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TRANSCPEARLYWARNING

TransCPEarlyWarning Civil Protection Early Warning Platform

ADMINISTRATOR USER MANUAL

"TRANSCPEARLYWARNING": Establishment of "TRANSnational Civil Protection EARLY WARNING System" to improve the resilience of Adrion territories to naturaland man-made risks.

JUNE 2022

Disclaimer

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TRANSCPEARLYWARNING: Establishment of "TRANSnational Civil Protection EARLY WARNING System" to improve the resilience of Adrion territories to natural and man-made risks (ADRION 979)

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❖ Executive Summary

This manual elaborates on the conceptual architecture of the TransCPEarlyWarning Civil Protection Early Warning Platform (**TransCPEW platform**). Its aim is to provide clear navigation guidelines to administrator users, describing its different modules and functions in detail.

❖ Introduction

The **TransCPEW platform** aims to unify and automate the various Civil Protection (CP) processes regarding the prevention of natural and man-made disasters. **It serves the purpose of offering a focal point of reference for the Civil Protection stakeholders in ADRION territories** enabling the integration of different information sources and systems and will make it possible for CP stakeholders to perform the relevant experimentation through pilot implementations.

The creation of the Platform involved several preceding steps that resulted in gathering the necessary information and extracting the correct user requirements from it. The first step was a thorough analysis of the Civil Protection Early Warning frameworks in Italy, Greece, Bosnia-Herzegovina, Croatia, Slovenia, Albania and Montenegro, which resulted in a firm understanding of the current regulatory status of Early Warning (EW) mechanisms in each participating country. Existing procedures related to Early Warning were extracted and broken down into basic modules that appeared to be repeatable in each country. Finally, consultation with Civil Protection officers provided the necessary expert knowledge regarding requirements that needed to be included in the Platform's design.

Based on the accumulated data and knowledge, this web enabled, semantically enriched Platform was designed and implemented. The Platform allows Civil Protection officers to perform all of their duties from a single unified and easily accessible point all. These include:

- ✓ access to the different information sources and systems utilized in their everyday routine with reference **to forest fires and floods**
- ✓ monitoring and management of the early warning process within their area of responsibility
- ✓ communication and message forwarding to other stakeholders based on the procedure defined from the existing framework in each country
- ✓ process design and modification, according to the needs of the Civil Protection organization that a user represents

To promote innovation in the area of Early Warning, a separate experimental module has also been integrated in the platform. A repository of Machine Learning algorithms, implemented solutions and tools, is provided to the user as a starting point for the use of Artificial Intelligence in the field of forest fire detection, together with a service that showcases one of the proposed algorithms and its results on user supplied images or video feeds.

All the above are presented through a Graphical User Interface that is designed specifically to aid users in their work by highlighting the most important information and actions that need to be taken. The Platform has been designed to follow accessibility and security by design principles. It also offers

multilingual support to enhance user interaction with platform modules and services. Finally, users are offered support on mobile devices, allowing for access and monitoring of ongoing Civil Protection processes even when out of office, thus supporting officials and field officers in their everyday routines.

In order to facilitate easy access and effective usage of the Platform, training materials have been designed covering the operational processes, functionality & security analysis of the platform for each user group.

There are two main user groups:

- **Civil Protection process developers:** group of experts whose job is to design and develop the processes, and
- **Civil Protection end users**: group of Dashboard users (CP officers). Dashboard users are divided in two more categories: the "administrators" and "normal users". Administrators have full access to all parts and functionalities of the system. An administrator can create, delete users, as well as give them access to the system modules that they are required to see according to their role in the hierarchical and administrative schema of the Civil Protection Early Warning system. Normal users on the other hand can view and modify only basic profile information, as described in the following section.

The current document, "ADMINISTRATOR USER MANUAL", addresses "administrators" and includes a detailed description of the layout of the platform and the general concept for its usage. In particular, it presents the front – end of the TRANSCPEARLYWARNING platform comprising general layout, features, navigation map, dashboard and page functionalities.

1. TransCPEW Platform Log in page

This section presents the login system used by users, so that they can access the features offered by the TRANSCPEARLYWARNING platform.

It is noted that user authentication is necessary for platform access. The page consists of the project logo and a card containing the user's credentials entry form. In order to complete the login process, the user just needs to fill in the username and password fields of the form and press the “Login” button.

Figure 1 shows the login page of the application.

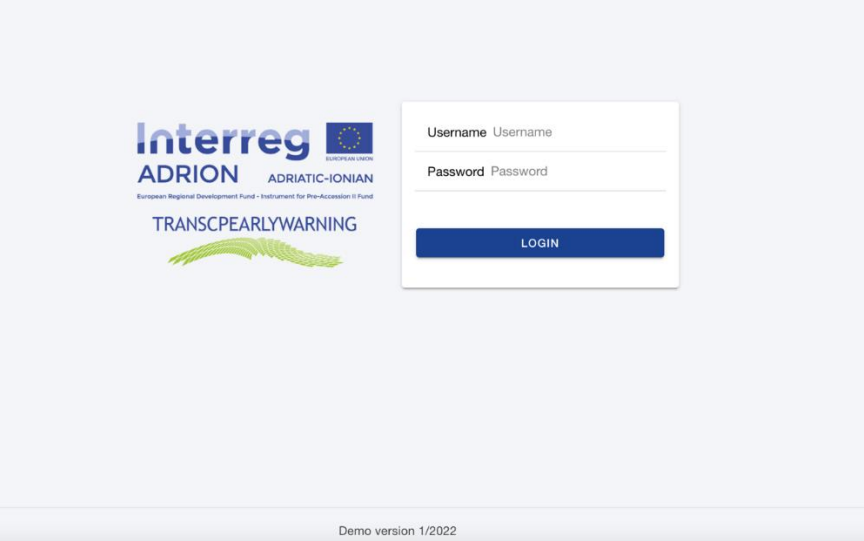


Figure 1: Login Page

Each administrator must have a distinctive name and password. These credentials have been created from the developers and exist inside the database of the system. In order to have stronger security the password must contain at least 8 characters, a mixture of both uppercase and lowercase letters, a mixture of letters and numbers, inclusion of at least one special character (! @ # ?). In addition to the credentials there will also be information about the administrator such as the country which he is responsible for, and an email address for each administrator.

2. TransCPEW Platform Navigation Map

This section presents the graphical user interface of the Platform of the TRANSCPEARLYWARNING project and elaborates on the functions provided to the system user. It is devoted to providing the user with quick and simple answers to questions related to the functionality of the TRANSCPEARLYWARNING platform and how to access each part of it. Both basic and advanced features are presented, so that the application can be fully exploited.

2.1. Dashboard general layout

The dashboard (***Figure 2)*** **is the landing page of the TRANSCPEARLYWARNING platform** and the point where the user can control the functionalities of the platform.

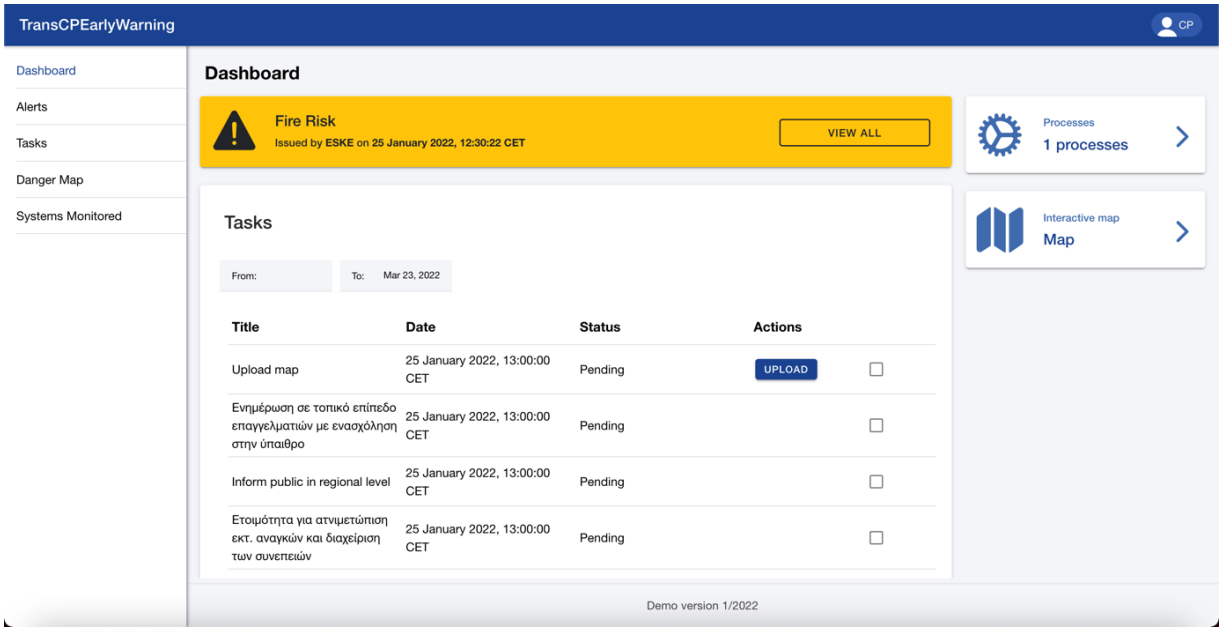
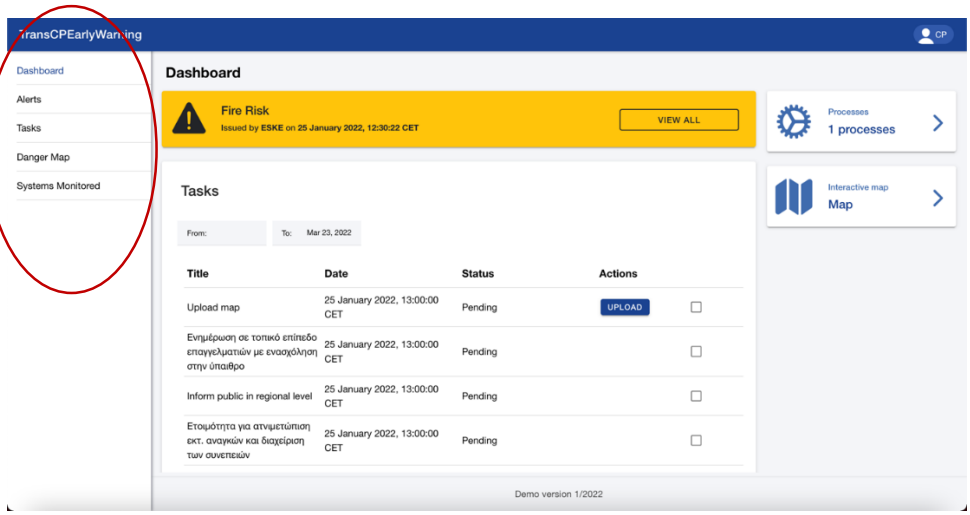


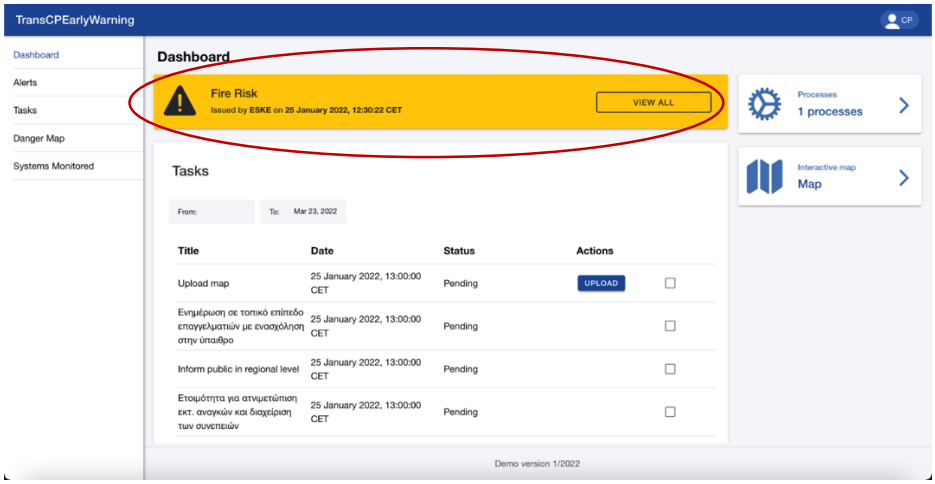
Figure 2: Dashboard Navigation Map

The TRANSCPEARLYWARNING platform has been designed with an eye on promoting user experience and providing easy access to the application functionality. A unified look and feel approach has been followed throughout the entire platform, with a standard layout adopted for all pages.

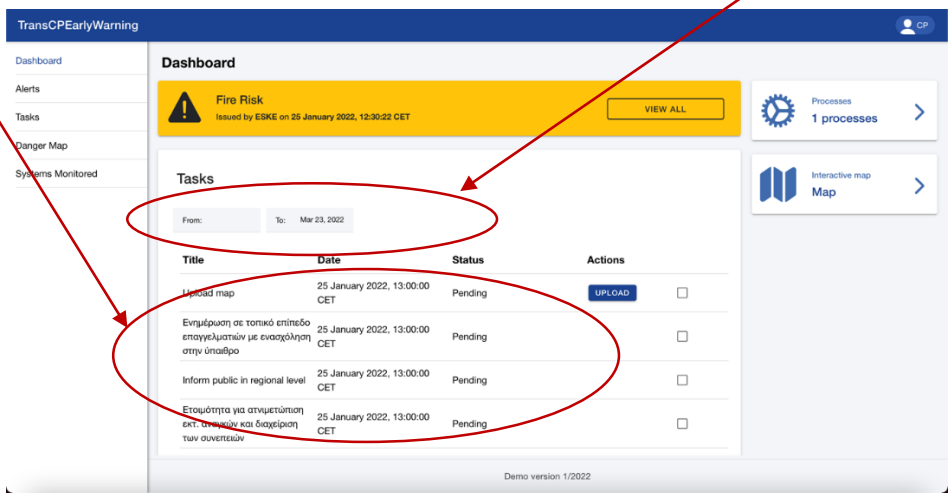
The **main menu** appears in a sidebar to the left of the screen, leaving the rest of the page for the main platform functionality.



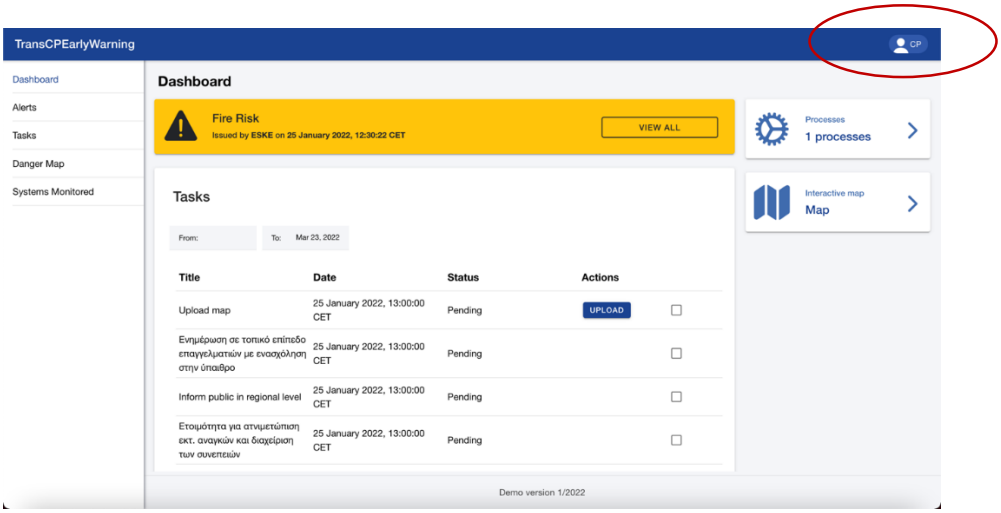
Critical areas that denote important **notifications** or tasks to be completed are represented in the form of cards and can be highlighted in color.



Multiple elements of the same type are always presented in a list in tabular format, with **action elements** like buttons and check boxes situated on the right. **Calendar functions** that allow filtering elements by date are positioned to the top of the screen where necessary.



Finally, the **user profile** section is situated on the top right corner as an icon that produces a dropdown menu when clicked.



The **user profile section** (***Figure 3***) provides the ability to configure users' personal information, such as first name, last name, password, and the language in which the user requires the platform to be translated. Users can modify their personal information through profile section or "logout" at all times. Although normal users can modify their personal information through profile section, more **vital modifications, such as the number of the platform modules visible to each user are locked features, are only available for modification to the administration users**.

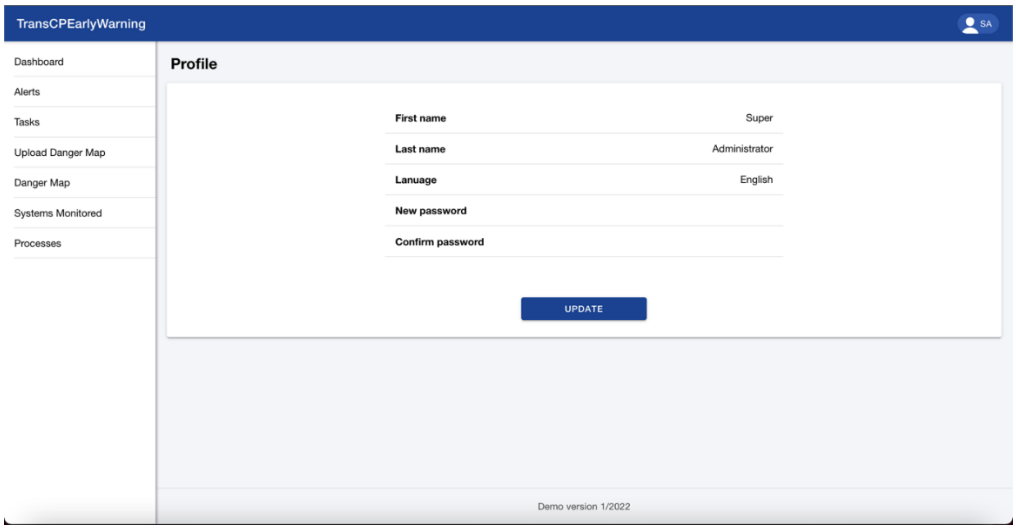


Figure 3: Users Profile Page

In addition, **the ability to create a new user account is granted only to the administrators of the platform.** An administrator can create, delete users, as well as give them access to the system modules that they are required to see according to their role in the hierarchical and administrative schema of the Civil Protection Early Warning system.

After the login, the administrator is presented with the main page which contains two specific widgets, the **manage user widget** and the **manage category widget**. The "Manage user" widget is used for deleting existing users. The "Manage category" widget is used in order to add or delete widgets in a specific category. The administrator has the ability to decide the widgets that each category contains. Depending on the country which the administrator is responsible for, a list of specific categories of users is available. By choosing a category, the administrator can add or remove widgets (from a list of available widgets) that the users of this specific category can view and use.

2.2. Dashboard Modules

Platform features are accessible through the side menu that contains all system modules in the form of cards. By pressing the desired card, the relative module is loaded and the user is presented with the appropriate content.

The following table provides information about the possible user actions and their results depending on the selected system module.

Description	Action	Target
Alerts - Fire Risk Notification	"View All" Button on card **or** "Alerts" on side menu	**Alerts** section
Tasks	"Tasks" on side menu	**Tasks** section
Danger Map	"Interactive Map" card or "Danger Map" on side menu	**Interactive Map** section
Upload Danger Map	"Upload Danger Map" Button **or** "Upload Danger Map" on side menu	**Danger map** section
Systems Monitored/ Monitors	"Systems Monitored" card **or** "Systems Monitored" on side menu	**Systems Monitored** section
Machine Learning Repository	"ML Repository" card **or** "ML Repository" on side menu	**Machine Learning Repository** section
Processes	"Processes" card **or** "Processes" on side menu	**Processes** section

Depending on their role (user group), users have access to different dashboards, which are described in the following sections.

This chapter describes the dashboard available to "administrators". The administrator dashboard page is available to users with elevated access privileges. It offers a holistic view of the TransCPEarlyWarning application, since the administrator has access to all modules of the platform.

In summary, the available modules are:

- Alerts
- Tasks
- Upload Danger Map
- Systems Monitored
- Processes

These are described in detail in the following chapters.

All the available functions are accessible to the user in two different ways, either from the left side menu, or from the available cards in the main body of the dashboard, as seen in Figure ***4***. This two-way access to functions was implemented with the aim of increased interactivity and faster response of the user to the task at hand.

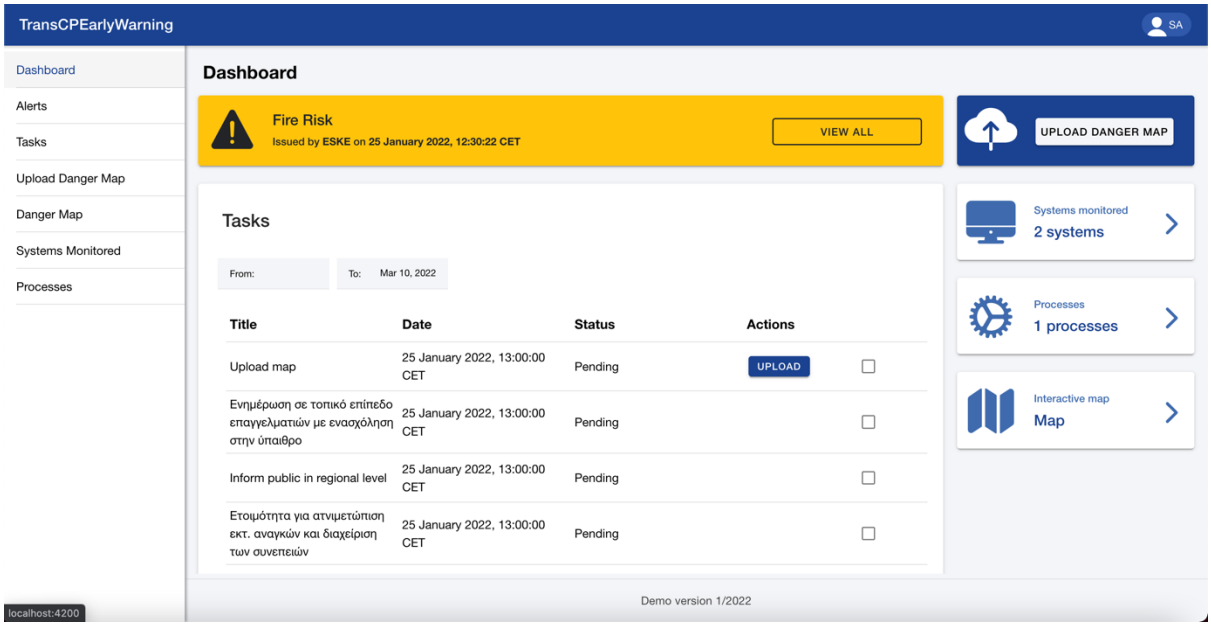


Figure 4: Dashboard Page

The user's menu is placed in the top bar of the platform. It is a pop-up menu, which provides access to profile information and to logout, accessible from the user icon in the top right corner (***Figure 5***). The administration feature leads to the enhanced user menu that allows administrators to add, remove and modify users and their privileges.

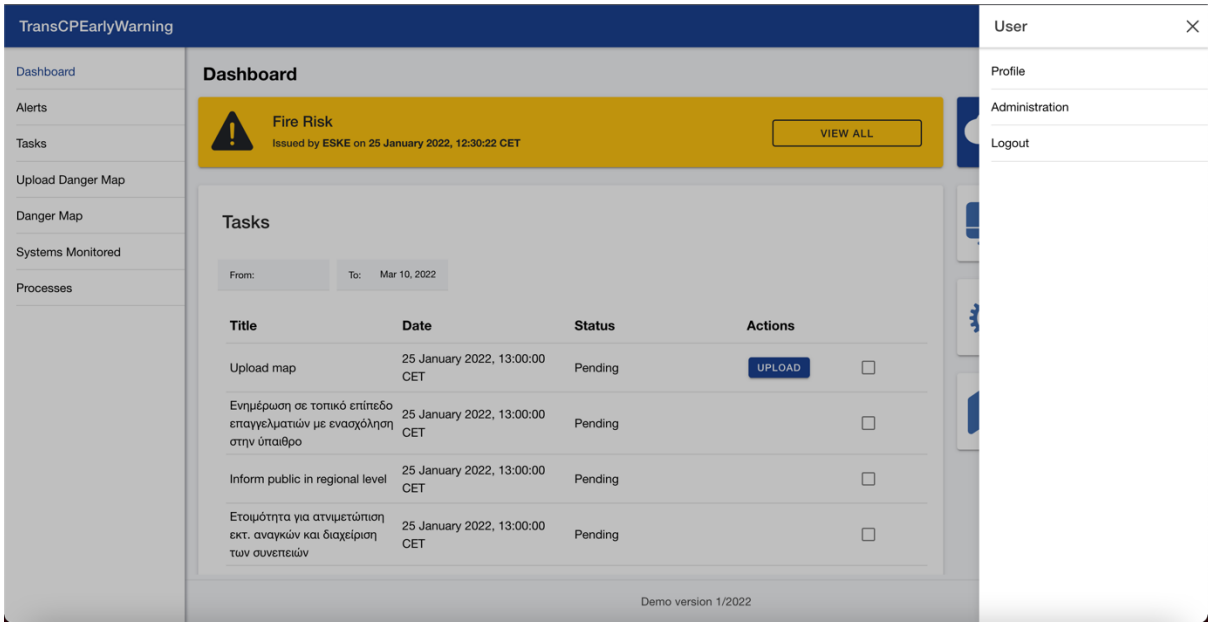


Figure 5 Figure Dashboard: User Menu

2.2.1. Alerts

The **Alerts** section provides access to one of the most important functionalities of the platform. This feature creates alerts and communicates them to the appropriate users. Alerts can be created either as a result of planned daily actions related to the planning and prevention early warning mechanism that is implemented for each partner, or of emergency events which require the immediate attention of the user.

The way this feature is implemented is that in each of the above cases, a yellow box will appear in a prominent part of the dashboard, on which the type of Alert, the organization that issued it and the date and time of issuance are displayed (***Figure 6***).

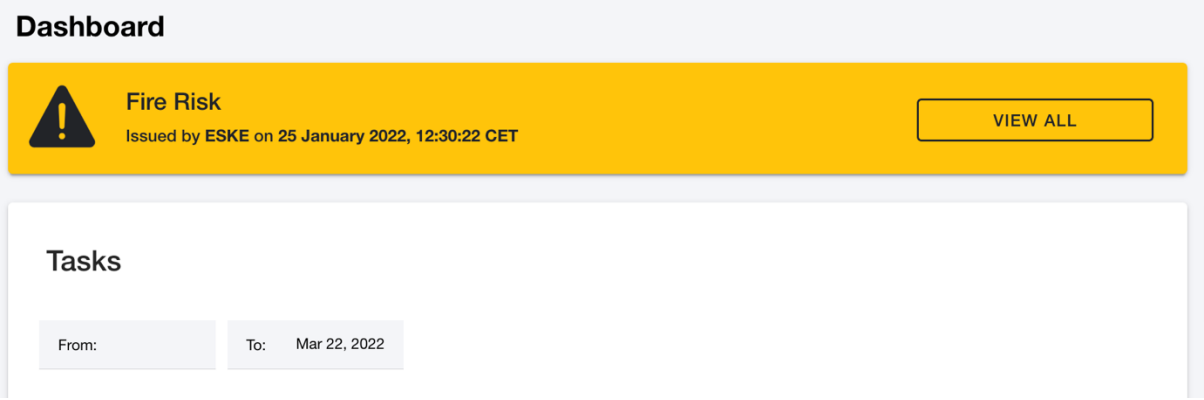


Figure 6: Alerts Card

After selecting the "View All" button, the user moves to the alerts tab (***Figure 5***). On this screen, the user can see all issued alerts, one per line. Alerts can be filtered by date issued by using the calendar option at the top of the list.

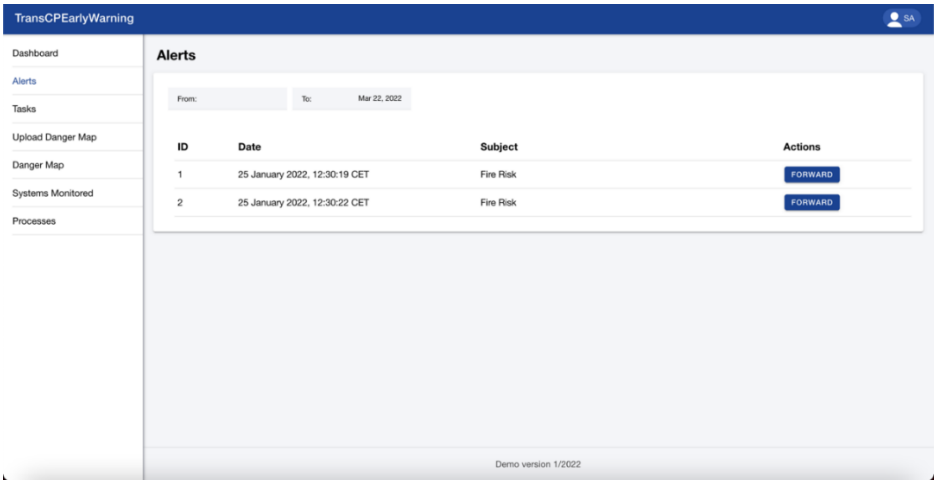


Figure 7: Alerts Page Navigation Map

The Alerts module (***Figure 7***) contains the monitoring and control functionality for the alerts produced by the system per participating country. **There are two options for the user at this point.** The actions available to the user on this page are explained in the table below:

Description	Action	Target
Calendar	Calendar module on top of the card	Allows user to filter visible alerts based on selected dates
Forward Action	"Forward" Button	Forwards the alert to a list of vendors that the user manually completes

The ***first*** involves checking the details of the alert by clicking on the corresponding line. This brings up the alert details page (***Figure 7***) where alert id, date created, sent and alert subject are displayed. There

is also information about whether the user has forwarded the alert to someone else and the contents of the alert message.

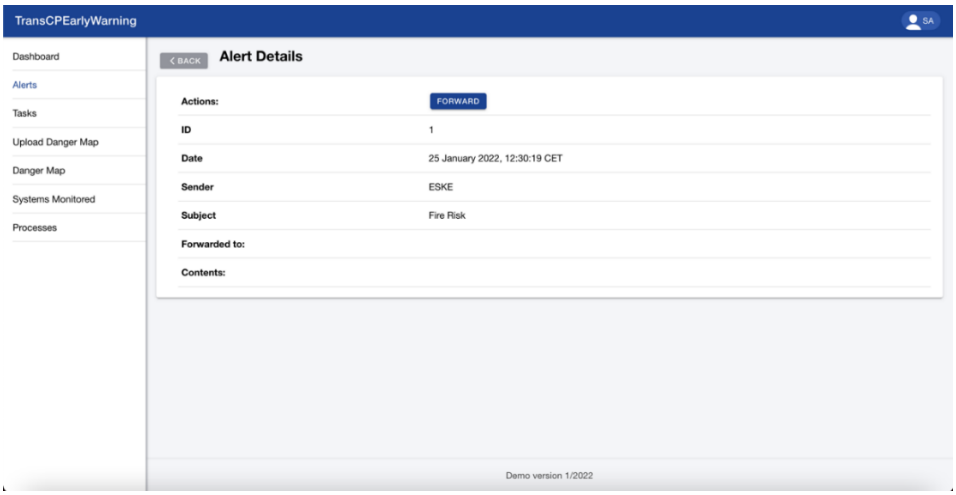


Figure 8: Alert Details Page

The ***second*** option available to the user is the forwarding of the alert to other entities and users in the system. This can be done either directly from the alert list by clicking the "Forward" button, or via the same button inside the alert details page. By clicking either button, the user is redirected to a pop-up modal that contains an input form called "Forward Alert" in which the list of recipients must be completed (***Figure 9***). The user must complete the form with the email addresses of the recipients, by inserting each email in a different line. Finally, clicking the "Send" button forwards the message to the selected recipients and updates the alert details page with the proper information.

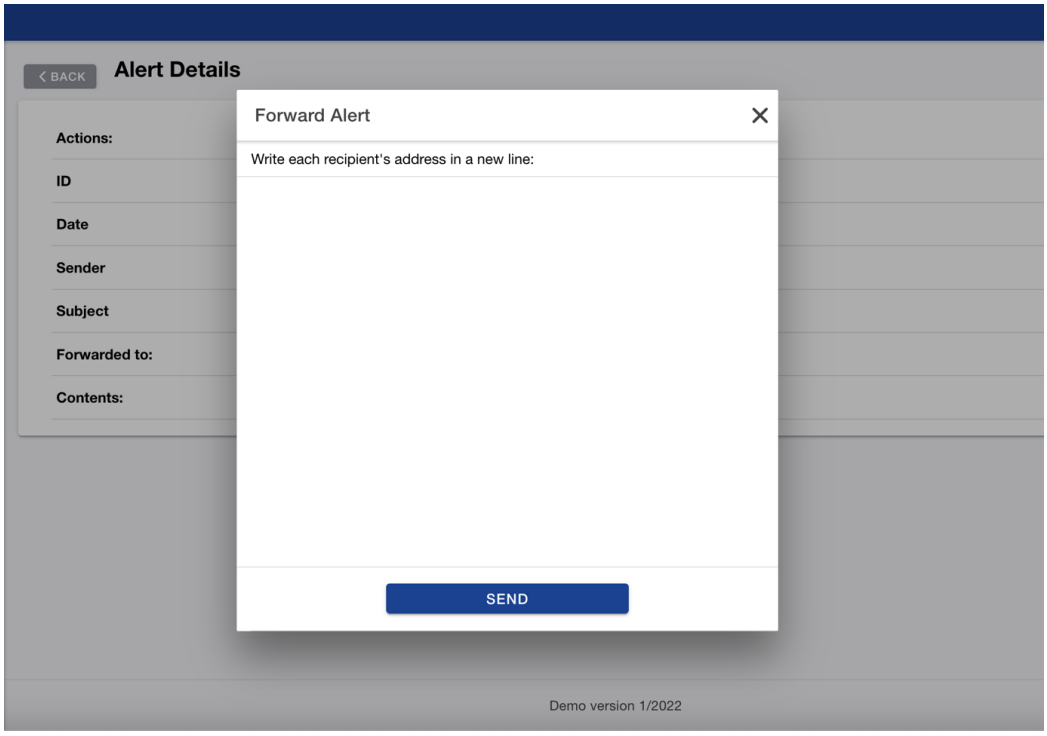


Figure 9 : Forward Alerts

2.2.2. Tasks

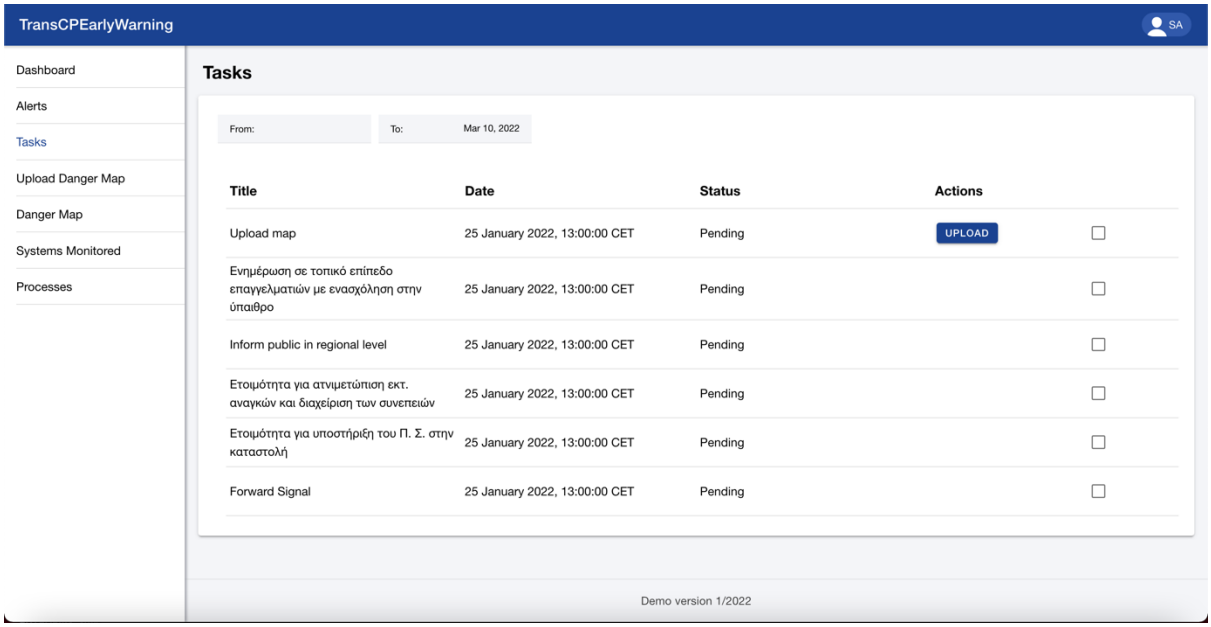


Figure 10: Tasks Page Navigation Map

The Tasks module concerns the set of manual tasks assigned to her / him by the systems administrator to achieve staff preparedness according to the action plan drawn up for each partner country. The tasks constitute the daily obligations of the user required in case of low risk and the emergency actions in case of high risk. The tasks module receives a daily list of tasks, either at a certain point in the working day or continuously as the mechanisms that send alarm signals provide information to the central administration.

From this screen (***Figure 10***), the user can see all tasks related to him, the date when the task was created and the task status. The tasks are displayed in calendar order.

The following table describes the cases of user actions.

Description	Action	Target
Task specific action	Corresponding Button in the Actions column	Corresponding section according to the action selected
Manual Confirmation of completing a task	Checkbox in right column	Manual Confirmation of completing a task
Calendar	Calendar module on top of the card	Allows past tasks to appear in the card

The tasks are all labeled as “User Tasks”, which means that they must be performed manually by the user in most cases independently of the services provided by the platform.

In case that some tasks require actions that can be performed through the utilities that the platform offers, a trigger button in the “Actions” column directs the user to the intended point of the platform

in order to perform the needed action. For example, in ***Figure 9*** above that presents a screenshot of the tasks section, a task that is the upload of the danger map, that can be performed by the platform, includes such an action button.

When a task is completed, the user manually notes the form field that denotes a task as completed.

In order to achieve control in past tasks, a calendar search has been implemented, which allows the user to view tasks that have happened in the past.

2.2.3. Danger Map

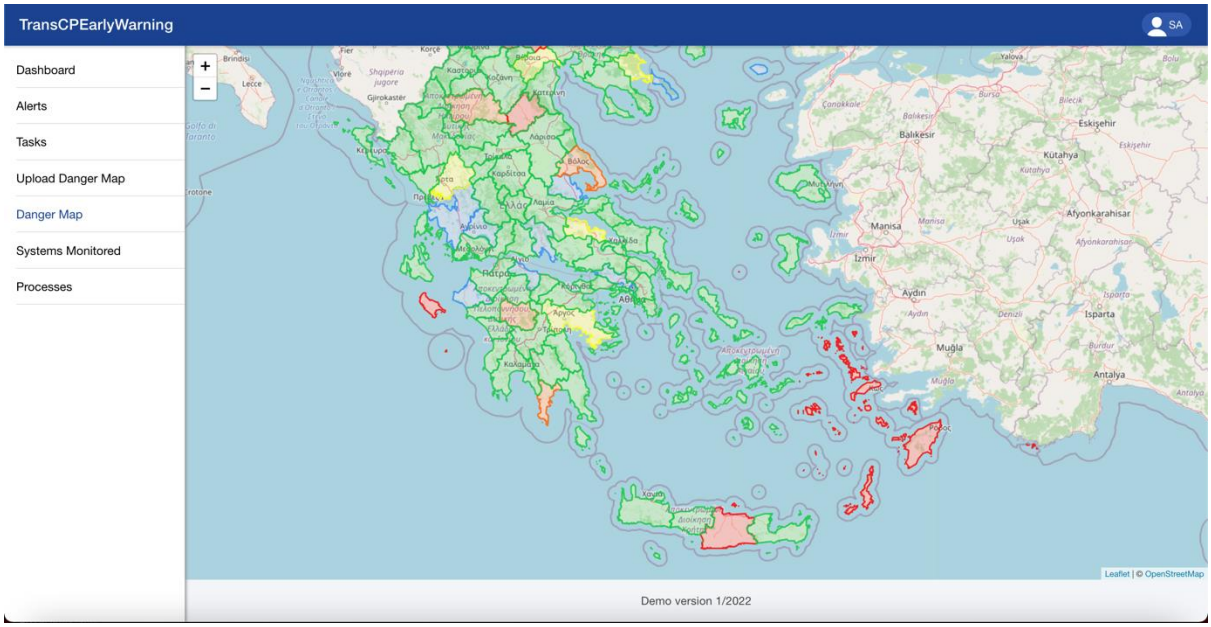


Figure 11: Danger Map Page (example for Greece)

Description	Action	Target
Interactive map	View Color Coded Regions according to the Fire Risk level	View Color Coded Regions according to the Fire Risk level

The "Danger map" module of the platform concerns a neuralgic process of the Early Warning system, which is the constant updating and display of the fire risk map in an interactive way, on the "interactive danger map". This map is included in the preparedness plan of each country. The map consists of colored tiles, where each color denotes the risk level for that particular area. The administrative units which are at low risk are painted green, while those which are at high risk are shown in red.

Figure 11 shows a sample fire risk map of Greece, color coded according to actual fire risk of each region, on that particular day. The different colors show the different level of risk, and therefore preparedness that authorities need to organize based on their operational procedures.

Depending on the country to which the current user of the platform belongs, access will be provided to the respective country risk map. The map is not designed to holistically display information but is targeted to the country of origin of the user. Thereby, the information displayed becomes more specific and the user is not confused with data that is not of interest to him.

2.2.4. Upload Danger Map

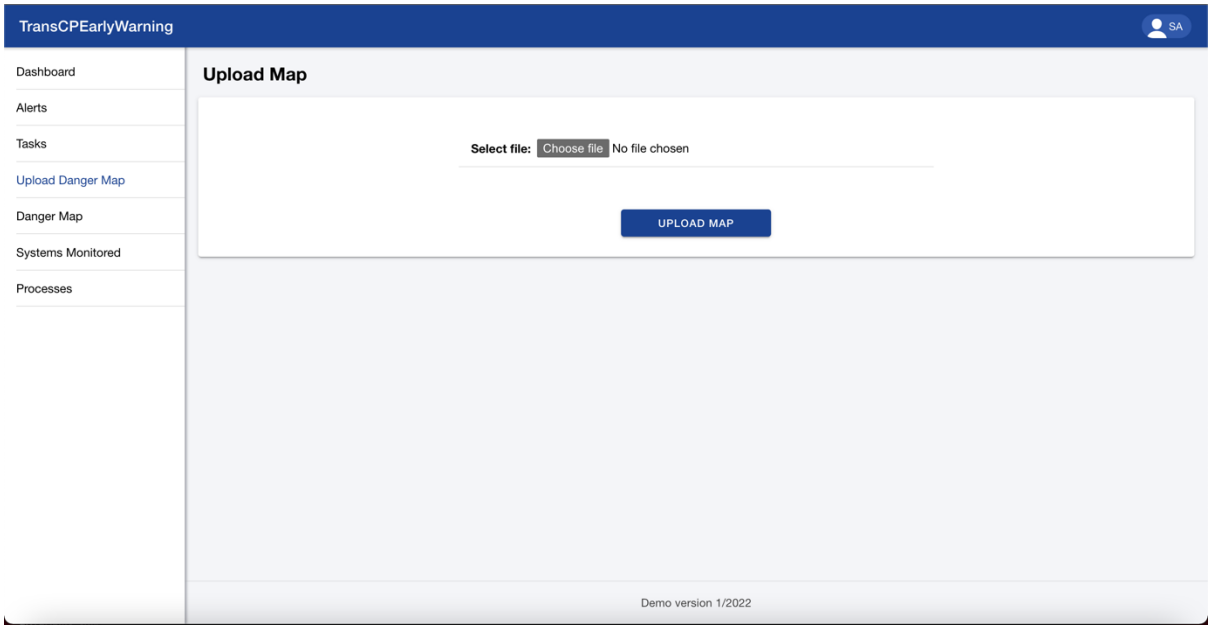


Figure 12: Upload Danger Map Page

The “Upload Danger map” module allows the user to upload a new danger map on the Platform. Thus, the process of updating the map is a 'user task', a process that must be done manually by the user of the platform who is responsible for this process.

The upload map section is accessible in three different ways, provided that the user has access to it:

1. through the side menu of the main screen,
2. through the display card in the main dashboard,
3. through the module 'Tasks', from the action button that appears in case one of the classified tasks is the refresh of the map.

User actions are detailed in the following table.

Description	Action	Target
Selection of Map	“Choose file” Button	User chooses the map that the administrative authorities have produced for the specific day that needs to be uploaded on the platform
Upload Danger Map	“Upload Map” Button	Uploads the map to the platform

The body of this module contains a straightforward upload form. The file that contains the map is either selected by the user and dropped inside the body of the form, or a pop-up window appears with the user's local files, from where the user must navigate to and select the appropriate file. By pressing the “Upload Map” action button, the uploading process of the file is initiated ***(Figure 11)***.

2.2.5. Systems Monitored

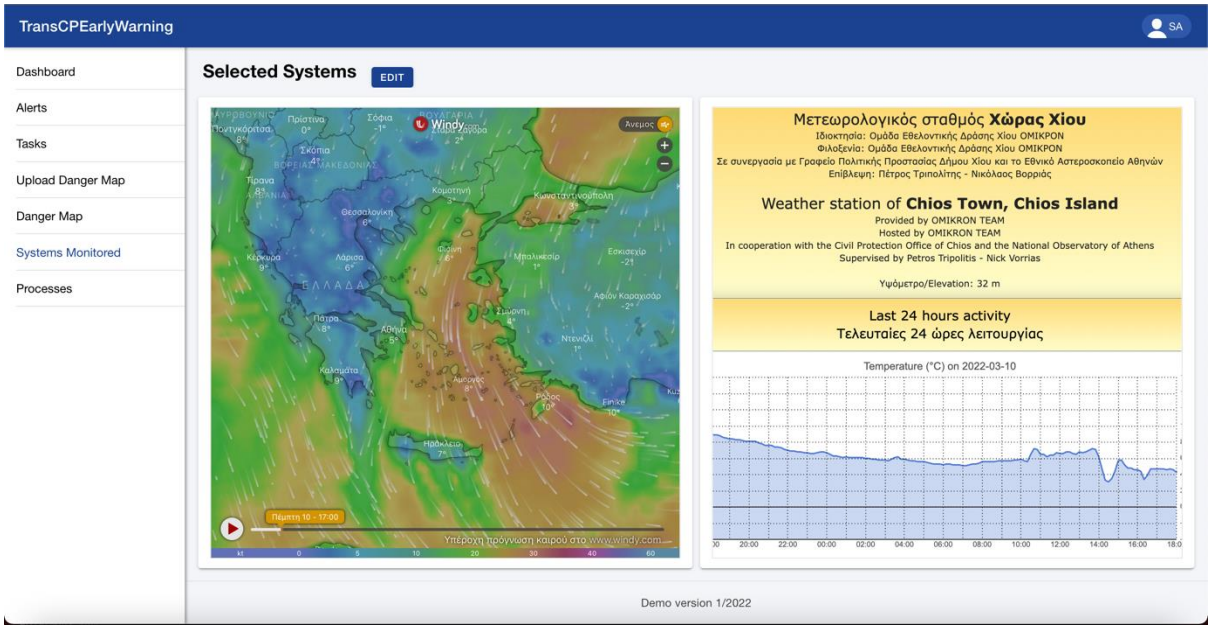


Figure 13: Systems Monitored Page Navigation Map

The “Systems Monitored” module of the platform, presents a series of different forecasting systems, integrated in the TRANCPEarlyWarning platform in order to facilitate the work of users. It shows the selected sets of emergency monitoring tools and helps the user combine all necessary information in order to determine the criticality of the situation. The different forecasting systems used by each country were collected by the project partners. Depending on the user’s country of origin, the corresponding systems are presented as in ***Figure 12*** for the case of Greece.

The set of user actions are described in the table below.

Description	Action	Target
Edit selected systems	“Edit” Button	**Addition** or **Removal** of monitoring tools, according to relevancy or user needs

Each tab is dynamic, meaning that if the selected monitoring system can be interacted with, the user has direct access to this feature without the need to go to any external web page.
A predefined set of tools is supplied to users on their first use of the platform, but users can easily add or remove certain tools and customize their user interface according to their needs. Since TRANSCPEARLYWARNING addresses the country-wide preparedness mechanism, it has monitoring systems which are oriented to monitor small areas or specific administrative units with great precision. These elements are available to system users, who can add or remove the displayed monitoring systems based on what is needed for their area of interest. By clicking on the “Edit” button on the top of the screen, the user is redirected to the "Edit Systems Monitored" section, where a list of integrated systems is presented. Selection of desired systems is performed via the check boxes in the right column, and validation of this choice is done by clicking the “Update” button. This action immediately refreshes the Systems Monitored page with the new user choices (***Figure 13***).

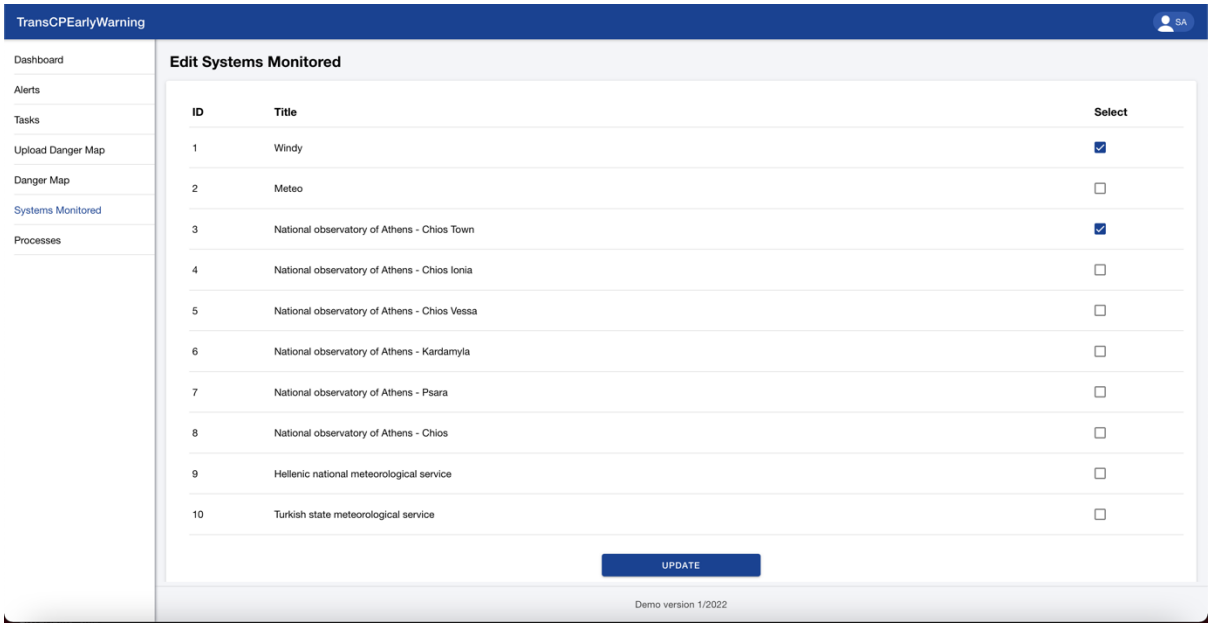


Figure 14: Edit Systems Monitored Page

2.2.6. Machine Learning Repository

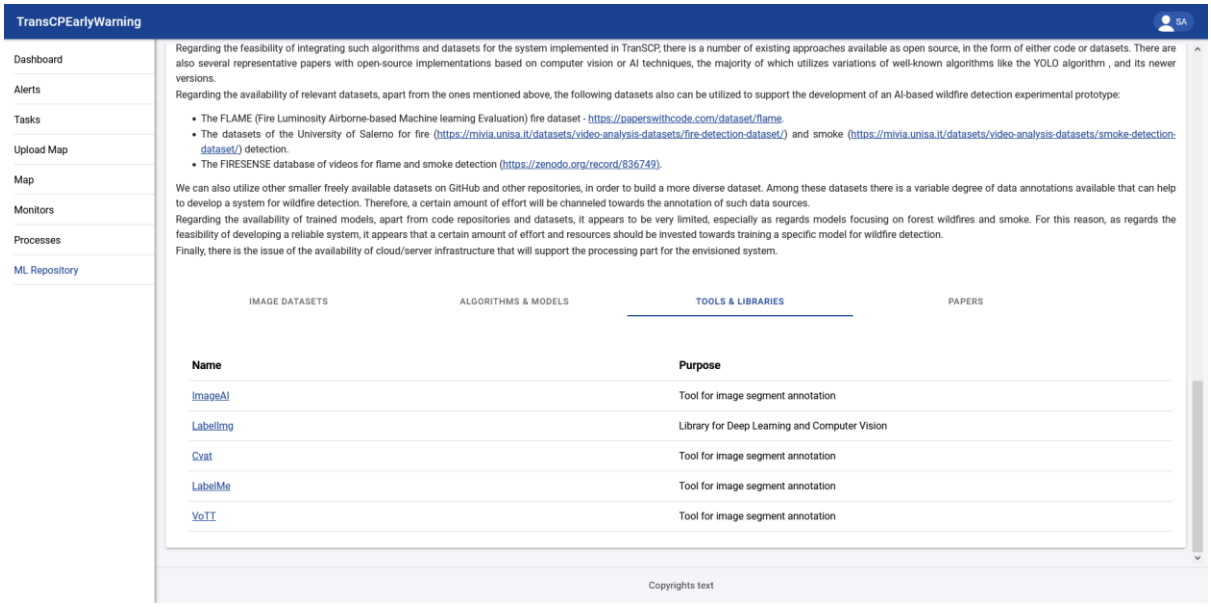


Figure 15: ML Repository Page Navigation Map

The "Machine Learning Repository" section (***Figure 15***) provides a brief explanation to the user about how Artificial Intelligence and Machine Learning is utilized in the field of early wildfire detection and alert creation through an automated procedure. The goal is to present the Early Warning Platform user with detailed information on the contents and provided services related to fire prediction analysis. The Platform provides several resources that can be used as a starting point for experimentation, as well as a set of tools, algorithms, datasets and papers that have been utilized to create the ML experimentation module.

The presented tool has two sections:

- the Fire Detection Repository
- the Fire Detection Tool

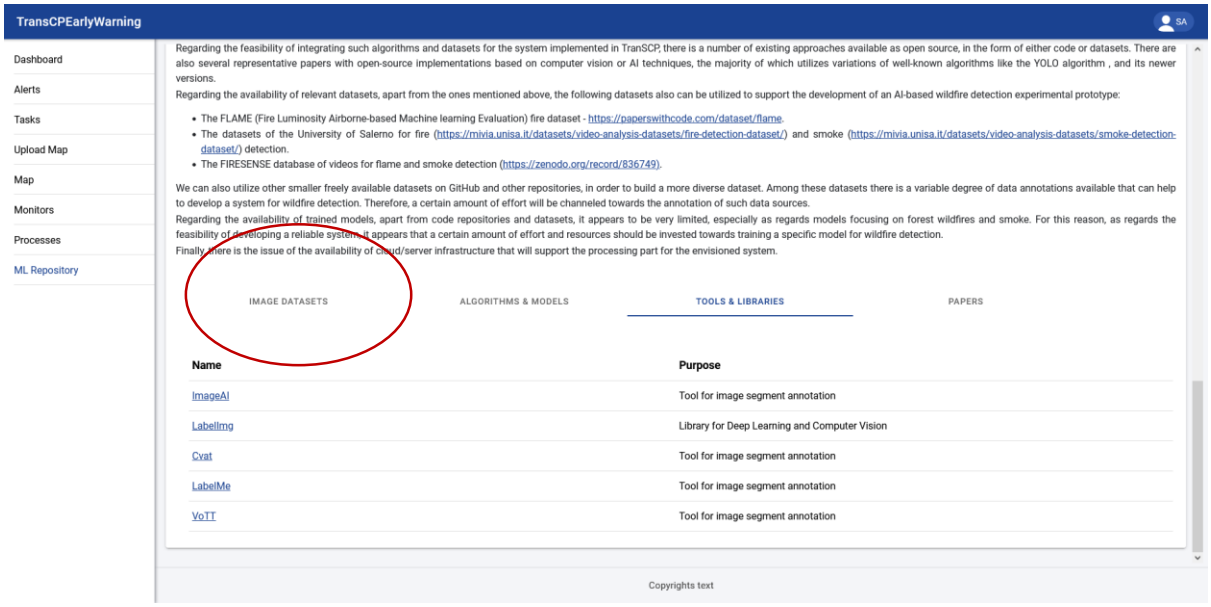
The first section of the fire prediction analysis component is the repository that presents gathered data on the different necessary components of the presented tool. The user can navigate through the repository and obtain valuable information on the components of an Early Warning Fire and Smoke Detection System.

To create a Fire Detection System specifically targeted towards wildfires, several components are needed. Moreover, a successful model needs extensive research to gather information and best practices from already deployed applications. In this section of the platform, the user can have direct access to an assortment of information that was gathered and evaluated as useful during the creation of the Fire Detection Tool.

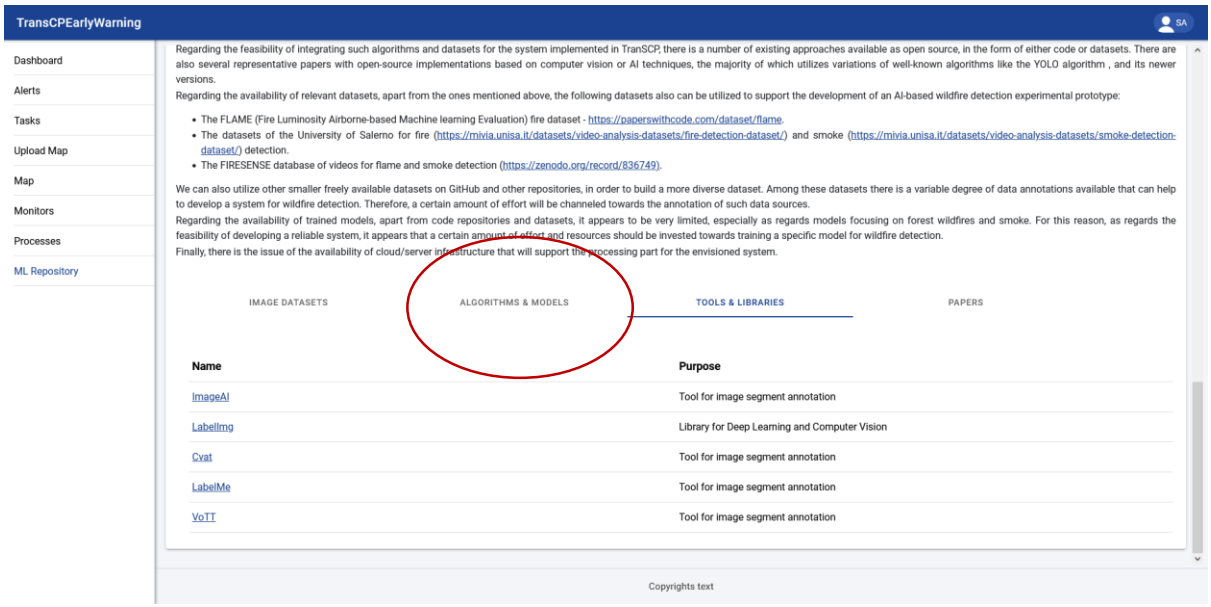
A detailed explanation of each repository section is provided below.

Description	Action	Target
Image Datasets	"Image Dataset" Tab	**Provides** a list with the image datasets used to train a fire detection model in the TRANSCPEARLYWARNING project
Algorithms and Models	"Algorithms & Models" Tab	**Provides** a list with the Algorithms and models used in the TRANSCPEARLYWARNING project
Tools and Libraries	"Tools & Libraries" Tab	**Provides** a list with the Tools and Libraries used in the TRANSCPEARLYWARNING project
Papers	"Papers" Tab	**Provides** a list with published scientific papers that contain information on Machine Learning implementations in fire detection

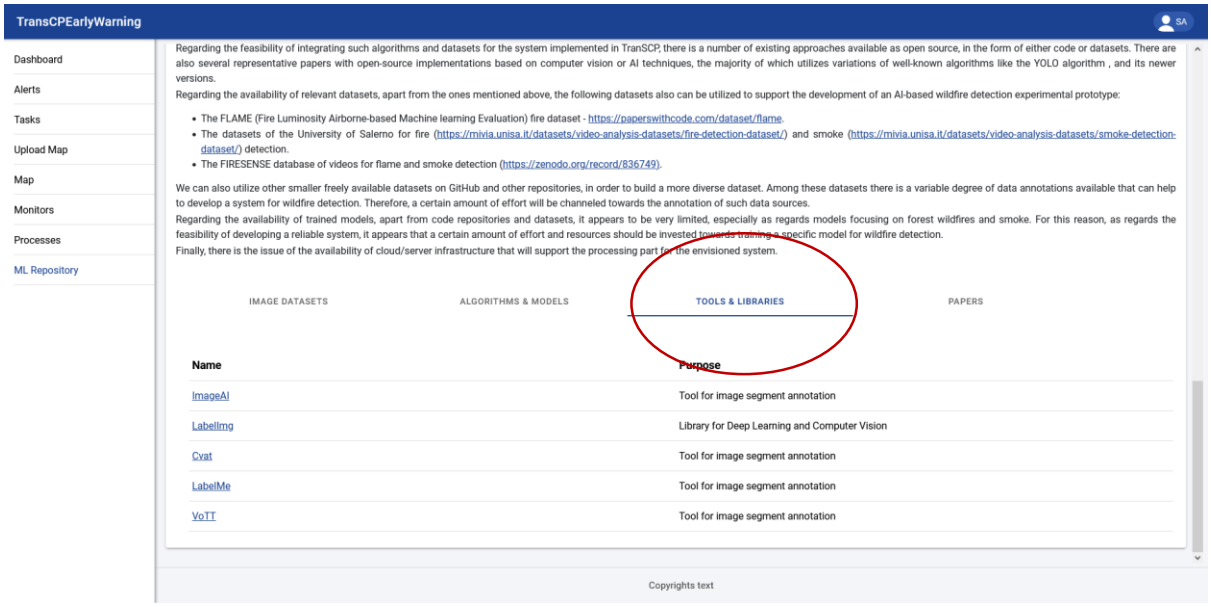
Datasets that depict the actual item that needs to be detected. In this specific case, the most useful datasets of images depicting wildfires and smoke from wildfires were gathered and presented to the user.



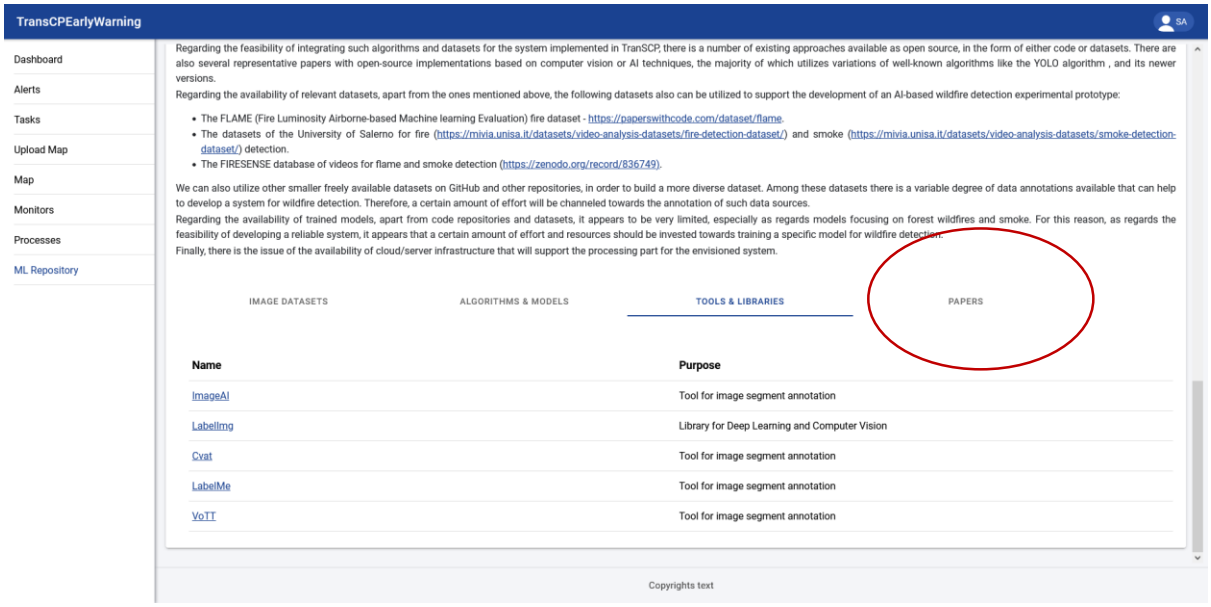
Specific **algorithms** are used to achieve the classification of images into ones that contain fire and smoke and those not. Throughout the years of research, some algorithms have stood out as more successful in image classification. We have selected the ones used most extensively in the field of fire and smoke detection. The use of an algorithm leads eventually to the creation of a model that is used to perform the actual object detection. Available models are also presented to the user as a starting point for the generation of a successful model for wildfire prediction.



Another key component is the use of the correct **tools and libraries** that are used to either prepare the dataset or to train the model by using the selected algorithm. The most useful free to use tools have been selected from the total assortment of available tools. Also, the user is presented with useful programming libraries which make model training easier and provide a wealth of specific capabilities to the programmer.



Finally, a limited **literature review (Papers)** is presented, focusing on different use cases that include data from static ground-based cameras, aerial images from drones and UAVs and satellite imagery. Each paper highlights the different approach followed based on the type of data available to achieve a successful prediction model.

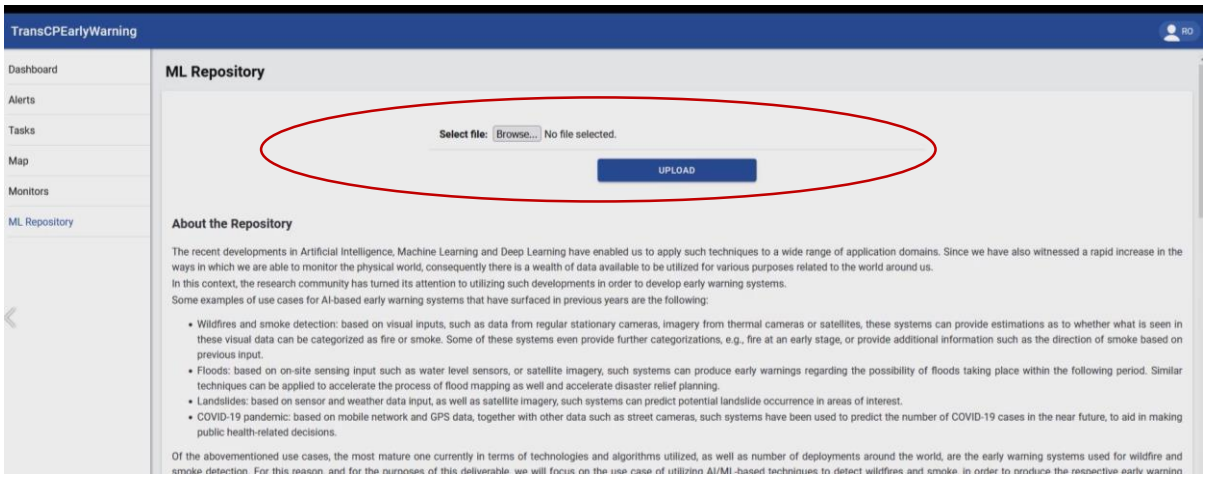


Fire Detection Tool

The second section of the Fire Prediction Analysis platform showcases an actual model that can predict wildfires through flame or smoke detection. The user can choose the type of input that will be given to the system for detection. Two types of input are accepted, either an image or a video. The user uploads the desired input to the platform and presses the corresponding button so that the model can categorize the image as either containing fire, or smoke or neither of the two.

The output is always of the same type as the input. In the case of video input, analysis is performed on all frames. Each frame or image is returned with the appropriate segmentation, meaning that it is divided into sections delimited by bounding boxes that denote either fire or smoke. The name of the

detected element is written on the top right corner of each box, along with the detection probability as given by the model. The detection probability is a metric that shows how confident the model is that the shown object belongs in the provided class of fire or smoke. The user can finally download the output of the tool, by pressing the download button.



The following paragraphs describe the process behind creating a custom deep learning model that can be used for fire and smoke detection. This can be used as a guide for users that either want to enhance the model or train a new model that can detect something similar.

The main components that are needed for training a model are the following:

- the detection algorithm
- the correct dataset of images
- tools for image processing
- the required hardware infrastructure
- a model that will be used as the basis for training
- software libraries that handle the training process

The first step in the model creation process is the selection of the algorithm that will be used for the training of the detection model. YOLO is one of the most popular algorithms used for image classification and segmentation, appearing in numerous papers and studies. There are two approaches when training a deep learning model: training from scratch or using transfer learning on a pre-trained model. The latter one is faster and presents the user with a lower level of difficulty, so it was the selected approach for the needs of this project. The difficulty lies in finding a pre-trained model on the detection classes that we want to use. There are but a few pre-trained models on fire detection, therefore one of them was used. The model can be found in https://github.com/OlafenwaMoses/FireNET.

Transfer learning can be applied on an already trained model by re-training it on a new dataset. Special libraries can be used to achieve this. The process is made simple by calling the predefined functions of a particular library like the one used in the project (ImageAI).

The most important part of a successful model training is the use of a correct dataset. The dataset needs to be large enough to achieve respectable results. In fact, the more difficult the detection of the intended objects is, the larger the database of images we need to use. To achieve this, several small datasets were used and unified into a large one, containing images of forest fires and smoke.

Correct preparation of the dataset is also crucial. When image segmentation is the intended output of the model, meaning that we need an output that shows the position of the detected object on the initial image, the training input needs to be correctly annotated. Annotation is the process during which the user manually draws bounding boxes that contain the object that needs to be detected. This is done using free software tools, like LabelImg.

After this process is completed the model training commences. The output of the training process is a model which can then be used to detect fire and smoke on any provided image or video. Several rounds of training may be needed before a satisfactory result is achieved.

The actual training of the model, as well as its use for detection, requires a certain infrastructure to operate in a satisfactory time frame. The proposed algorithms are GPU based, so graphics cards have to be used to achieve the intended results. This can be done either on a dedicated server, or on a cloud-based service that offers a GPU runtime.

The proposed process has been implemented as part of the creation of a ML (Machine Learning) repository for wildfire detection. All information and resources needed are presented in the platform repository section.

2.2.7. Processes

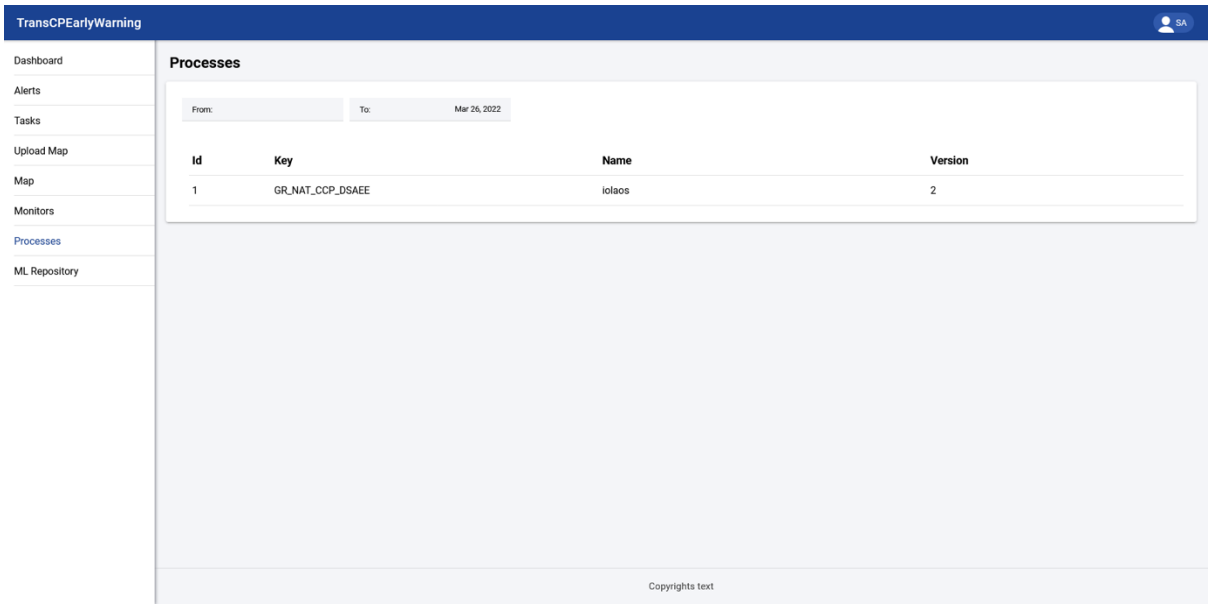


Figure 16: Processes Page

The "Processes" module of the TRANSCPEARLYWARNING Platform offers the user with the ability to visualize the business processes of the respective country Civil Protection Unit that depict the actions and actors involved in the daily plans of each country (***Figure 16***). Then, the user can select a process by clicking on the process line and inspect the business process diagram (***Figure 16***).

Description	Action	Target
Select process	Select any of the available processes	Visualization of the process through a BPMN diagram

Calendar	Calendar module on top of the card	Allows past processes to appear in the card

This is simply a visualization of the process and the user cannot directly interact and modify the diagram[1].

A calendar feature is also available in this module and allows the user to observe past processes, if any.

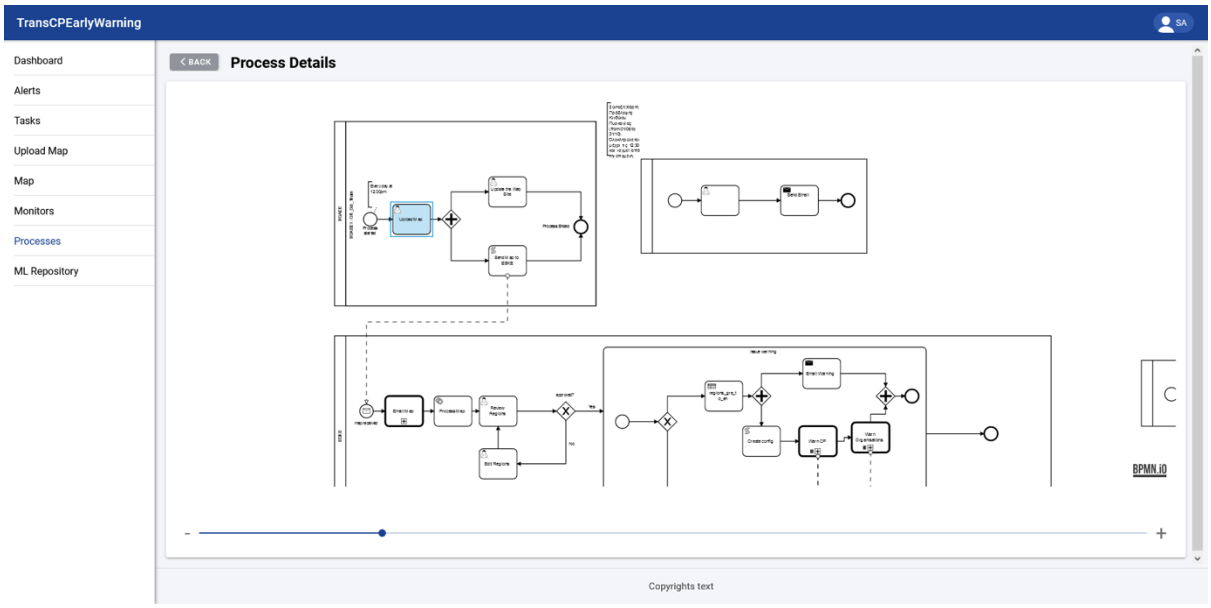


Figure 17: Business Process Details

1 Modification is only available for selected users through the Camunda modeler, which is the tool that is used to produce the business processes for the platform.