on a thematic accesses a dedicated detail view showing only that thematic's classes. From this view it is possible to return to the main list via a navigation button. The filter panel allows thematics or classes to be searched by name through the text search bar.

To add a thematic, the user clicks the dedicated button in the action bar. The modal window requires specifying the thematic name (mandatory field) and an optional description.

Both thematics and classes can be edited via the contextual menu available in each table row. The edit window is analogous to the creation one, with pre-filled fields. Deletion, after confirmation, permanently removes the entry and potentially affects all content classified under it.



Roles and Permissions

The platform adopts a role-based access control system that precisely determines which sections and features are accessible to each user. Roles are not simply labels: they translate into concrete permissions that enable or disable buttons, sections, columns and menu options contextually. A user not authorised for a given operation simply does not see the corresponding button in their interface.

Super Administrator

The Super Administrator is the role with the highest level of access to the platform. They have full visibility and control over all content from all partners, without administrative area restrictions. They can create, edit and delete partners, assign the Administrator role to other users, and upload cartographic layers on behalf of any partner. They are the only role able to manage the platform's core infrastructure.

Administrator

The Administrator has full access to the content and user management features of their own partner. They can view and manage all platform content and can create users with limited access profiles and they are the only role, together with the Super Administrator, authorised to create users.

Catalogue Management

The user with catalogue management permissions can upload, edit and delete cartographic layers and plan data relating to their own partner and administrative area. They can view all platform content but do not have access to the user and partner management sections.

Viewer

It is not a real role as it does not require authentication; it represents all users who access the public section and view data in view-only mode.

DSS Module - Monitoring and Alerting

The DSS (Decision Support System) module extends the platform with real-time monitoring capabilities for the IoT sensors associated with each project partner. When measured values exceed the thresholds configured by the user, the system automatically generates an alarm, displays it on the public map and sends notifications to the configured recipients. The module is accessible from the platform's main menu after login, under the *DSS* entry, and is organised into three areas: *Thresholds*, *Alarms* and *Map*.

Threshold Management

The Thresholds section allows each partner user to define the conditions under which the system must generate an alarm. For each threshold, the user specifies the sensor to monitor, the function to apply to the data and the limit values beyond which the alarm is triggered. It is also possible to restrict the activity of each threshold to certain months of the year, automatically excluding seasonally irrelevant periods. The supported risk types include general meteorological events, wildfire risk, hydrogeological risk from intense rainfall or landslide, and snow risk.

Notification Configuration

For each threshold it is possible to configure one or more notification modes: sending emails to a list of recipients, activating a connected actuator, or both options simultaneously. Each configuration includes a custom message that will appear in the notification body and an identifying colour that will be used for the label on the map.

Alarm Visualisation on the Map

Active alarms are visible on the platform's public map: at the geographic position of each sensor, a label appears identifying the sensor that caused the threshold breach.

Settings and Preferences

The platform offers a number of settings accessible to the user to customise their experience. Language switching between Italian and English is available both from the login screen, via the IT / EN buttons in the top right and from within the platform through the language selection component in the toolbar. The selected language is applied immediately and persists for the entire current session.

The interface structure is responsive and adapts to different screen resolutions, making it usable on large desktop monitors as well as laptops or tablets. The platform requires no add-ons, plug-ins or browser extensions: it runs entirely in the browser, with no installation required.