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Document Information

Title	**A4EU prototypes (A4Lig, A4Cat, A4CENEM, A4Nor, A4Finn, A4Alps, and A4Cor): final versions and performance assessment with focus on the comparison between the different A4EU systems' capabilities and functionalities**
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Related Documents:

This report and others are available from the ANYWHERE Project Website at: http://www.anywhere-h2020.eu/

Abstract

The objective of this document is to provide a detailed description of the final versions of the different A4EU prototypes focusing on the comparison of the different systems capabilities and functionalities.

The information herein is based on the inputs provided by developers (CIMA, HYDS, AIRBUS and PREDICT) after having worked with the different pilot sites to develop prototypes for Decision support in Emergency Management Operation Services for weather and climate induced hazards.

The document is structured in different blocks. Seven of them (§2 to §8) are dedicated to describe one by one the different prototypes and their implementation of each of the pilot sites – Liguria (Italy), Catalonia (Spain), CENEM (Spain), Rogaland (Norway) South Savo (Finland), Canton of Bern (Switzerland) and Corse (France). The last two sections are dedicated to provide a general overview of the different prototypes giving specific details on their integrated features and capabilities (§8) and the conclusion of the report (§9).

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1 Introduction

The WP4 main goal is to design a common ANYWHERE platform for Decision support in Emergency Management Operation Services for weather and climate induced hazards (A4EU, formerly named A4DEMOS) that could be a general solution for providing support to any emergency management centre in Europe. At the same time, it needs to be easily customizable to the local needs, and adaptable to the local data availability with the purpose of being a powerful support tool in the decision-making process during (and before) weather induced emergencies.

The chosen strategy has been to develop different operational prototypes of the A4EU concept to be implemented, tested and demonstrated in the pilot sites during the project operational demonstrations having the same basic objectives:

- Enable integration of forecasts and hazard impact indicators provided by the MH-EWS service platform (WP3) and local risk and vulnerability analyses, open and commercial data, local sensor data, crowdsourced data and social media information, for monitoring and decision-support during emergency management.
- Propose adapted solutions to the local requirements, being able to build on or to interface with the present legacy systems through standardized interface layers and through offering specific “plug-ins” and toolkits to support integration and sharing of data.
- Be able to provide the products of the MH-EWS to any emergency management command centre to support decision making during weather-induced emergencies. To that end, the lessons learnt in the implementation on the 7 pilot sites, will be used to prepare a final version able to be easily deployed in any new location (“anywhere” in Europe).

One main requisite is that the A4EU system should be designed to be locally customizable and proactively targeted to the needs and requirements of the users and designed to maximize the exploitation and market uptake potential of the results of the ANYWHERE innovation action.

A4EU prototypes provide User Oriented Data to the End Users, output of A4EU processes that use Impact Products and Local Data as input. The User Oriented Data presents pertinent information in a human readable way. Thus, it combines images, graphics and text.

Each prototype has been therefore developed, following the co-creation and co-ownership philosophy promoted in WP1, with closed implication of its corresponding pilot sites (including inputs form managers and operational of the emergency command centres) to make sure that their operational needs were taken into account as much as possible during the design and development of the tools.

In addition, it shall be highlighted the fact that, due to the built-in customisation capabilities of the A4EU platforms, it has been demonstrated their capacity to be able to integrate a variety of sources of information and visualisations, which enable them to be adapted to different scopes (local, regional, national, continental) and to expand its use and implementation "anywhere" in Europe (and also beyond). Examples:

- The platforms by CIMA and PREDICT, were systems already operating at national level and have demonstrated to be able to successfully integrate Anywhere's products at regional level.
- The platform by AIRBUS has demonstrated its adaptability by being developed involving regions from three different countries.
- An additional prototype (the 7th, not foreseen initially) has been deployed during the Anywhere project at the CENEM (Spanish Emergency Control Centre) by HYDS widening the scope of Anywhere's products to manage a whole country.

On this deliverable, the developers (CIMA, HYDS, AIRBUS and PREDICT) describe each of the A4EU prototypes and provide a comparative table of the different system functionalities and capabilities. The developers focus on explaining which solutions have been developed to integrate forecasted hazard impact indicators provided by the MH-EWS service with the local requirements expressed by the end users.

The document is organized in a few main chapters describing the features and capabilities associated to each Pilot site where the Prototypes have been deployed.

The different A4EU prototypes and their associated pilot sites are:

- A4EU by CIMA:
  - Pilot Site Liguria (Italy) – A4EU-A4Lig.
- A4EU by HYDS
  - Pilot Site Catalonia (Spain) – A4EU-A4Cat.
  - Pilot Site CENEM (Spain) – A4EU-A4CENEM.
- A4EU by AIRBUS

    - Pilot Site Rogaland (Norway) - A4EU-A4Nor.
    - Pilot Site South Savo (Finland) - A4EU-A4Finn.
    - Pilot Site Canton of Bern (Switzerland) - A4EU-A4Alps.
- A4EU by PREDICT
    - Pilot Site Corsica (France) - A4Cor.

Each pilot site chapter is divided as follows:

- Detailed description of the A4EU system and functionalities related to the Pilot site:
    - System→ Description of the prototype's systems and architecture.
    - Functionalities→ description of the prototype's functionalities focused on user experience and aid to the decision.
    - Toolkits→ Description of the available toolkits accessible via the prototype.
    - Products→ Description of the weather forecast and hazard products (MH-EWS and/or local) available in the prototype.

The final chapters are dedicated to highlight the features and capabilities of the different prototypes in a summarized manner (tables) and the conclusions of the report.

2 A4EU at Pilot Site Liguria (Italy) – A4EU-A4Lig. Responsible Partner: CIMA

The system has been developed by CIMA Foundation and is technically and operationally certified.

The application provides, through a graphical interface, high-resolution and continuously updated information, allowing the user to monitor weather events, to build detailed risk scenarios and evaluate the potential impact of the phenomena on communities and infrastructures.

The system allows each computer connected to the Internet the use of the integrated data, regardless the provider. The application manages, in fact, both the data provided by the ANYWHERE MH-EWS, by local data providers (Italian Civil Protection, ARPAL and CDG-Municipality of Genoa) and can integrate the territorial and geospatial data published as WMS services by other platforms.

The system is able to load and display geo-referenced static and dynamic layer, and allows the end users to browse the values of each gauging station (only for the data provided locally) and other more advanced observational tools, offering the interactive tools and features for the analysis of ongoing and past events.

2.1 A4EU-A4Lig operational system description

2.1.1 System

The A4Lig system can be accessed at http://mydewetra.cimafoundation.org through the most common web browsers (the current version is optimized for Google Chrome). The application proposes a login form in which it is necessary to introduce user's account details (as provided to the user partners) and click on the button LOGIN: once the password is entered, press the "Enter" button. **¡Error! No se encuentra el origen de la referencia.** shows a screenshot of the main page as currently structured.

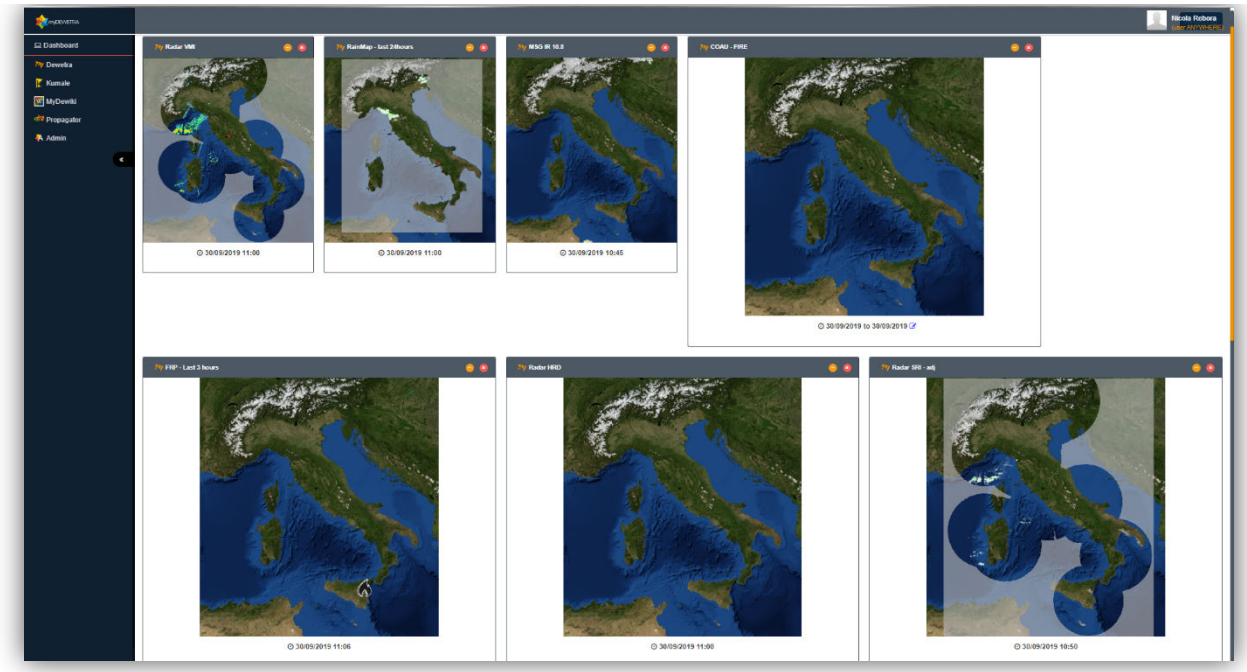


Figure 1. A4Lig-Dewetra main menu, shows at a glance the main products selected by the user.

Product visualization rights depend on the user. The ANYWHERE partners are allowed to see all the products available within A4Lig also these specifically designed for the Liguria pilot site.

The user is then prompted to the next tab in which the applications available in the portal are shown. A4EU-A4Lig is based on Dewetra 2.0. To enter Dewetra 2.0 users may click either on the icon (a black "W" on orange background) in the displayed widgets regarding some of the available Dewetra 2.0 layers (e.g., Radar VMI, MSG 10.8, Radar SRI).

In the upper-left sidebar menu, you find:

- Dewetra (main tool)
- Kumale (a web tool to communicate with the other user and with the system developer/manager)
- MyDewiki (user guide)
- Propagator (allow for the access to the Propagator tool)
- Admin

Once accessing to the Dewetra menu, the main system interface is shown (see **¡Error! No se encuentra el origen de la referencia.**).

Figure 2. The A4Lig-Dewetra main menu showing the main functionalities: 1) Control Map; 2) Toolbar; 3) Display; 4) Layer List; 5) Additional Tools.

The user can select products from Pan-European to local scale available both trough the MH-EWS and from local sources, in a seamless way. The user can select and upload together on the screen as many product layers as needed in order to cross and compare the different information available.

2.1.2 Functionalities

As shown in **¡Error! No se encuentra el origen de la referencia.**, the system main functionalities are:

- Control Map;
- Toolbar
- Display
- Layer List
- Additional Tools

2.1.2.1 Control Map

The Control Map of the application is managed by the open source Java script library Leaflet. The control is instantiated as the system is started, using the Google Hybrid map provided by Google-Maps services as the background layer. The available background maps are:

- Google Map: consists of the world political map, toponyms are shown with respect to the zoom level;
- Google Satellite: consists of the world's physical map obtained from the composition of high-resolution satellite images;
- Google Hybrid (default): represents the combination of the two aforementioned maps.

In addition to these main options, the user can upload every background map released by open source consortia (eg., OpenStreetMap) such as Standard, Cycle Map, Transport Map, MapQuestOpen, Humanitarian, etc.

The user can select the background map by moving the cursor on the action button located in the lower right of the screen, shown in the following figure:  .

¡Error! No se encuentra el origen de la referencia., shows an example of background map with a product of the ANYWHERE MH-EWS.

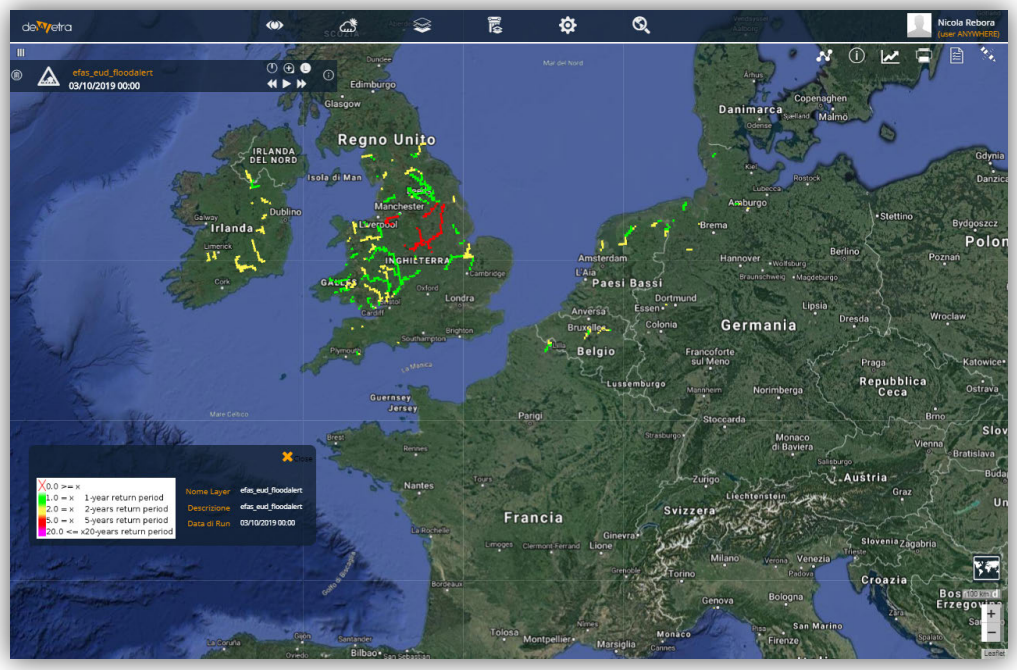


Figure 3. Example of Google hybrid background map with one of the MH-EWS products (EFAS flood alert).

It is possible to pan the map by clicking the left mouse button and dragging it to the desired direction. The zoom level may be controlled:

- using the mouse wheel (scroll forward: increases level of zoom / scroll back: decreases zoom level)
- by holding down the SHIFT key on the keyboard and drawing a rectangle with the mouse, holding the left mouse button clicked. In this way, the zoom will be related to the selected area
- by the combination of CTRL and + buttons (Zoom In) or CTRL and - (zoom out)

2.1.2.2 Toolbar

The Toolbar contains many action buttons, depending on user's profile, like the following:

- **Observations**: is the section dedicated to observational data and diagnostic models (available both trough the MH-EWS and local data providers)
- **Forecasts**: lists all the available forecast products (available both trough the MH-EWS and local data providers);
- **Static Layers**: provides all the information needed to design a comprehensive risk scenario such as the exposures or the hazard maps;
- **Events**: is the category that groups all the layers concerning disasters happened in the past such as floods, earthquakes, fires, etc.
- **Tools**: enables some ancillary functions such as Add a WMS, Anywhere Impact tool, Risk Scenarios. In
- **Search**: is the tool allowing the users to search for any element visualized by the platform such as weather stations, toponyms, specific MH-EWS and local products.

Figure 4. The system toolbar with the 5 main menus used for showing the products and tools available within A4Lig-Dewetra.

The system allows to select as many layer as needed and show them together allowing to use the on/off and opacity features in order to combine them.

Specifically, each layer presents a menu, that can be activated by clicking on the layer name (in orange), containing an information pop-up with a brief explanation about the product (in the selected language – English, Italian, and Spanish).

The layer menu also contains:

1. a layer property sub-menu that allows to choose the specific variable to be displayed (some layers may contain different variables) and the reference date of observation/forecast.
2. an animation button to launch the timeline application;
3. an on/off button to show/hide the specific layer;
4. an opacity setter;
5. a download button to download the layer (if available in the system and not through a WMS server).
6. a “refresh layer” button,
7. a “trash bin” button to remove the layer.

Figure 5. Example of a layer menu of a FORECAST product with the buttons for changing the visualization options.

2.1.2.3 Time range – date settings

The time range of the data the system is visualizing are shown in the Display. Within this area the users find:

- the initial date of the time range selected by the users
- the end date of the time range selected by the users
- the current date

By default, the application sets the limits of the time range between the "now" (as the end date of the time range) and 24 hours before (beginning of the period)

Figure 6. Time range display allows the user to set initial and final dates (time range) during which will be shown the available products.

In the display there are four action buttons:

The two calendar icons allow the users to modify, respectively, the starting date and the end of the time range. By clicking on the buttons, you can set both start and end dates (minutes, hours, day, month and year) of any time window into the past and view the data available at that time (the so-called deferred time mode).

The clock-shaped icon sets back the dates of beginning and end of the time range to the default mode.

2.1.2.4 Layer List – multilayer feature

The Layer List is dynamically created whenever the user loads a static and / or dynamic layer. Every time a layer is selected by the user, the Layer List -containing the layer name and the available options for it- is displayed in the top left corner.

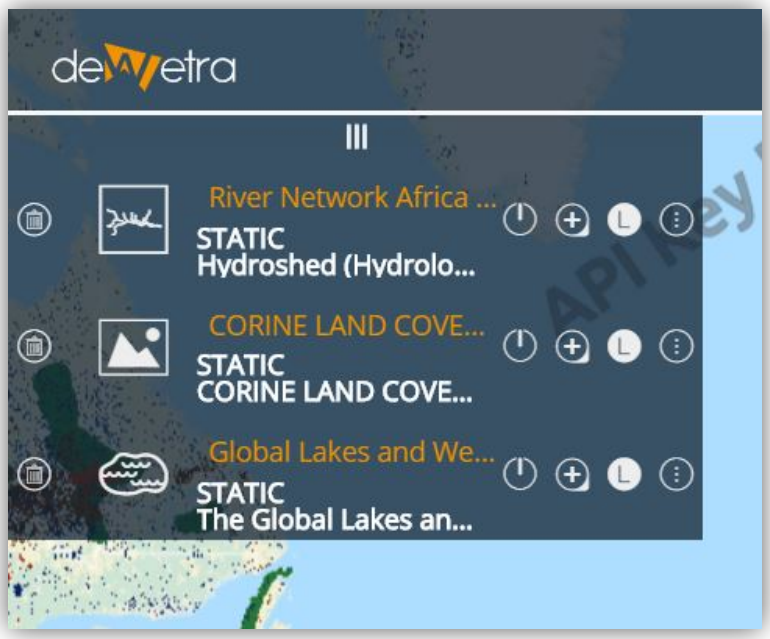


Figure 7. Example of layer list that have been selected to be displayed together (Multi-layer)

Each element of the list can be turned on or off and therefore displayed or hidden on the map, by acting on the control menu next to the name. Its relative position on the list corresponds to the position of the layer on the map: usually, the latter layer that has been pulled on overlaps the former ones. Anyway, users may change the priority of a layer, by left-clicking the layer icon next top the name in the Layer List and dragging it up or down.

The available features for the dynamic layers (Observations and Forecast), for the Static Layers and for the Tools bar are described in the next sections.

2.1.2.5 Additional tools

The Additional Tools button is placed in the upper right of the dashboard, immediately below the Toolbar and includes in order, from left to the right, the tools Share, info, Print map, Measure and Report.

Figure 8. Figure 1. Additional tools located in the upper right corner of the A4Lig-Dewetra main screen

Info

Info is activated by left-clicking i icon and allows the user to pull on the information associated to each layer that has been previously loaded.

In the following example, the application of 'info to the rainfall layer: the pop-up window opens in the upper right part of the screen displaying the rain depth of the point that has been clicked on.

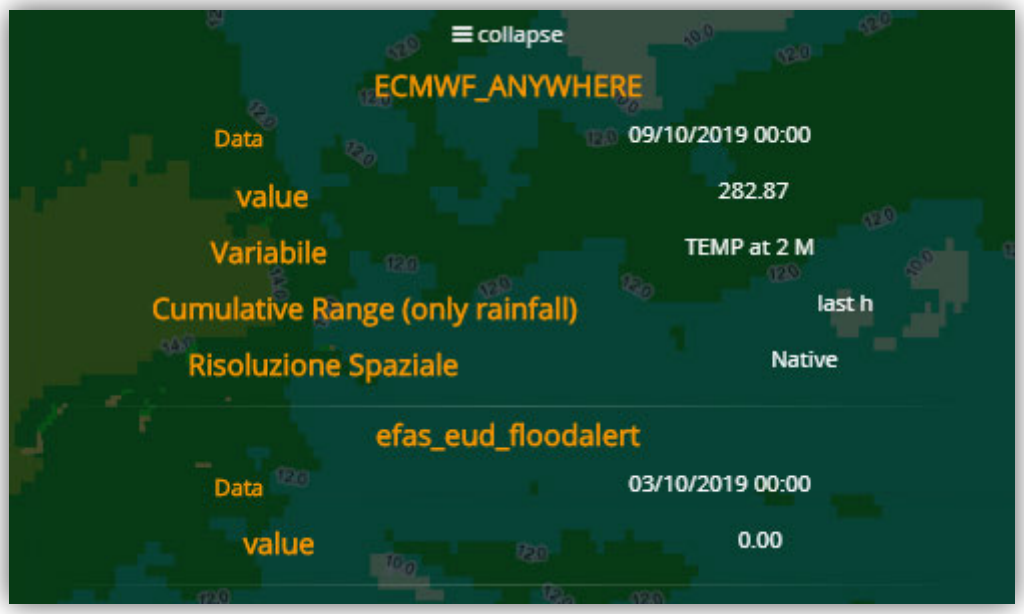


Figure 9. Pop-up Info window containing Temperature value provided by the ECMWF NWP model available within the ANYWHERE MH-EWS.

If info is applied to a static layer, the pop-up window will show all the attributes available in the database for that layer. As an example, the next figure shows the result displayed in case a user clicked the Hospitals layer.

Figure 10. Pop-up info window containing the attributes of the Hospitals layer.

To disable the info and return to the navigation mode, left-click again on the “i” icon.

Print Map

The Print map button allows the user to open a pop-up window containing a preview of the Control Map displayed at the time: by clicking the Download Image button

located at the lower-right corner of the pop-up window, the map can be downloaded in png (Portable Network Graphics) format and saved on user's own local disk.

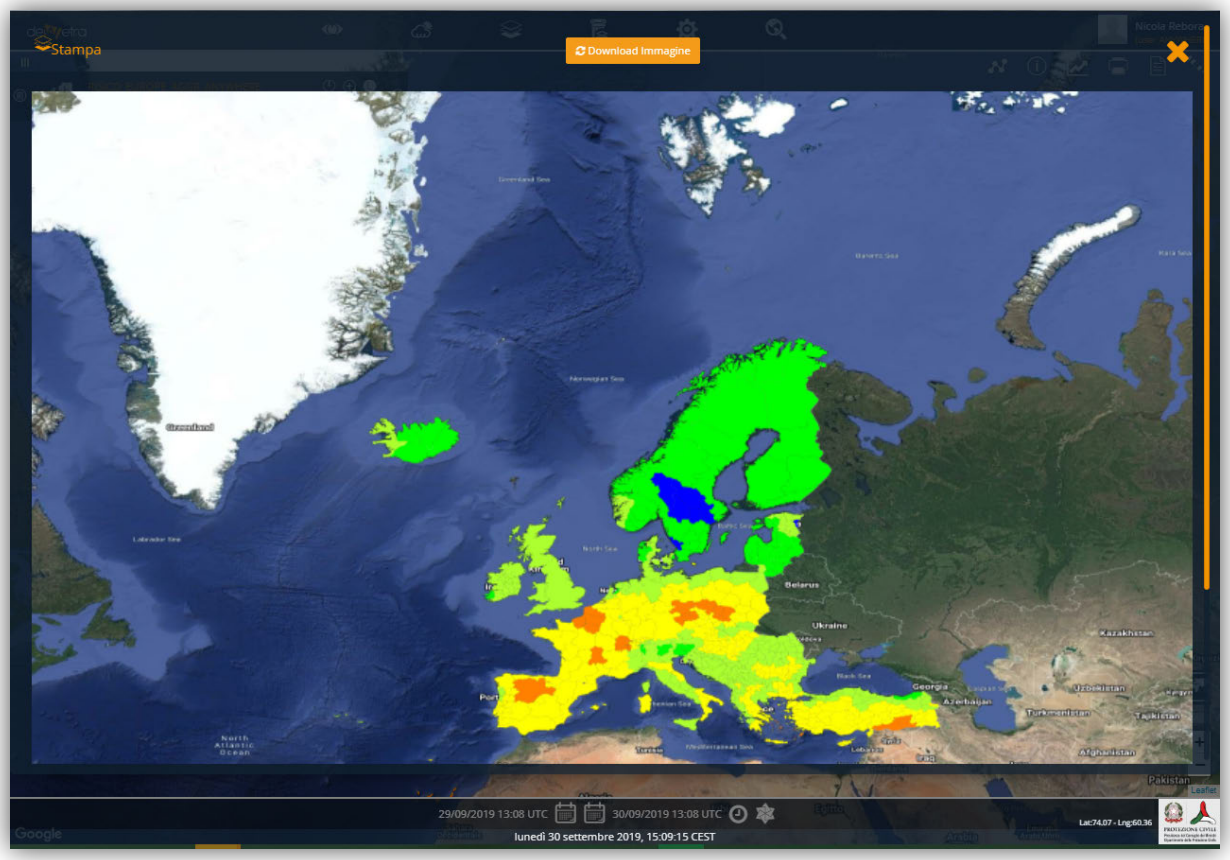


Figure 11. Example of the function Print Map applied to the RISICO Forest Fire model available within the ANYWHERE MH-EWS.

Measure Distance and Areas

The Measure button allows you to open a drop-down menu through which you can choose to create a new measurement by left-clicking on the corresponding button. In this way the user can draw a straight line or pinpoint the vertices of a polygon by left-clicking directly on the map. At the same time, through a pop-up window, the system provides information about the line's length (in both kilometers and miles) and the area of the polygon (in both square meters and miles).

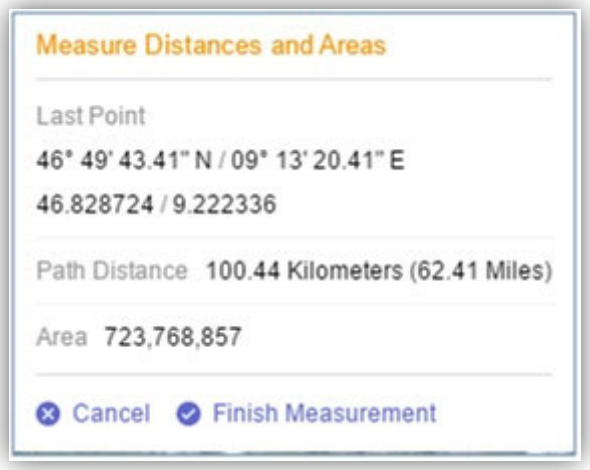


Figure 12. Pop-up window containing the length of the line drawn by the user and the area of the polygon.

2.1.3 Toolkits

Within A4Lig-Dewetra has been implemented two specific toolkits:

1 PROPAGATOR
2 ANYWHERE scenarios

2.1.3.1 PROPAGATOR

The PROPAGATOR toolkit allows to access and run the on-demand model PROPAGATOR developed by CIMA, which can be accessed from the MyDewetra main menu, available, after the login, on the upper left area.

The toolkit can be used following this procedure:

1. Insert run name. The default name is “run current data”
2. Insert run date
3. Insert simulation time limit
4. Insert ignition point(s), line or areas. It is possible to define the ignition point selecting directly on the map one or more points (Add ignition point). Selecting Add ignition line it is possible to start a fire from a line. Selecting “Add ignition polygon” it is possible to start the ignition from an area already burned.

5. Define wind conditions. It is possible to set the wind conditions during the simulation. Starting form Time [min] it is possible to define wind speed (max 100 km/h) and direction.
6. Clicking on Add Boundary Conditions it is possible to modify wind conditions in one or more time intervals.
7. Start the simulation.

In the following figures (**¡Error! No se encuentra el origen de la referencia.**, **¡Error! No se encuentra el origen de la referencia.¡Error! No se encuentra el origen de la referencia.**,**¡Error! No se encuentra el origen de la referencia.**) is reported the operational sequence to set-up and run PROPAGATOR.

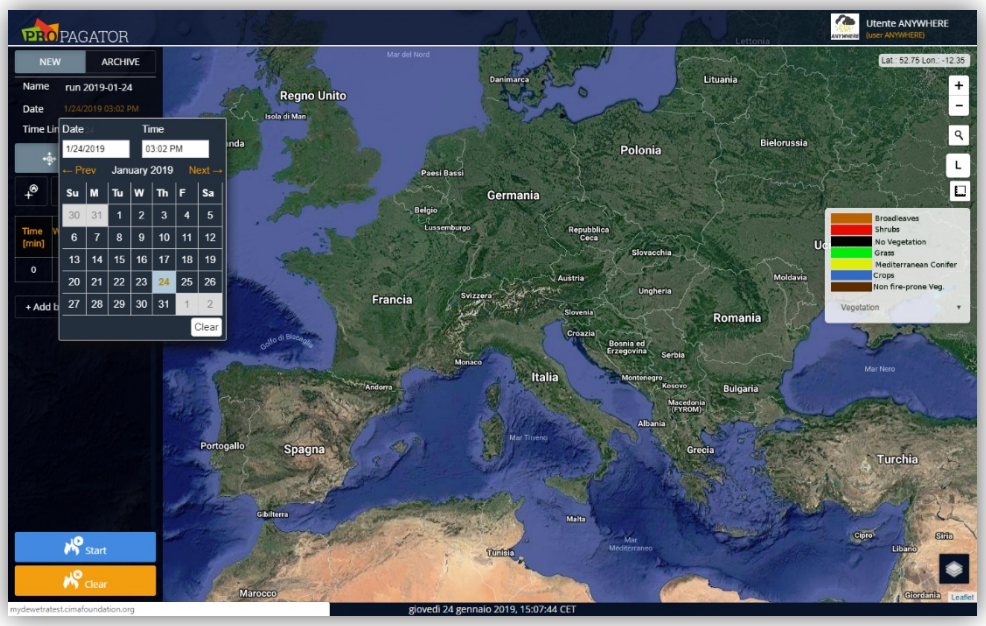


Figure 13. PROPAGATOR tool within A4Lig-Dewetra.

Figure 14. . PROPGATOR tool, menu for defining ignition points/lines/areas.

Figure 15. PROPAGATOR, definition of ignition area and ignition line

Above the button Start, a dialog box indicates the simulation time, the number of active fires, compared to the 100 simultaneous simulations generated by

the stochastic model, and finally the size of the burned area, in hectares, considering the area covered by at least 50% of contemporary simulations. Push button Stop to stop the simulation.

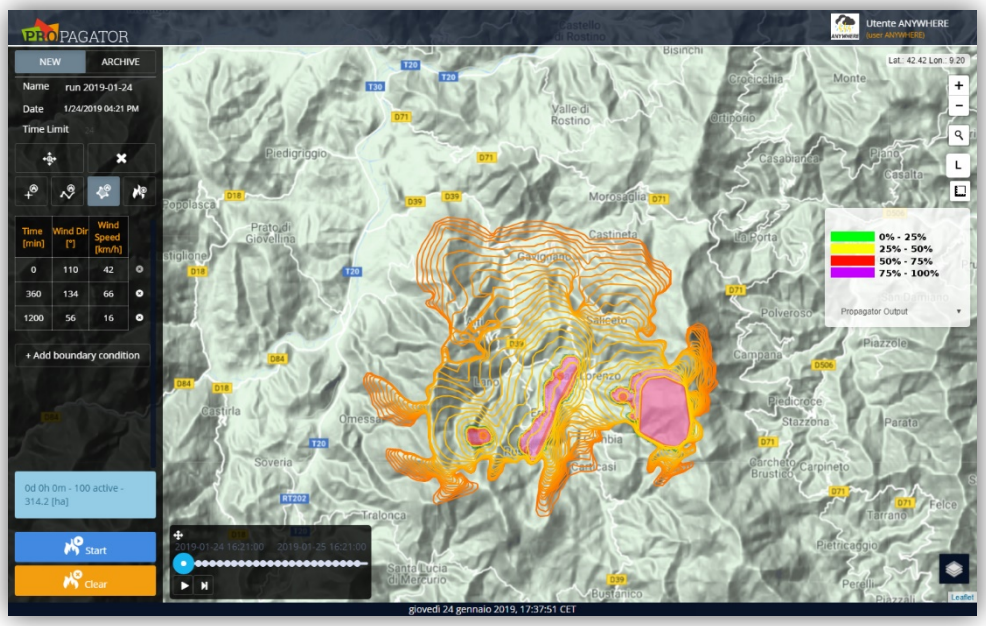


Figure 16. PROPAGATOR, example of operational run.

Passing the mouse on the button at the bottom right of the interface it is possible to modify the basic background, selecting among those available, and display some basic layers including vegetation classes. The legends viewer allows you to select the legend of the displayed layer.

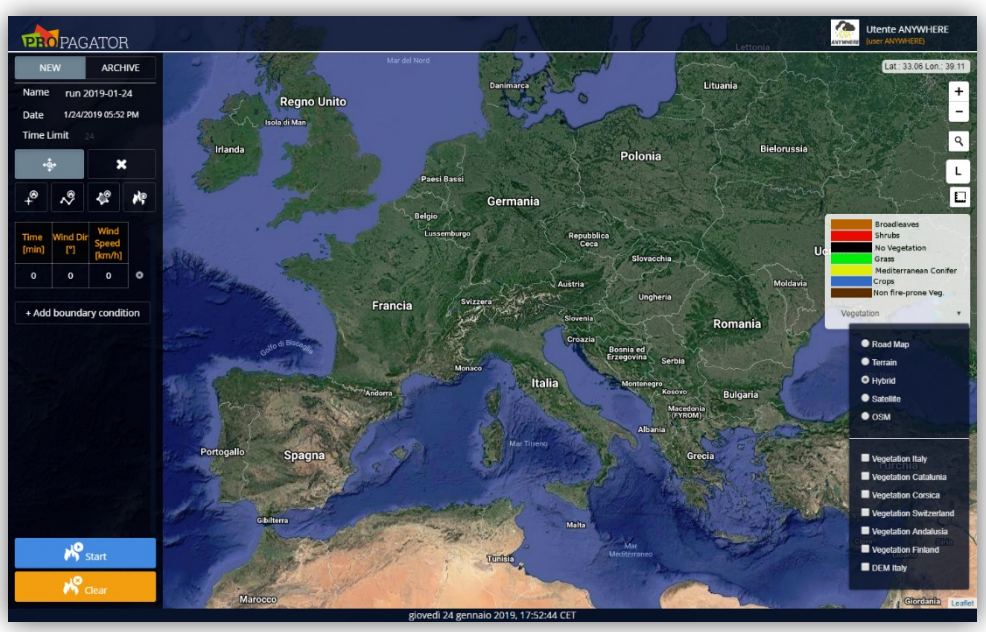


Figure 17. PROPAGATOR, set-up of background maps and data legend.

It is suggested to visualize the vegetation classes when the ignition is defined in order to avoid the ignition in a non-vegetated area.

Some tools in the upper right corner allow the classic map controls, zoom in / zoom out, a button to search for toponymy, a button to control the opacity of the layer and finally a button to create measurements of areas and lengths.

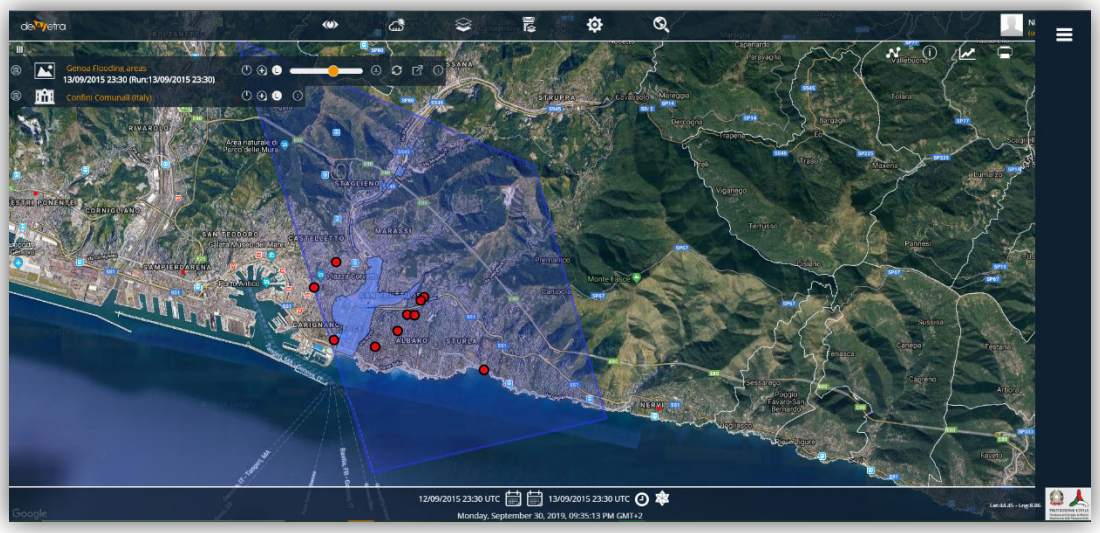
It is possible to run the simulation again, using the same ignition points and / or parameters or modifying them in part by selecting the simulation name in the ARCHIVE menu. Once the simulation name has been selected by clicking on the NEW button, it is possible to restart the simulation with the parameters displayed in the dialog.

All the simulations done with PROPAGATOR will be also available within the A4Lig-Dewetra forecast menu in order to allow the user to compare and combine them with the other relevant MH-EWS and local products.

2.1.3.2 ANYWHERE impact scenarios tool

The ANYWHERE impact scenarios tool has been designed in order to combine the real-time hazard maps with the information on the exposed elements. It can be accessed from the tools menu in the A4Lig-Dewetra page.

The user can define a specific area and the relevant exposed elements. The tool will then combine the exposed elements in the selected area. A list with all the specific metadata of the exposed elements will then be available to the user for emergency management purposes. The tool can be used with all the hazards available within the MH-EWS.



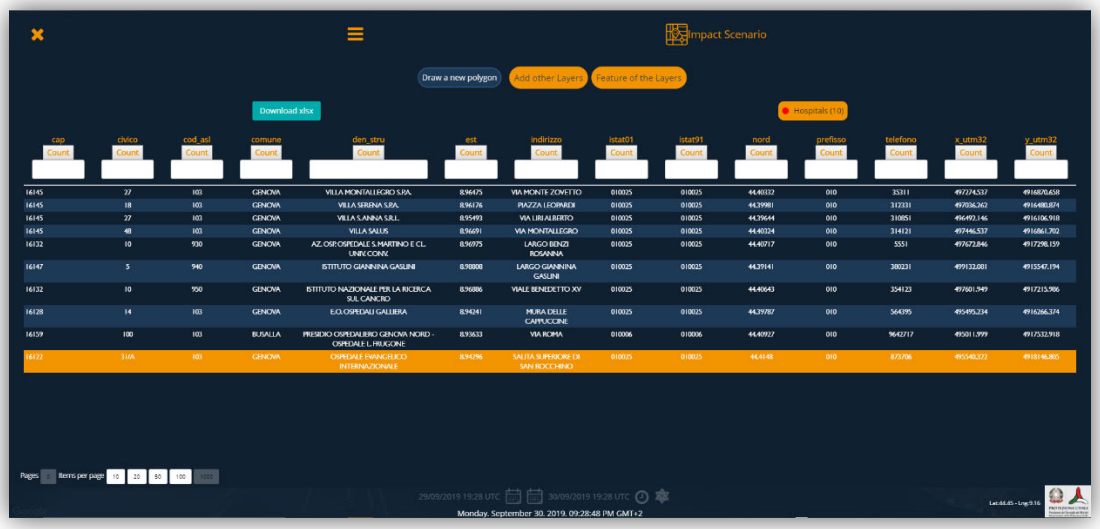


Figure 18. ANWHERE impact scenarios tool. In the upper panel are reported the hospitals within the selected area. It is possible to add layer from the ANYWHERE MH-EWS to evaluate if the predicted hazard can have an impact on specific exposed elements selected by the user. In this figure are reported the expected flooded areas in the upcoming hours.

2.1.4 Products

The Toolbar tool reported in section 2.1.2.2 contains the MH-EWS products as well as the local layer available.

2.1.4.1 Forecasts

This menu lists all the available forecast products (available both trough the MH-EWS and local data providers);

Figure 19. Forecasts menu reporting: 1) on the left the 7 folder of the ANYWHERE MH-EWS products divided by hazard (seven folder) plus two folder devoted to experimental local products; 2) on the right the EWS products available for the specific hazard with the name highlighted in orange in the left menu.

Both the observations and forecasts menus of the A4Lig-Dewetra are divided into seven folders that represent the different hazard considered (**¡Error! No se encuentra el origen de la referencia.**) :

- "Meteorological Forecast and Nowcast" menu contains the following layers:
    i. ECMWF_ANYWHERE
    ii. ffews_rain_accumulation_15min_opera
    iii. ffews_rain_accumulation_1h_opera
    iv. ffews_rain_accumulation_24h_opera
    v. ffews_rain_accumulation_30min_smc
    vi. ffews_rain_accumulation_6min_smc
    vii. ffews_rain_rate_opera
    viii. ffews_rain_warning_opera
    ix. ffews_rain_warning_smc
    x. ffews_river_warning_bern
    xi. ffews_river_warning_opera
    xii. ffews_river_warning_smc

xiii. fmi_freezing_drizzle_prob
xiv. fmi_freezing_rain_prob
xv. fmi_rain_accumulation_1h_prob20_35
xvi. fmi_rain_accumulation_1h_prob35_45
xvii. fmi_rain_accumulation_1h_prob45
xviii. fmi_rain_accumulation_24h_prob120
xix. fmi_rain_accumulation_24h_prob50_70
xx. fmi_rain_accumulation_24h_prob70_120
xxi. GFS05_ANYWHERE
xxii. ifs_efi_precipitation_index
xxiii. ifs_efi_precipitation_prob1
xxiv. ifs_hres_precipitation
xxv. Italian radar nowcasting (from Italian radar composite)

- "Floods Debris-flow and Landslides" menu contains the following layers:
  i. efas_eud_floodalert
  ii. efas_severe_alert_prob
  iii. efas_high_alert_prob
  iv. efas_medium_alert_prob
  v. efas_seas_spi_1_month_10
  vi. efas_seas_spi_1_month_median_2
  vii. efas_seas_spi_1_month_p25
  viii. efas_seas_spi_1_month_p75
  ix. efas_seas_spi_1_month_p90
  x. Flood Proofs Q Index (Italy)
  xi. FlooodProofs Italy Probabilistic - COSMO-5M
  xii. Genoa Flooding areas
  xiii. Genoa nowcasting-hydro sections

- "Heatwaves Weather-induced health" menu contains the following layers:
  i. ifs_efi_2m_max_temperature_index
  ii. ifs_efi_2m_min_temperature_index
  iii. ifs_hres_2m_temperature
  iv. raq_carbon_monoxide
  v. raq_nitrogen_dioxide
  vi. raq_ozone
  vii. raq_particle_matters_below_10
  viii. raq_particle_matters_below_2p5
  ix. raq_sulphur_dioxide
  x. utci_heatwave_probability

xi. utci_index
xii. fmi_temperature_p0
xiii. fmi_temperature_p100

- "Weather-induced forest fires" menu contains the following layers:
  i. effis_fwi_build_up_index
  ii. effis_fwi_daily_severity_rating
  iii. effis_fwi_daily_severity_rating
  iv. effis_fwi_danger_class
  v. effis_fwi_drought_code
  vi. effis_fwi_duff_moisture_code
  vii. effis_fwi_fine_fuel_moisture_code
  viii. effis_fwi_fire_weather_index
  ix. effis_fwi_initial_spread_index
  x. fmi_forest_fire_index
  xi. PROPAGATOR_ANYWHERE
  xii. RISICO Europe Anywhere
  xiii. risico_dead_fuel_moisture
  xiv. RISICO_EUROPE_AGGR_ANYWHERE
  xv. risico_fireline_intensity
  xvi. risico_rate_of_spread
  xvii. RISICOANDALUSIA
  xviii. RISICOANDALUSIA_AGGR
  xix. RISICOCATALUNIA
  xx. RISICOCATALUNIA_AGGR
  xxi. RISICOCORSICA
  xxii. RISICOCORSICA_AGGR
  xxiii. RISICOFINLAND
  xxiv. RISICOFINLAND_AGGR
  xxv. RISICOGENOVA
  xxvi. RISICOGENOVA_AGGR
  xxvii. RISICOSWITZERLAND
  xxviii. RISICOSWITZERLAND_AGGR

- "Storms Winds Snowfall" menu contains the following layers:
  i. fmi_snow_load
  ii. fmi_snowfall
  iii. fmi_snowfall_prob4_6
  iv. fmi_snowfall_prob6
  v. fmi_wind_gust_p100

vi. ifs_efi_10m_wind_gust_index
vii. ifs_efi_cape_index
viii. ifs_efi_cape_shear_index
ix. ifs_efi_snowfall_index
x. ifs_hres_10m_u_wind_speed
xi. ifs_hres_10m_v_wind_speed
xii. ifs_hres_snowfall
xiii. ifs_ptype_precipitation_type
xiv. sasse_storm_cells
xv. sasse_storm_clusters

- "Storm Surges" menu contains the following layers:
  i. cfr_sea_elevation_stavanger
  ii. cfr_sea_hazard_stavanger
  iii. cfr_sea_inundation_stavanger
  iv. cfr_sea_level_europe
  v. cfr_sea_level_sola
  vi. cfr_sea_velocity_stavanger
  vii. cfr_storm_surge_level_europe
  viii. cfr_storm_surge_warning_europe
  ix. ifs_wam_max_individual_wave_height
  x. ifs_wam_mean_wave_direction
  xi. ifs_wam_mean_wave_period

- "Drougths" menu contains the following layers:
  i. wur_discharge_deficit_p50
  ii. wur_drought_probability
  iii. wur_groundwater_deficit_p50
  iv. wur_precipitation_deficit_p50
  v. wur_runoff_deficit_p50
  vi. wur_soil_moisture_deficit_p50
  vii. wur_standard_groundwater_index_p50
  viii. wur_standard_precipitation_evaporation_index_1m_p50
  ix. wur_standard_precipitation_evaporation_index_3m_p50
  x. wur_standard_precipitation_evaporation_index_6m_p50
  xi. wur_standard_precipitation_index_12m_p50
  xii. wur_standard_precipitation_index_1m_p50
  xiii. wur_standard_precipitation_index_3m_p50
  xiv. wur_standard_precipitation_index_6m_p50
  xv. wur_standard_runoff_index_12m_p50

xvi. wur_standard_runoff_index_6m_p50

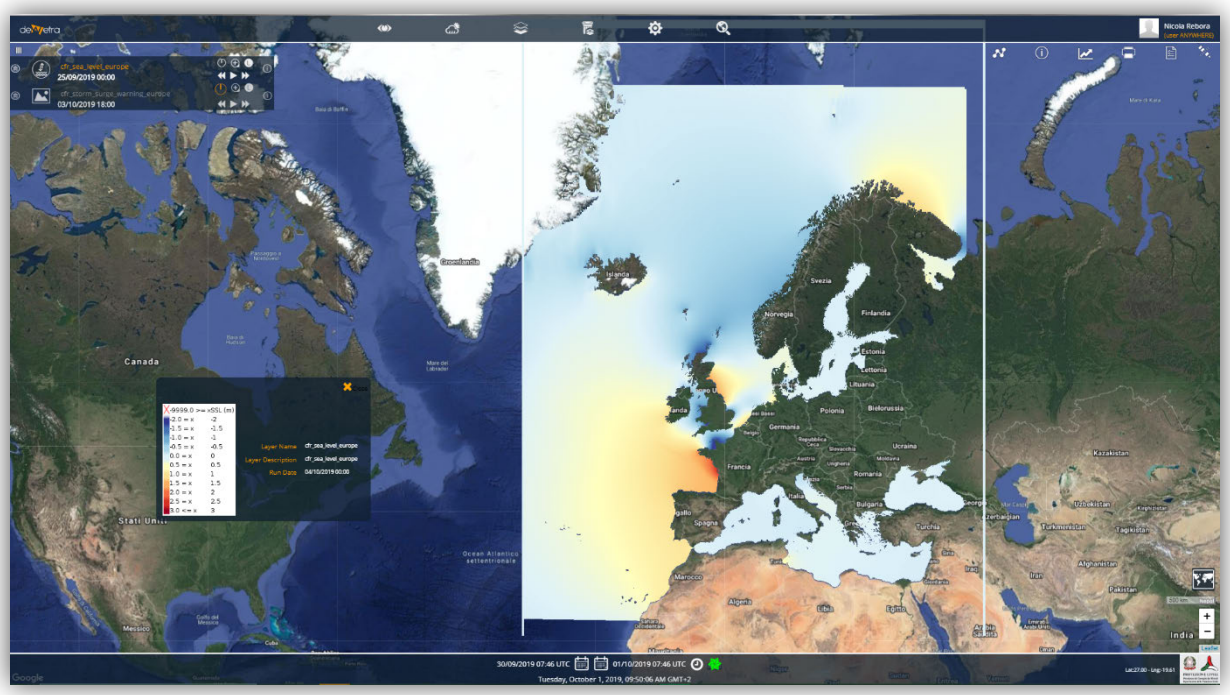


Figure 20. Example of a MH-EWS product (pan-European sea level forecast) available in the Forecasts/Storm surge folder.

1.1.1.1 Observations

This section is devoted to observational data and diagnostic models (available both trough the MH-EWS and local data providers).

- "Meteorological & Hydrological" menu contains the following layers:
  - i. HSAF03
  - ii. Merging radar-raingauge
  - iii. MSG_IR
  - iv. RADAR ITA SRI
  - v. RADAR ITA SRT
  - vi. RADAR_SETTEPANI
  - vii. RAINMAP italy
  - viii. WARNINGS HYDRO italy
  - ix. WARNINGS RAIN italy
  - x. WARNINGS THERMO italy

- "Water levels" menu contains the following layers:
  i. WARNINGS HYDRO Italy
- "Rainfall" menu contains the following layers:
  i. RAINMAP Italy
  ii. WARNINGS RAIN Italy
- "Snow" menu contains the following layers:
  i. MODIS_SCA_ITALY
  ii. SN OBS 4 H13
  iii. SN OBS 4 H13
- "Weather induced fires" menu contains the following layers:
  i. LSASAF - FRP
  ii. RISICO_live_Anywhere
- "Cloud cover" menu contains the following layers:
  i. MSG_IR
- "Drought observations" menu contains the following layers:
  i. edo_combined_drought_indicator

1.1.1.2 Static Layers

This section is devoted to the static data available.

ii. European settlements map 10m resolution (Europe - source JRC)
iii. Schools (Italy - Civil Protection)
iv. Hospitals (Italy - Civil Protection)
v. Railroads (Italy - Civil Protection)
vi. Roads (Italy - Civil Protection)
vii. Municipalities boundaries (Italy - Civil Protection)
viii. Provices boundaries (Italy - Civil Protection)
ix. Regional boundaries (Italy - Civil Protection)
x. Main catchments (Italy - Civil Protection)
xi. Secodary catchments (Italy - Civil Protection)
xii. Dams (Italy - Civil Protection)
xiii. Flood Hazard Map (High) - (Italy - Civil Protection)
xiv. Flood Hazard Map (Medium) - (Italy - Civil Protection)
xv. Flood Hazard Map (Low) - (Italy - Civil Protection)
xvi. Flood Hazard Maps (T=50yrs) - (Italy - Global Assessment Report - UNDRR)
xvii. Flood Hazard Maps (T=100yrs) - (Italy - Global Assessment Report - UNDRR)
xviii. Flood Hazard Maps (T=100yrs) - (Italy - Global Assessment Report - UNDRR)
xix. Flooded areas (Genoa 2014)
xx. Fire Hazard Map - summer (Liguria)

xxi. Fire Hazard Map - summer (Italy)
xxii. Fire Hazard Map - winter (Liguria)
xxiii. Fire Hazard Map - winter (Italy)
xxiv. Fire Hazard Map - Wildland-Urban Interface (WUI) - summer (Liguria)
xxv. Fire Hazard Map - Wildland-Urban Interface (WUI) - summer (Liguria)
xxvi. Genoa buildings
xxvii. Genoa catchments
xxviii. Genoa commercial activities
xxix. Genoa CP collection point
xxx. Genoa cultural sites
xxxi. Genoa Districts
xxxii. Genoa health facilities
xxxiii. Genoa hospitals
xxxiv. Genoa inhabitants
xxxv. Genoa metro network
xxxvi. Genoa metro stations
xxxvii. Genoa open air markets
xxxviii. Genoa parks
xxxix. Genoa primary river network
xl. Genoa primary river network (covered)
xli. Genoa railway network
xlii. Genoa relevant risk plants
xliii. Genoa schools
xliv. Genoa secondary river network
xlv. Genoa secondary river network (covered)
xlvi. Genoa shops
xlvii. Genoa sport sites
xlviii. Genoa strategic buildings
xlix. Genoa streets
l. Genoa subways

3 A4EU at Pilot Site Catalonia (Spain) – A4EU-A4Cat. Responsible Partner: HYDS

3.1 A4EU-A4Cat operational system description

3.1.1 System

Users can access A4Cat system using a web browser (Google Chrome or Mozilla Firefox for a better experience) from any device connected to internet (computer, tablet, mobile, etc.). See in Figure 21 an example of A4Cat system as seen from a Smartphone.

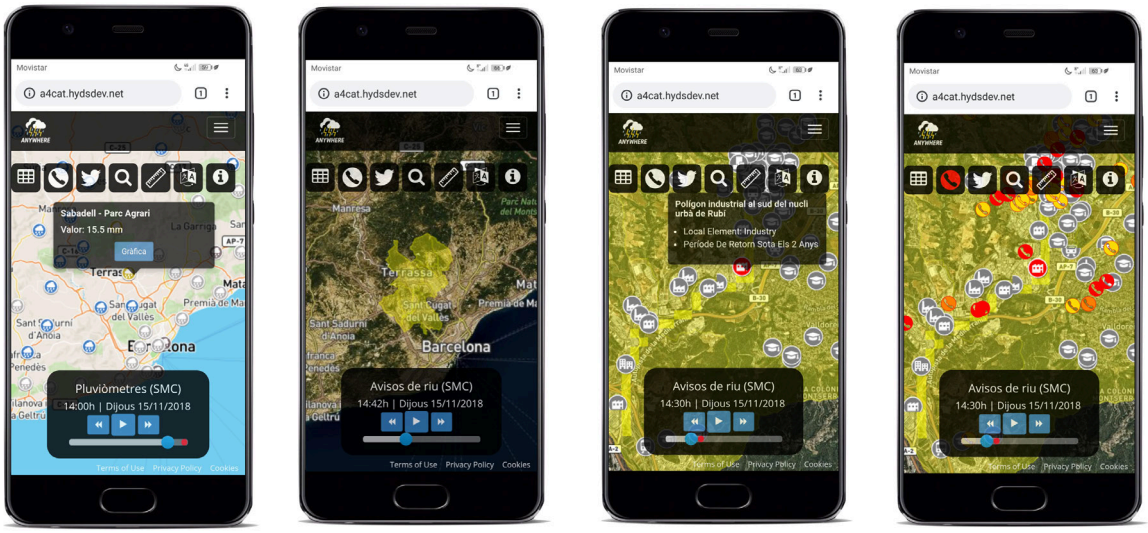


Figure 21. Examples of A4Cat in a mobile device (Huawei P10).

There is a login page at the beginning and the user needs credentials to access to the information. Product visualization rights depend on the user. Currently some information is only available to limited users (e.g. 112 Calls are limited to only users of personnel from CECAT in Civil Protection of Catalunya).

Besides the user graphical interface, A4Cat has a set of interfaces devoted to connecting to different sources of data:

- Connector to Anywhere MH-EWS to gather Anywhere products in real time and display them in the viewer. Both Pan-European products and local high-resolution version of some products are gathered. For those last, local information is send to the MH-EWS using its interfaces if needed (e.g. local radar observations in Catalunya are send to the MH-EWS to calculate high-

resolution versions of the different radar-based warning products). See in Figure 22 and example of a Pan-European product and a high-resolution local version.

- FTP/FTPs interface to receive data. Data from some network sensors is received through this interface.
- Encrypted API to receive information about the 112 Calls in real time.
- Different APIS to connect to different sources of information and gather data in real time (e.g. transit information, Crowdsourcing information, sensors of SmartyRiver, etc.)

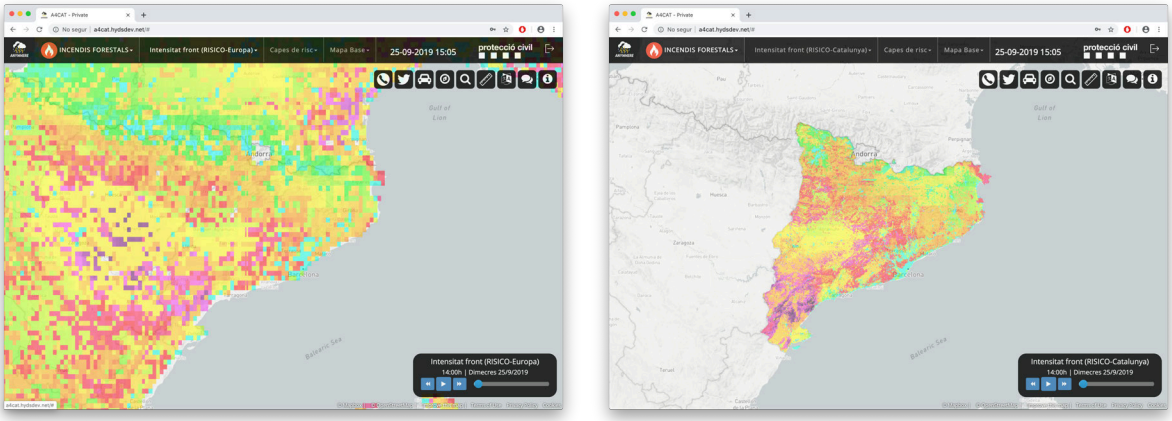


Figure 22. Example of RISICO Front-Intensity Pan-European product (left using CORINE vegetation information) and local product (right using local high-resolution vegetation information), both obtained from the Anywhere MH-EWS.

3.1.2 Functionalities

Current functionalities of A4Cat are the result of a process involving a close relation between developers (Hyds) and end-users (Civil Protection). A large number of meetings have been held to discuss the needs, priorities in the development and details of the functionalities. Training sessions have been also held to ensure a correct use of the system. Here we describe the main functionalities result of this process.

A4Cat interface is based on a map where all the information is displayed time- and geo-referenced. It is initially centred at Catalunya region but allows for zoom and pan.

At the top of the screen there is a menu bar that allows to:

- Switch among the different hazards.
- Switch among the products for the specific hazard (observations, forecasts, impact, etc.). The products are structured in different sections to facilitate operator duties.
- Select vulnerability layers.
- Select Cartography.
- See the last time that the data has been updated.

Below the menu bar there are a set of icons (see Figure 23) used for different purposes (from left to right):

- Summary table of warnings.
- Activate 112 Calls.
- Activate Crowdsourcing information.
- Activate transit information.
- Activate tool to navigate/search coordinates in different projection systems.
- Search tool.
- Activate palette in the viewer containing the colour scheme or the basic information to understand the product seen in the screen.
- Change language. Currently A4Cat is supported in Catalan (default), English and Spanish.
- Provide feedback to the developers.
- Link with the Wiki.

Figure 23. A4Cat tools that can be activated from the viewer.

Those different functionalities are described in detail below.

At the bottom of the screen a time navigation menu appears.

3.1.2.1 Cartography

A4Cat allows to change the Cartography shown as base for all the information. It has a set of general maps:

- Global light map (from MapBox provider).
- Global satellite map (from MapBox provider).
- Global streets map (from MapBox provider).
- Global white map with the country and pilot site (Catalunya) boundaries.

And a set of local high-resolution maps provided by ICGC (*Institut Cartogràfic i Geològic de Catalunya*):

- Local Topographic map, both in colour and in grayscale.
- Local Ortophoto map, both in colour and in grayscale.

On top of the base map selected, different local thematic cartography can be overlaid from different sources:

- ICGC – Different administrative boundaries (Municipal, county).
- ACA - Rivers, catchments and sub-catchments.
- CHE - Catchments and sub-catchments.
- DGA - Administrative catchments divisions.
- Gencat - Train network.
- Gencat - Road network.

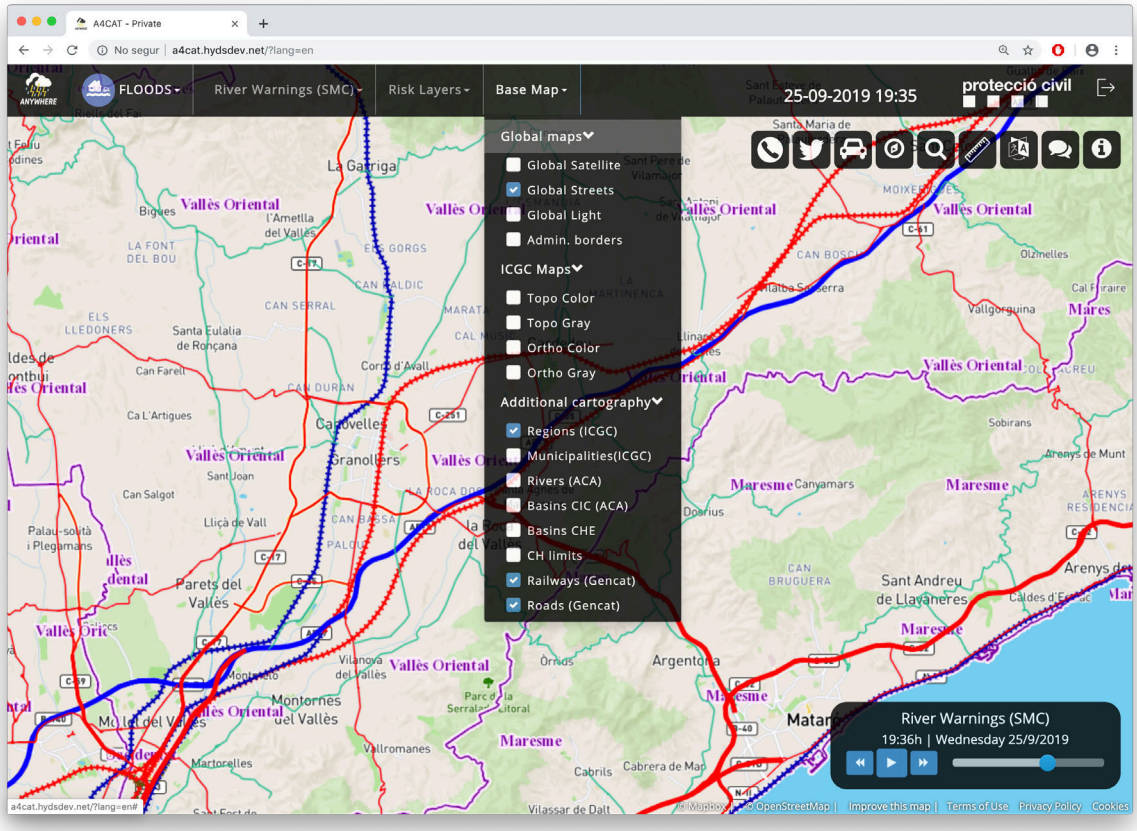


Figure 24. Example of thematic cartography (county division, roads and train lines) overlayed in a base map (global streets in this case).

3.1.2.2 Time navigation

There is a time navigation menu at the bottom left that allows to navigate in time inside one product, freely with the slider or using animation buttons. The range is predefined for each product and it might range from only past (e.g. observations from sensors), only future (e.g. forecasts from NWP models), mixed past/future (e.g. radar precipitation observations/nowcast), or specific blocs (e.g. meteorological warning products).

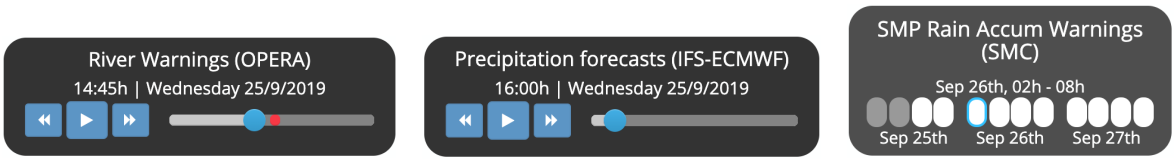


Figure 25. Some examples of time navigation menus for different products.

3.1.2.3 Product selection

Selection of MH-EWS products is done through menus and submenus as explained before. Products are sorted by hazard and then grouped by categorize based on operational needs (sensors observations, official warnings, forecasts, etc.). Products of the MH-EWS and local products are mixed together since organization is set to help operation, not on source.

As example, Flood hazard products are sorted in four categories (see Figure 26):

- Current information: Containing information measured by sensors and short-term forecasts based on nowcasting techniques.
- Current automatic warnings: Containing the warnings based on automatic algorithms (e.g. river and rainfall warnings based on radar observations).
- Current official warnings: Containing the warnings of the official institutions of the current situation.
- Forecasted warnings: Containing all products forecasting hazard or impact for the next hours/days.

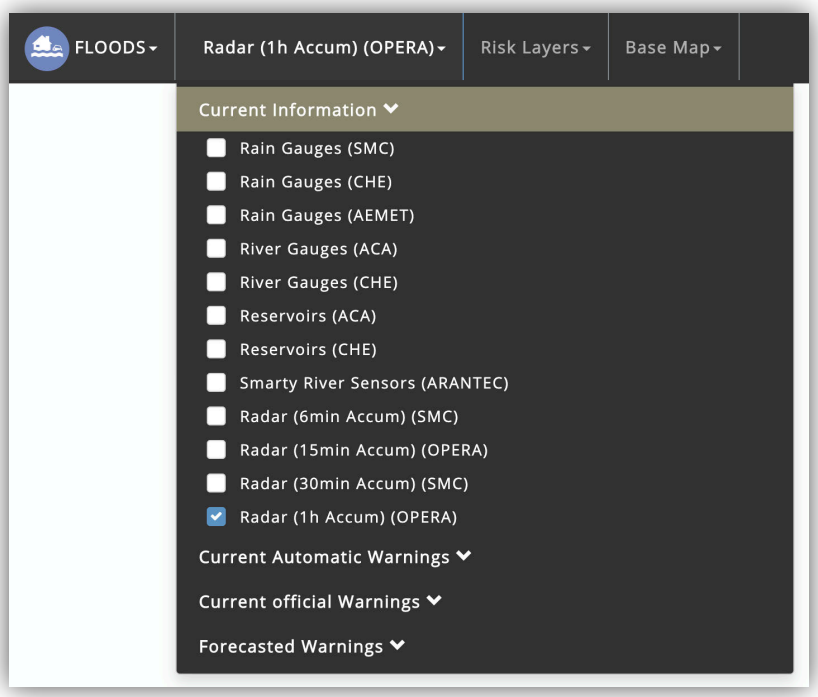


Figure 26. Menu showing the different products for floods under the category of current information.

3.1.2.4 Information and feedback support

There is an associated Wiki with detailed information of all the products (description, links to the project product catalogue, images, videos, examples, etc.) and functionalities of the A4Cat. It can be accessed in:

http://confluence.hyds.es/display/A4CATDOC/A4EU+Documentation

And it is linked from the A4Cat viewer -using the "i" icon- (with direct access to the specific product seen).

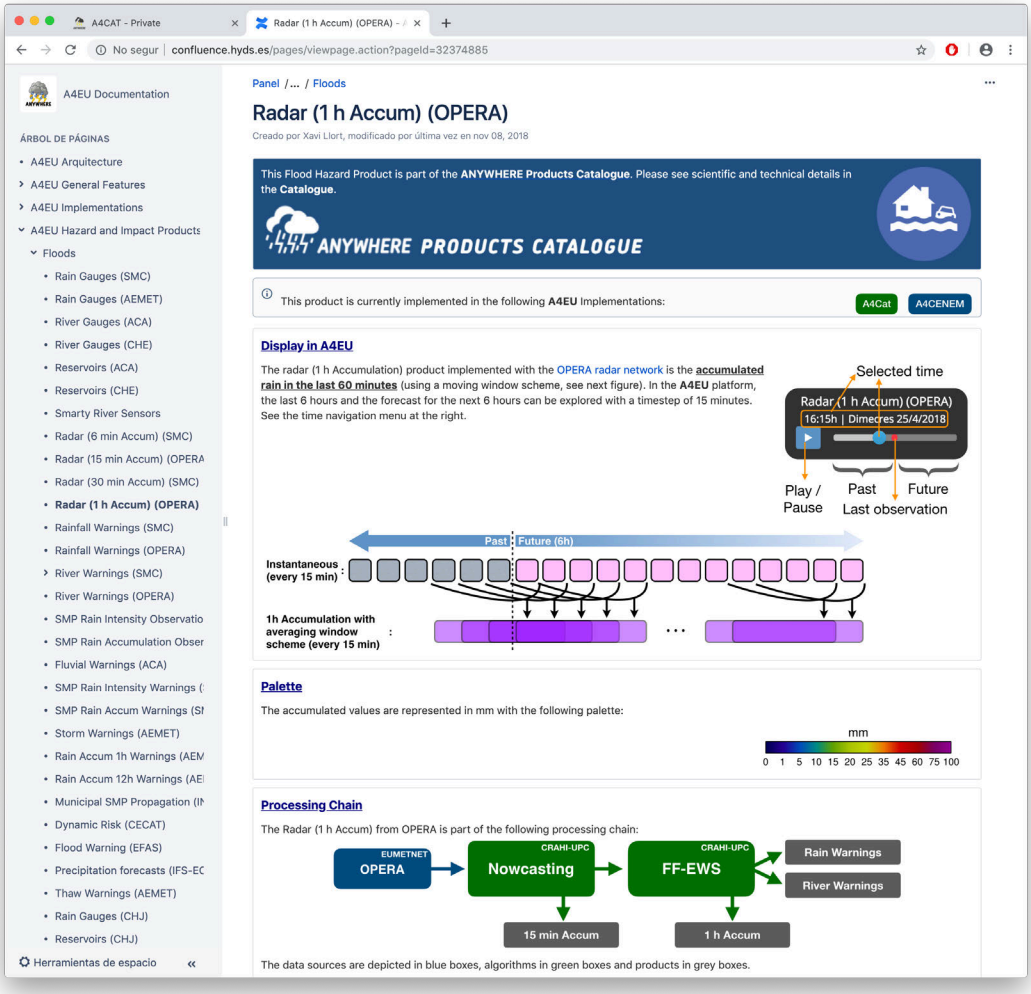
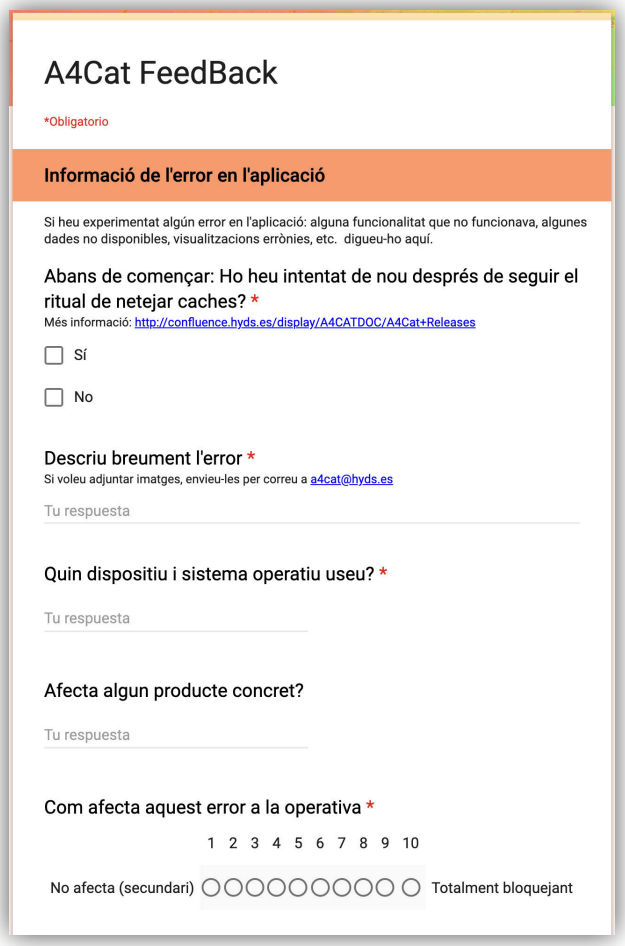


Figure 27. Example of the A4Cat's associated Wiki showing the details of the product for 1h precipitation accumulation (observed and nowcasted).

A4Cat also includes forms to gather feedback form the users. Three different forms have been prepared using Google Forms to gather information for:

- Errors in application. Asking specific information to understand and reproduce the error for development of a solution. See Figure 28.
- Errors in the data / forecasts / warnings. Asking information about the error to further improve the models.
- Suggestions and others.



A4Cat FeedBack

*Obligatorio

Informació de l'error en l'aplicació

Si heu experimentat algún error en l'aplicació: alguna funcionalitat que no funcionava, algunes dades no disponibles, visualitzacions errònies, etc. digueu-ho aquí.

Abans de començar: Ho heu intentat de nou després de seguir el ritual de netejar caches? *
Més informació: http://confluence.hyds.es/display/A4CATDOC/A4Cat+Releases

☐ Sí

☐ No

Descriu breument l'error *
Si voleu adjuntar imatges, envieu-les per correu a a4cat@hyds.es

Tu respuesta

Quin dispositiu i sistema operatiu useu? *

Tu respuesta

Afecta algun producte concret?

Tu respuesta

Com afecta aquest error a la operativa *

1 2 3 4 5 6 7 8 9 10

No afecta (secundari) ○○○○○○○○○○ Totalment bloquejant

Figure 28. Beginning of the A4Cat form to gather feedback for error in the application.

3.1.2.5 Search engine

The viewer includes a search engine (see Figure 29). Currently searches for geographical elements (cities, towns, regions, etc.) but in future will be able to search other elements of the system (roads, sensors, etc.).

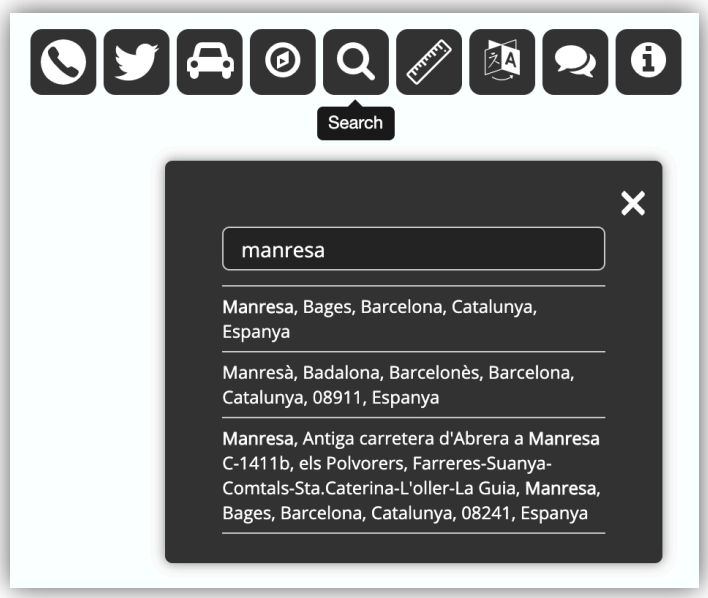


Figure 29. A4Cat's search engine build in the viewer.

Selecting one of the results, the viewer zooms in the specific place.

3.1.2.6 User focus functionalities and risk identification

A4Cat shows summary tables for each product of the active warnings for the different elements (municipalities, regions, sensors, roads, critical elements, etc.), see Figure 30 for an example. Elements can be sorted by name, level (default) or time of the warning. The elements shown in the table are space-temporal links. That is, when clicking on an element of the table the viewer zooms to the element and the time navigation menu moves to:

- Beginning of the warning (if it a warning from a forecasting model: warnings in the future).
- Last time of the warning (if it is a warning based on measurements -e.g. sensors-: warnings in the past).

Elements in the map (depending on the product: critical elements, regions, roads, etc.) are highlighted with colours depending on the level of warning (thresholds achieved). They also can be selected to gather information and level of warnings (see Figure 31) and see the evolution of the hazard/risk (see Figure 32).

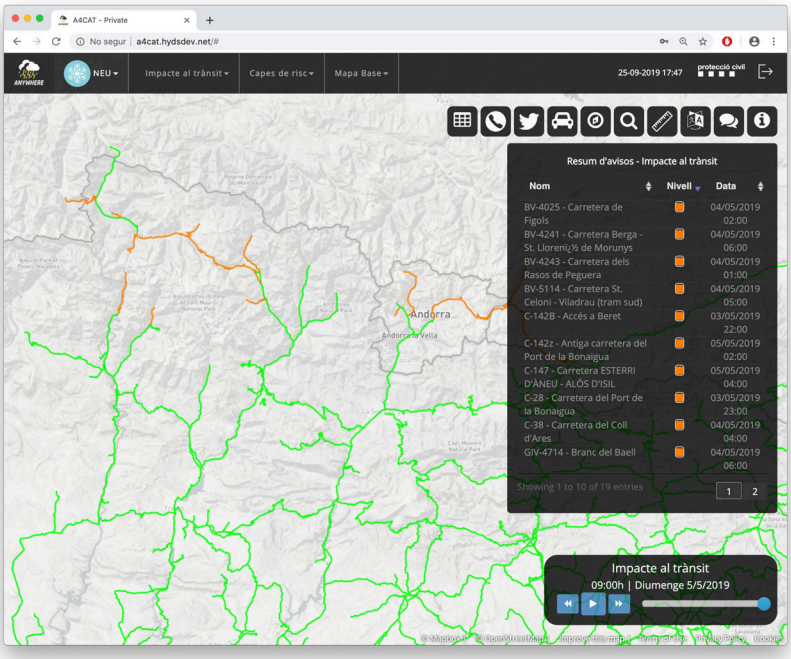


Figure 30. Example of the product "snow impact on transit" applied to the rad network of Catalunya and surroundings. The table shows the different road sections at warning.

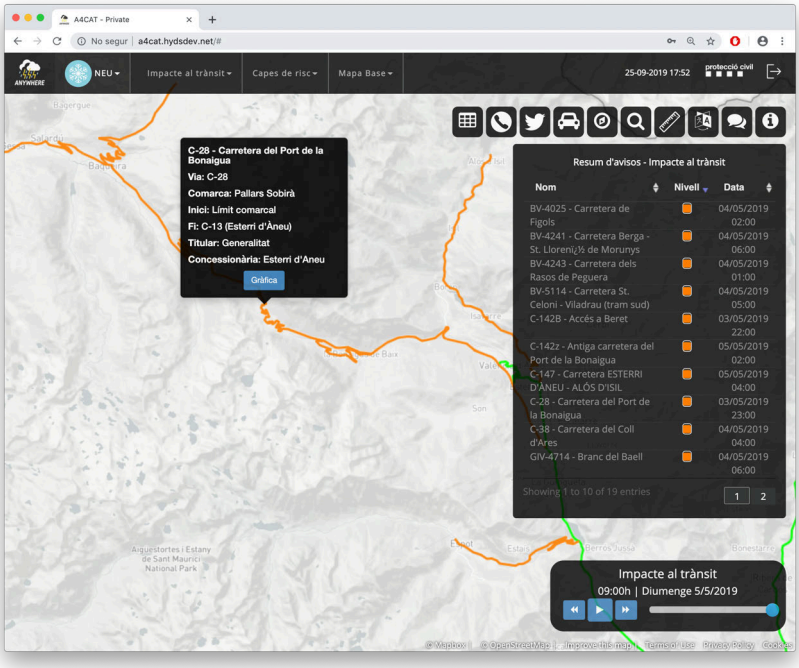


Figure 31. Example selection of one element (in the snow impact on roads, a section of road in this case) to know the details.

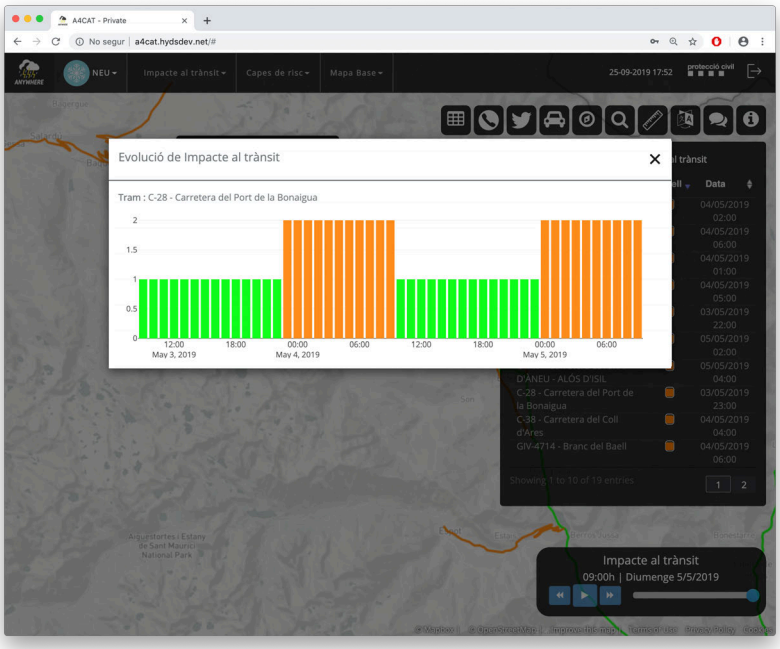


Figure 32. Example of the hazard/risk level of one element (in the snow impact on roads, a section of road in this case).

Areas activation

A4Cat can activate areas (municipalities, counties, etc.) based on "what it is happening inside", that is, based on functions on the hazard/impact products, see Figure 33 for an example.

Critical elements activation

A4Cat can activate critical elements based on rules set for the different forecasting products included in the MH-EWS, generating and alert message and highlighting in the viewer the areas to be affected depending on the level achieved.

Examples of activation are explained in detail in the Wiki:

- Activation of critical elements for flash-flood warning:

  http://confluence.hyds.es/pages/viewpage.action?pageId=32375282

- Activation of critical elements with for fire propagation warning:

  http://confluence.hyds.es/pages/viewpage.action?pageId=32375442

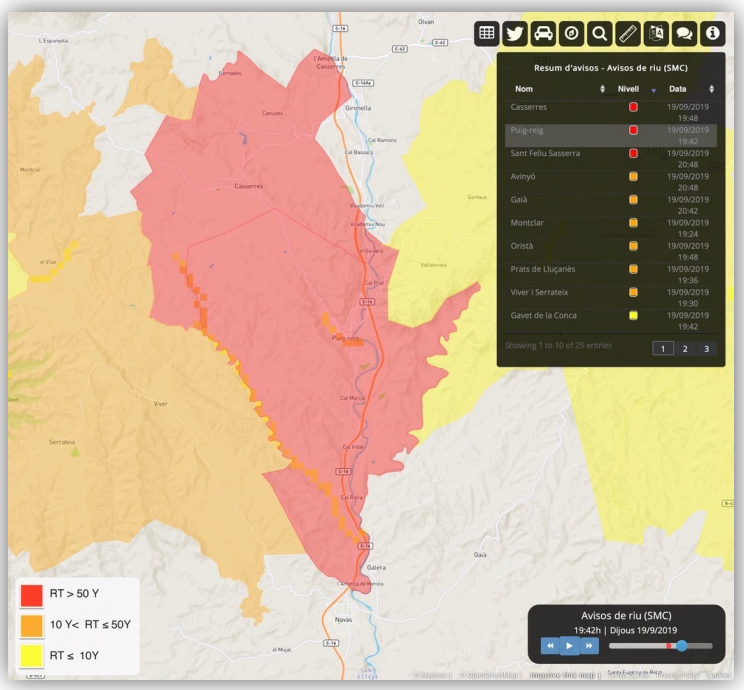


Figure 33. Example of municipality activation using "FF-EWS river warnings" based on a local high-resolution implementation (200 m). Municipalities are activated (and summarized in the

corresponding table) based on the maximum level of warning inside them. Details in: http://confluence.hyds.es/pages/viewpage.action?pageId=32374889

3.1.2.7 112 Calls integration

A4Cat receives in real time the 112 Calls geo-localized through an encrypted channel.

112 Calls are plot in the A4Cat viewer using a colour code to show how old are they: Red (last 30 min); Orange (between 30 and 60 min); Yellow Orange (between 60 and 90 min). Once the calls are activated with the corresponding button, appears a dialog window that allows filtering the calls based on several categories (decided by civil protection). Selecting a call shows the exact time and the typology. See an example in Figure 34.

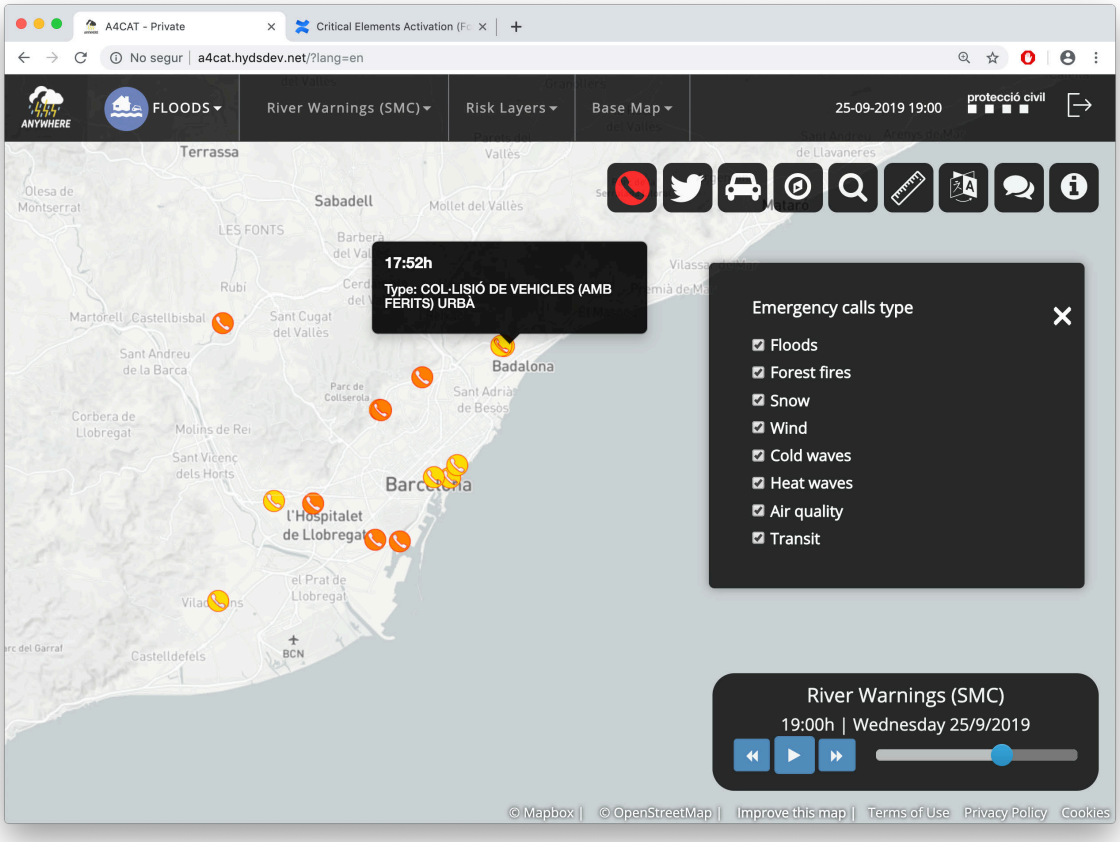


Figure 34. Example of 112 Calls shown in real time in A4Cat with all categories selected.

3.1.2.8 Transit incidents and cameras

Transit incidents (from *Servei Català de Trànsit*) are integrated in real time in A4Cat. Once the transit incidents are activated with the corresponding button, appears a dialog window that allows to filter the incidents based on several categories and the level. Selecting an incident, information about it is shown (municipality, road direction and kilometres affected, time, cause and description). See Figure 35 for an example.

A4Cat also shows the transit cameras information in real time. See Figure 36.

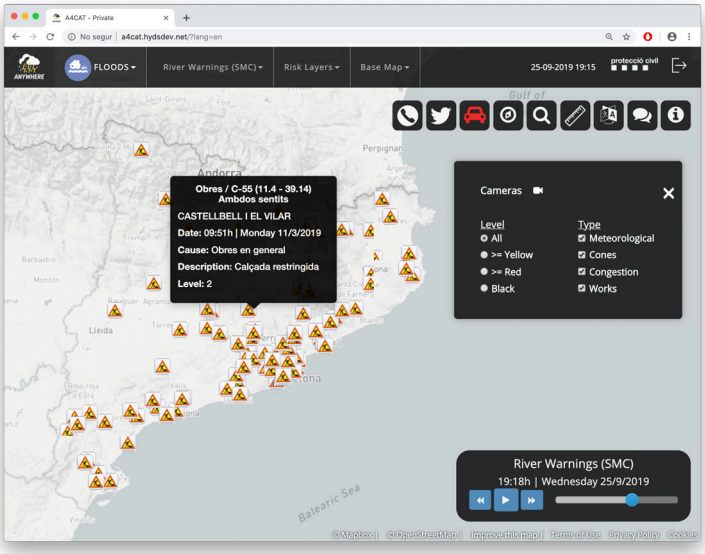


Figure 35. Example of transit incidents shown in real time in A4Cat with all categories selected and showing all levels.

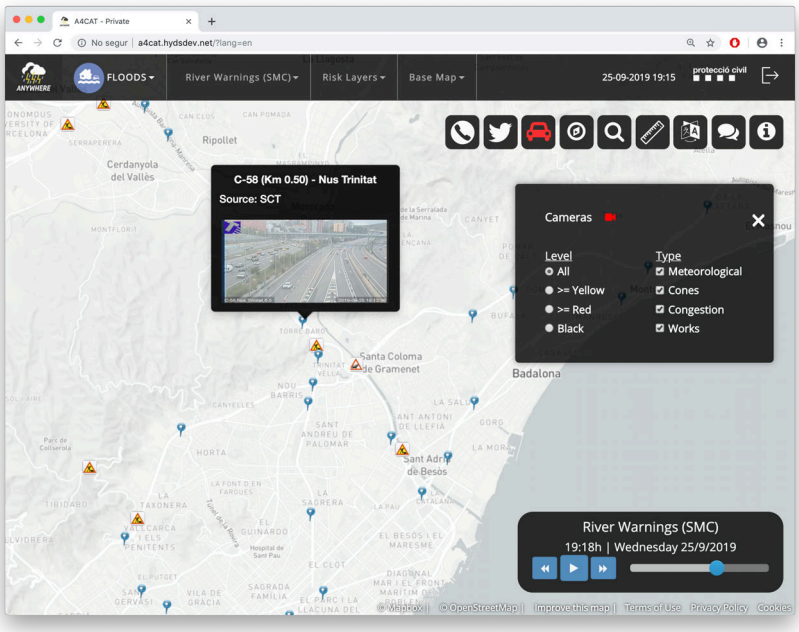


Figure 36. Example of transit cameras shown in real time in A4Cat.

3.1.3 Toolkits

3.1.3.1 Crowdsourcing tool

A4Cat includes an API to include the information of the crowdsourcing tool developed by Kajo. Tweets filtered by the toolkit that exceed a certain threshold of likelihood are plot in the viewer in real time using a colour code to show how old are they: Red (last 30 min); Orange (between 30 and 60 min); Yellow Orange (between 60 and 90 min).

Tweets can be selected to show the text and a link to the original in the Twitter platform. See an example in Figure 37.

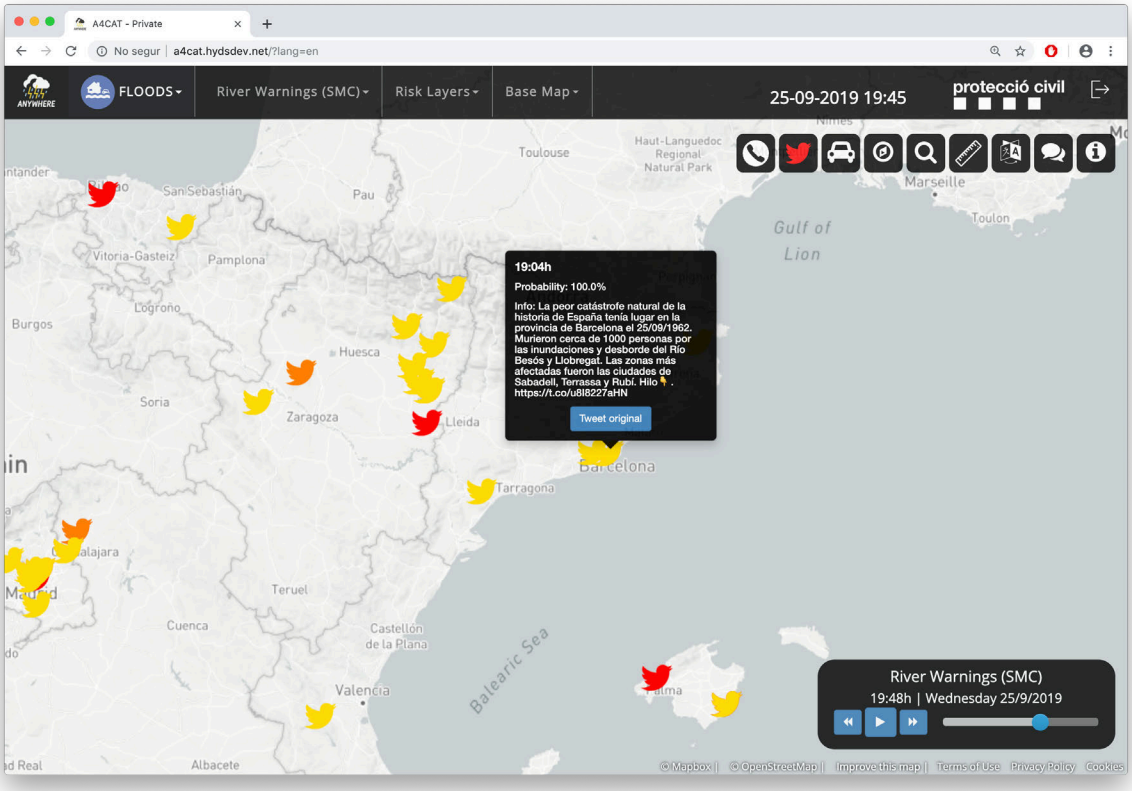


Figure 37. Example of crowdsourcing information shown in A4Cat.

3.1.3.2 Propagator

A4Cat includes an API to connect with the Propagator system developed by CIMA (and implemented in Catalunya with a high-resolution DEM and vegetation information). Details of the integration can be found in Rivera [1](2018).

The A4Cat viewer allows setting up the initial conditions for the simulation (see Figure 38):

- Ignition elements. Points, lines and polygons can be added or removed.
- Wind information. It can be set to automatic (uses the wind information from the last simulation of the ECMWF forecasts) or manual (where the direction and speed can be set for different lead times).

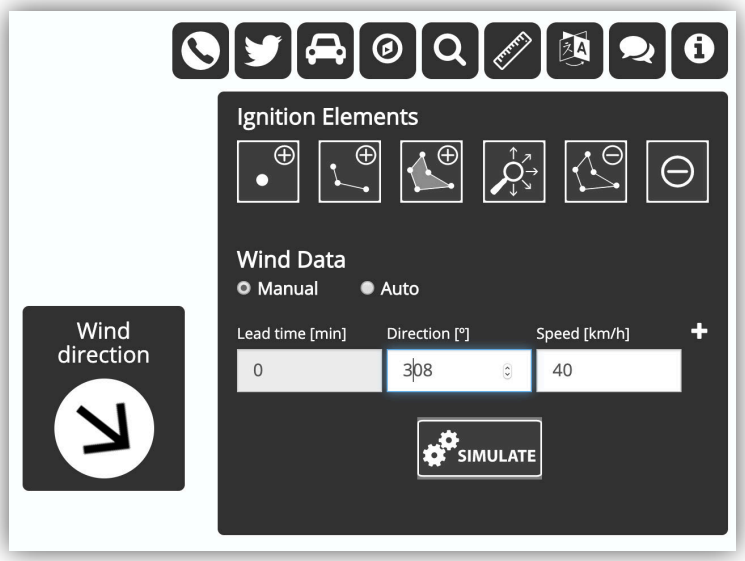


Figure 38. Menu to set the conditions for the PROPAGATOR simulations.

Once the results from CIMA system are obtained, those are crossed with the critical elements information. Details in the Wiki associated to A4Cat:

http://confluence.hyds.es/pages/viewpage.action?pageId=32375442

[1] Rivera, Cristhian, 2018: Sistema d'informació i alerta de risc potencial d'incendis forestalls. Degree thesis, Universitat Politècnica de Catalunya. http://hdl.handle.net/2117/127538

Both the results of the simulation and the critical elements activation is displayed in the viewer. The visualization is limited to the first 6 hours with a 30 min resolution and to the 50, 75 and 90 percentiles of burned probability. Figure 39 shows and example of the visualization in A4Cat.

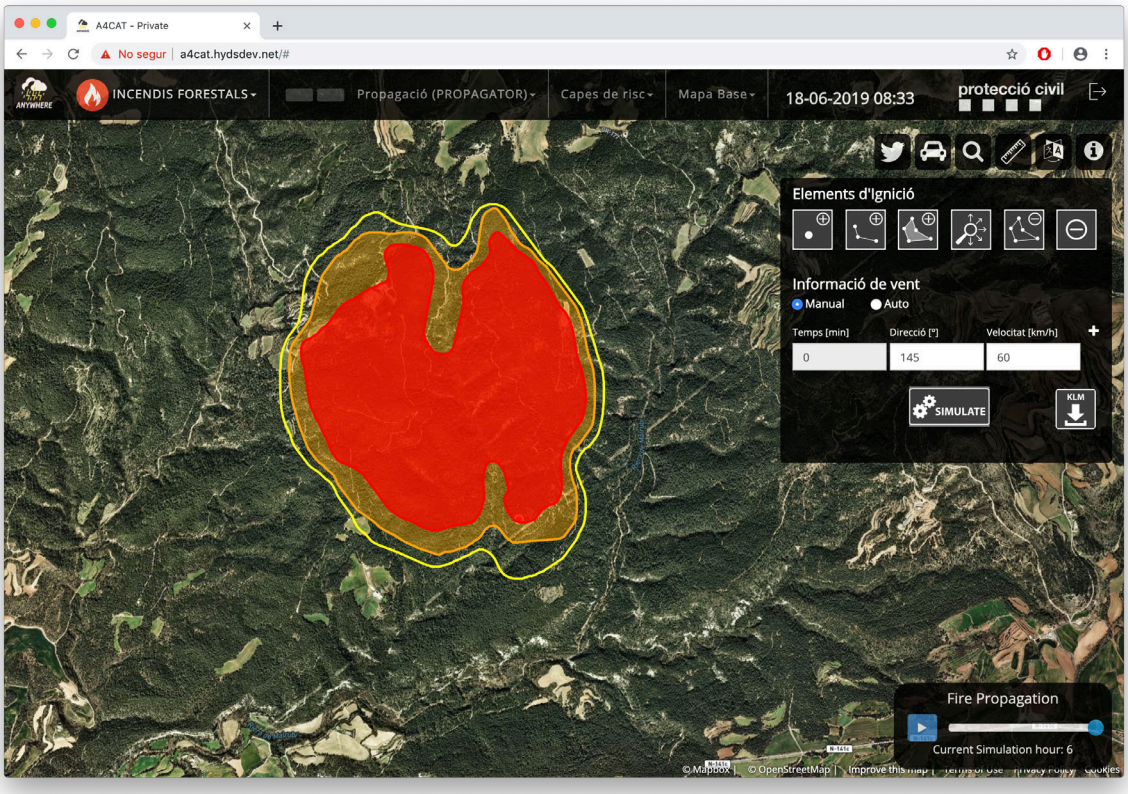


Figure 39. Example of PROPAGATOR simulation shown in A4Cat.

3.1.3.3 Snow impact on roads

A4Cat includes the tool to assess the impact of the snow on the roads developed by CRAHI-UPC. A4Cat shows the forecasted status of the road and the impact of the snow in critical elements.

Examples of the tool are shown in the previous Figure 30, Figure 31 and Figure 32.

3.1.4 Products

3.1.4.1 Hazard and impact products

A4Cat includes all the Pan-European products of the MH-EWS and local versions (high-resolution) of some of them. A4Cat also includes several sources of local information:

- Local forecasting products.
- Sensors.
- Different warnings (Meteorological, water agencies, etc.).

The products are organized by hazard and mixed together and with local layers of information to help operation duties. A specific order and aggrupation are defined for each hazard.

Complete list of products is described in Table 1 (Floods), Table 2 (Forest Fires), Table 3 (Convective Storms), Table 4 (Wind), Table 4 (Storm Surges), Table 6 (Snow), Table 7 (Air Quality), Table 8 (Heat and Cold Waves), Table 9 (Droughts).

Table 1: A4Cat's products for Floods. Details can be obtained in the corresponding page of the A4Cat associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Floods

Product	Description and Source
Rain gauges (SMC)	Local network of sensors. SMC
Rain gauges (CHE)	Local network of sensors. CHE
Rain gauges (AEMET)	Local network of sensors. AEMET
River gauges (ACA)	Local network of sensors. ACA
River gauges (CHE)	Local network of sensors. CHE
Reservoirs (ACA)	Local network of sensors. ACA
Reservoirs (CHE)	Local network of sensors. CHE
Smarty River sensors (ARANTEC)	Local network of sensors. ARANTEC
Radar (6min Accum) (SMC)	MH-EWS product. Local version computed with local radar data.
Radar (15min Accum) (OPERA)	MH-EWS Pan-European product.
Radar (30min Accum) (SMC)	MH-EWS product. Local version computed with local radar data.
Radar (1h Accum) (OPERA)	MH-EWS Pan-European product.
Rainfall Warnings (SMC)	MH-EWS product. Local version computed with local radar data.
Rainfall Warnings (OPERA)	MH-EWS Pan-European product.
River Warnings (SMC)	MH-EWS product. Local version computed with local radar data.
River Warnings (OPERA)	MH-EWS Pan-European product.
SMP Rain Intensity Obs. Warnings (SMC)	Official Warnings from local Meteorological Service. SMC

Product	Description and Source
SMP Rain Accum Obs. Warnings (SMC)	Official Warnings from local Meteorological Service. SMC
SMP Rain Intensity Warnings (SMC)	Official Warnings from local Meteorological Service. SMC
SMP Rain Accum Warnings (SMC)	Official Warnings from local Meteorological Service. SMC
Storm Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
Rain Accum 1h Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
Rain Accum 12h Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
Municipal SMP Propagation (INUNCAT)	Derived product from SMP Warnings. Calculated inside A4Cat.
Dynamic Risk (CECAT)	Derived product from SMP Warnings. Calculated inside A4Cat.
Flood Warning (EFAS)	MH-EWS Pan-European product.
Precipitation forecasts (IFS-ECMWF)	MH-EWS Pan-European product.
Thaw Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET

Table 2: A4Cat's products for Forest Fires. Details can be obtained in the corresponding page of the A4Cat associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Forest+Fires

Product	Description and Source
Forest fire danger forecasts (DARPA)	Local forest fire danger forecast product. DARPA
Rule 30-30-30 (IFS-ECMWF)	Derived product from IFS-ECMWF. Calculated inside A4Cat.
Fire Weather Index (EFFIS)	MH-EWS Pan-European product.
Build up Index (EFFIS)	MH-EWS Pan-European product.
Duff Moisture code (EFFIS)	MH-EWS Pan-European product.
Drought code (EFFIS)	MH-EWS Pan-European product.
Fine Fuel Moisture code (EFFIS)	MH-EWS Pan-European product.
Initial Spread Index (EFFIS)	MH-EWS Pan-European product.
Fire Weather Index (EFFIS - MeteoFrance)	EFFIS forecasts based on MeteoFrance NWP data. Obtained through EFFIS platform.
Build up Index (EFFIS - MeteoFrance)	EFFIS forecasts based on MeteoFrance NWP data. Obtained through EFFIS platform.
Duff Moisture code (EFFIS - MeteoFrance)	EFFIS forecasts based on MeteoFrance NWP data. Obtained through EFFIS platform.
Drought code (EFFIS - MeteoFrance)	EFFIS forecasts based on MeteoFrance NWP data. Obtained through EFFIS platform.
Fine Fuel Moisture code (EFFIS - MeteoFrance)	EFFIS forecasts based on MeteoFrance NWP data. Obtained through EFFIS platform.
Initial Spread Index (EFFIS - MeteoFrance)	EFFIS forecasts based on MeteoFrance NWP data. Obtained through EFFIS platform.
Anomaly (EFFIS - MeteoFrance)	EFFIS forecasts based on MeteoFrance NWP data. Obtained through EFFIS platform.

Product	Description and Source
Ranking (EFFIS - MeteoFrance)	EFFIS forecasts based on MeteoFrance NWP data. Obtained through EFFIS platform.
Fireline Intensity (RISICO-Europe)	MH-EWS Pan-European product.
Dead Fuel Moisture (RISICO-Europe)	MH-EWS Pan-European product.
Rate of Spread (RISICO-Europe)	MH-EWS Pan-European product.
Wind Effect (RISICO-Europe)	MH-EWS Pan-European product.
Risk Level (RISICO-Catalonia)	Derived product from RISICO-Catalonia. Calculated inside A4Cat.
Daily Risk Level (RISICO-Catalonia)	Derived product from RISICO-Catalonia. Calculated inside A4Cat.
Fireline Intensity (RISICO-Catalonia)	MH-EWS product. Local version computed with local vegetation information.
Dead Fuel Moisture (RISICO-Catalonia)	MH-EWS product. Local version computed with local vegetation information.
Rate of Spread (RISICO-Catalonia)	MH-EWS product. Local version computed with local vegetation information.
Wind Effect (RISICO-Catalonia)	MH-EWS product. Local version computed with local vegetation information.
Meteorological Forecasts	A set of meteorological variables forecasts form (IFS-ECMWF and EFI-ECMWF): • Wind Gust Index. EFI • Maximum Temperature Index. EFI • Temperature. IFS • Precipitation. IFS • Wind. IFS • Rel. humidity (derived from IFS) MH-EWS Pan-European product.

Product	Description and Source
PROPAGATOR	ANYWHERE Toolkit.
Hotspots (NASA-FIRMS)	MODIS and VIIRS hotspots retrieved from NASA FIRMS (not filtered)
Hotspots (EFFIS)	MODIS and VIIRS hotspots retrieved from EFFIS (filtered)
Burnt areas (EFFIS)	Burned areas observed from satellite from two sources (obtained through EFFIS): • MODIS supervised, including reports. • VIIRS automatically processed by HYDS.

Table 3: A4Cat's products for Convective Storms. Details can be obtained in the corresponding page of the A4Cat associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Convective+Storms

Product	Description and Source
CAPE Index (EFI-ECMWF)	MH-EWS Pan-European product.
SHEAR Index (EFI-ECMWF)	MH-EWS Pan-European product.

Table 4: A4Cat's products for Wind. Details can be obtained in the corresponding page of the A4Cat associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Wind

Product	Description and Source
Anemometers (SMC)	Local network of sensors. SMC
Anemometers (AEMET)	Local network of sensors. AEMET
SMP Wind Warnings (SMC)	Official Warnings from local Meteorological Service. SMC
Wind Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
Wind gust Index forecasts (EFI-ECMWF)	MH-EWS Pan-European product.
Wind forecasts (IFS-ECMWF)	MH-EWS Pan-European product.

Table 5: A4Cat's products for Storm Surges. Details can be obtained in the corresponding page of the A4Cat associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Storm+Surges

Product	Description and Source
SMP Sea Status Warnings (SMC)	Official Warnings from local Meteorological Service. SMC
Sea Status Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
"Rissaga" Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
"Galerna" Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
Sea Surface Level - Global	MH-EWS Pan-European product.
Sea Surface Level - Regional	MH-EWS Pan-European product.
Storm Surges Level	MH-EWS Pan-European product.

Table 6: A4Cat's products for Snow. Details can be obtained in the corresponding page of the A4Cat associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Snow

Product	Description and Source
SMP Snow Warnings (SMC)	Official Warnings from local Meteorological Service. SMC
Snow Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
Precipitation type forecasts (IFS-ECMWF)	MH-EWS Pan-European product.
Snowfall forecasts (IFS-ECMWF)	MH-EWS Pan-European product.
Snowfall index forecast (EFI-ECMWF)	MH-EWS Pan-European product.
Avalanche Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
Fog Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
Snow Impact on transit (CRAHI-UPC)	ANYWHERE Toolkit.
State of the road (CRAHI-UPC)	ANYWHERE Toolkit.

Table 7: A4Cat's products for Air Quality. Details can be obtained in the corresponding page of the A4Cat associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Air+Quality

Product	Description and Source
Sensors – Particulate matters (PM10) (XVPCA)	Local network of sensors. XVPCA
Sensors – Nitrogen Dioxide (NO2) (XVPCA)	Local network of sensors. XVPCA
Sensors – Ozone (O3) (XVPCA)	Local network of sensors. XVPCA
Sensors – Sulphur Dioxide (SO2) (XVPCA)	Local network of sensors. XVPCA
Sensors – Carbon Monoxide (CO) (XVPCA)	Local network of sensors. XVPCA
Particulate matters below 2.5 microns	MH-EWS Pan-European product.
Particulate matters below 10 microns	MH-EWS Pan-European product.
Nitrogen Dioxide (NO2)	MH-EWS Pan-European product.
Ozone (O3)	MH-EWS Pan-European product.
Sulphur Dioxide (SO2)	MH-EWS Pan-European product.
Carbon Monoxide (CO)	MH-EWS Pan-European product.
Dust Warnings (AEMET)	MH-EWS Pan-European product.

Table 8: A4Cat's products for Heat and Cold Waves. Details can be obtained in the corresponding page of the A4Cat associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Heat+and+Cold+Waves

Product	Description and Source
Thermometers (SMC)	Local network of sensors. SMC
Thermometers (AEMET)	Local network of sensors. AEMET
Universal Thermal Climate Index (UTCI)	MH-EWS Pan-European product.
Heatwave probability (UTCI > 32ºC)	MH-EWS Pan-European product.
Temperature forecasts (IFS-ECMWF)	MH-EWS Pan-European product.
Maximum temperature Index forecast (EFI-ECMWF)	MH-EWS Pan-European product.
Rel. humidity forecast (IFS-ECMWF)	MH-EWS Pan-European product.
SMP Heat Warnings (SMC)	Official Warnings from local Meteorological Service. SMC
Heat Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
Minimum temperature Index forecast (EFI-ECMWF)	MH-EWS Pan-European product.
SMP Cold Warnings (SMC)	Official Warnings from local Meteorological Service. SMC
Cold Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET

Table 9: A4Cat's products for Droughts. Details can be obtained in the corresponding page of the A4Cat associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Droughts

Product	Description and Source
Standard Precipitation Index (SPI)	SPI for 1, 3, 6, and 12 months. MH-EWS Pan-European product.
Standard Precipitation Evaporation Index (SPEI)	SPEI for 1, 3, and 6 months. MH-EWS Pan-European product.
Standard Groundwater Index (SGI)	MH-EWS Pan-European product.
Standard Runoff Index (SRI)	SRI for 6 and 12 months. MH-EWS Pan-European product.
Deficits	Deficits for: • Precipitation • Soil Moisture • Groundwater • Runoff • Discharge MH-EWS Pan-European product.
Drought probability	MH-EWS Pan-European product.

3.1.4.2 Vulnerability and risk information

A4Cat includes a set of vulnerability information for some hazards. Complete list of vulnerability information for each hazard is described in Table 10.

Table 10: A4Cat's vulnerability and risk information. Details can be obtained in the corresponding page of the A4Cat associated Wiki: http://confluence.hyds.es/display/A4CATDOC/A4Cat+Risk+Layers

Hazard	Product	Description and Source
Flood	T10 Flooded areas	Areas Flooded with a return period of 10 years. ACA.
Flood	T50 Flooded areas	Areas Flooded with a return period of 50 years. ACA.
Flood	T100 Flooded areas	Areas Flooded with a return period of 100 years. ACA.
Flood	T500 Flooded areas	Areas Flooded with a return period of 500 years. ACA.
Flood	T10 Risk areas	Flooding risk with a return period of 10 years. INTC.
Flood	T100 Risk areas	Flooding risk with a return period of 100 years. INTC.
Flood	T500 Risk areas	Flooding risk with a return period of 500 years. INTC.
Flood	Critical Points	Set of critical elements vulnerable against flooding (Industries, aeronautical infrastructures, education centres, health centres, camping sites, train stations, etc.). Complete list in Wiki (see table header). Different sources depending on the element type.
Forest Fires	Risk map	Forest fire risk map at municipal level. INTC
Forest Fires	Vulnerability map	Forest fire vulnerability map at municipal level. INTC
Forest Fires	Vegetation map models (RISICO, PROPAGATOR)	Simplified vegetation map used in the RISICO and PROPAGATOR models. Derived from the CREAF Map
Forest Fires	Vegetation map High Resolution (CREAF)	High Resolution vegetation Map. CREAF.
Forest Fires	Critical Points	Set of critical elements vulnerable against forest fires. Currently the same set as flood critical elements.
Storm Surges	T100 Flooded areas	Areas Flooded by the sea with a return period of 100 years. ACA.
Storm Surges	T500 Flooded areas	Areas Flooded by the sea with a return period of 500 years. ACA.

Hazard	Product	Description and Source
Storm Surges	T100 Risk areas	Flooding risk by the sea with a return period of 100 years. INTC.
Storm Surges	T500 Risk areas	Flooding risk by the sea with a return period of 500 years. INTC.
Snow	Critical Points	Priority road sections Conflictive road sections Electric stations and sub-stations Flux Silos Snowplough bases Deviation parking areas

Figure 40 shows a couple of examples of vulnerability and risk information in A4Cat.

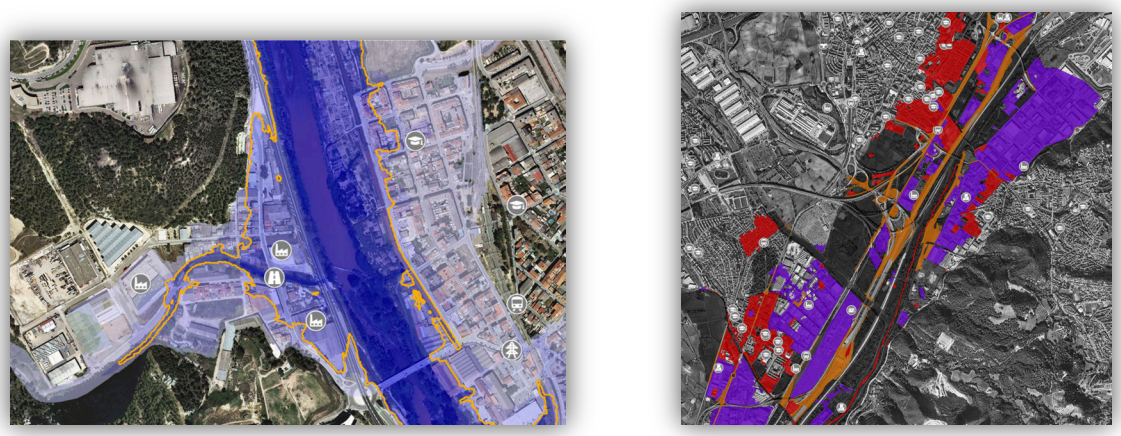


Figure 40. Flooding areas for 100 years return period and critical elements against flooding (left). Flooding risk for 500 years return period and critical elements against flooding (right).

4 A4EU at Pilot Site CENEM (Spain) – A4EU-A4CENEM. Responsible Partner: HYDS

4.1 A4EU-A4CENEM operational system description

A4CENEM system is based on the same platform as A4Cat system. Therefore, most of the functionalities are the same.

In this section, only the different functionalities or products from A4Cat are described.

4.1.1 System

The system description is the same as A4Cat with only two differences:

- A4CENEM has some more APIs to connect to different sources of information at national level (transit incidents from *Dirección General de Tráfico*, several water agencies sensors data, etc.).
- Lacks the encrypted API to receive 112 calls (those are managed at regional level).

4.1.2 Functionalities

A4CENEM functionalities are the almost same as A4Cat. The general section 3.1.2, and the subsections time navigation (3.1.2.2), product selection (3.1.2.3), information and feedback support (3.1.2.4), search engine (3.1.2.5), user focus functionalities and risk identification (3.1.2.6) are valid also for A4CENEM. The other sections are detailed below.

4.1.2.1 General meteorological warnings view

A4CENEM has a general view (default view when entering to the system) that summarizes the official meteorological warnings from the National Meteorological Agency (AEMET: *Agencia Estatal de Meteorología*).

The warnings for the different regions are shown in the map and can be filtered by leadtime (today, tomorrow and after tomorrow) and by hazard. Regions can be selected to get details of the warnings (comments, evolution, etc.). See Figure 41 for an example.

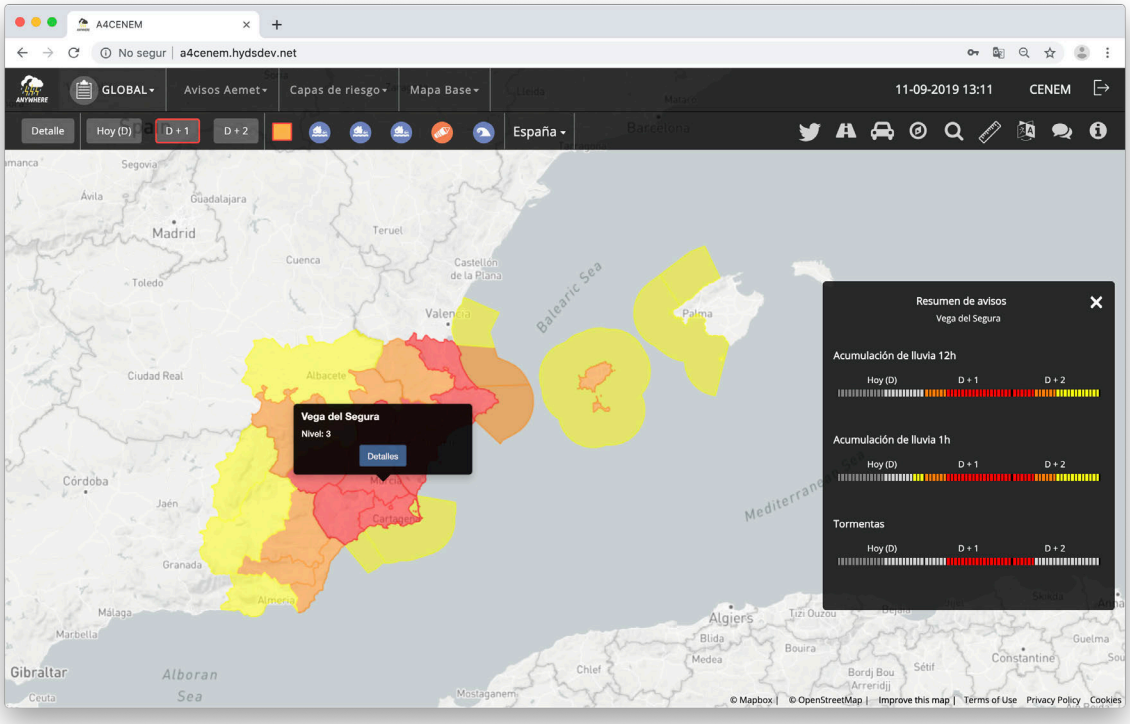


Figure 41. Example of the summary page of A4CENEM for official meteorological warnings corresponding to the flooding event of 12-13 September 2019.

4.1.2.2 Cartography

A4CENM allows changing the Cartography shown as base for all the information. It has a set of general maps:

- Global light map (from MapBox provider).
- Global satellite map (from MapBox provider).
- Global streets map (from MapBox provider).

And a set of local high-resolution maps provided by the different regional civil protections:

- Local Topographic map of the Comunidad Valenciana provided by the *Institut Cartogràfic Valencià*.
- Local Ortophoto map of the Comunidad Valenciana provided by the *Institut Cartogràfic Valencià*.

- Local land use map of the Comunidad Valenciana provided by the *Institut Cartogràfic Valencià*.
- Local Topographic map of the Illes Balears provided by the *Mapa Urbanístic de les Illes Balears*.
- Local Ortophoto map of the Illes Balears provided by the *Mapa Urbanístic de les Illes Balears*.
- Local land use map of the Illes Balears provided by the *Mapa Urbanístic de les Illes Balears*.

On top of the base map selected, different local thematic cartography can be overlayed from different sources (both global and at regional level):

- Train network provided by the *Instituto Geográfico Nacional*.
- Road network provided by the *Instituto Geográfico Nacional*.
- Administrative boundaries provided by the *Instituto Geográfico Nacional*.
- Administrative catchments divisions provided by the *Dirección General de Aguas*.
- Administrative municipal boundaries provided by Balearic Islands Civil Protection.
- Urban areas provided by Balearic Islands Civil Protection.

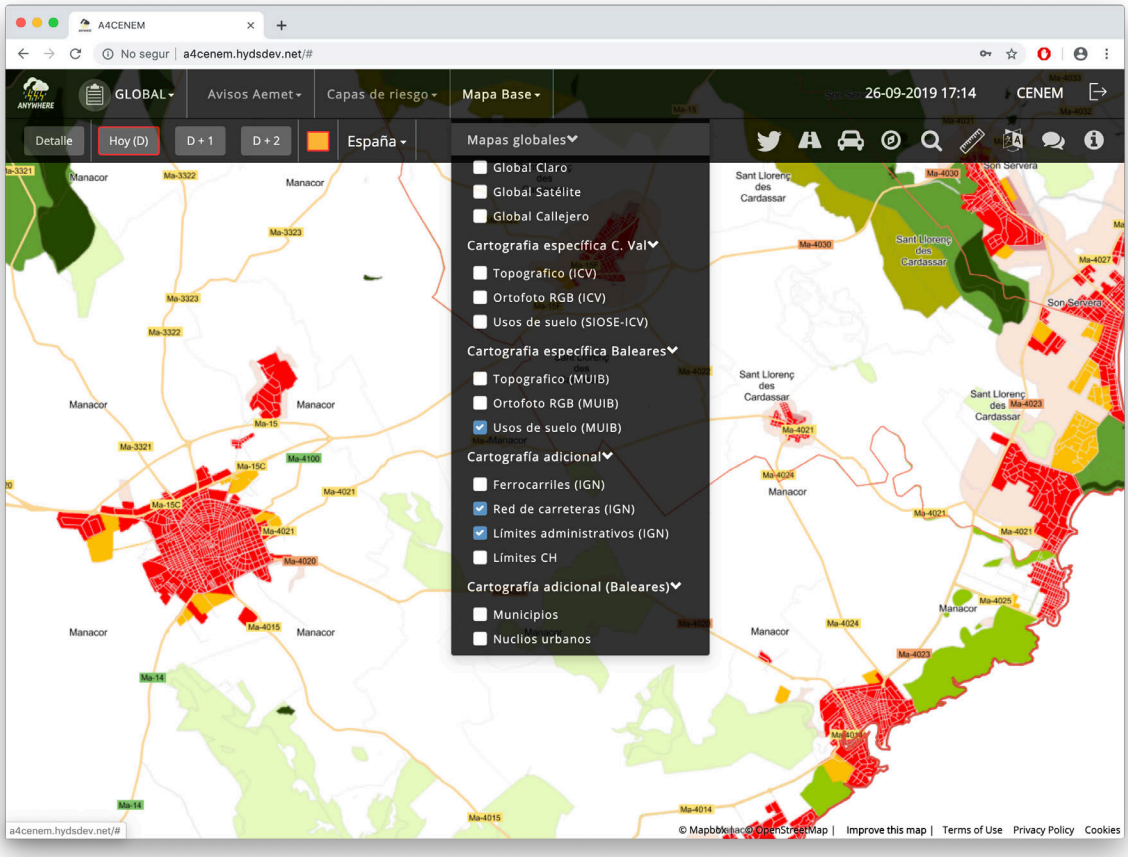


Figure 42. Example of thematic cartography (roads and administrative boundaries) overlayed in a regional base map (land use provided by MUIB).

4.1.2.3 Transit incidents and cameras

Transit incidents (from *Dirección Geneal de Tráfico*) are integrated in real time in A4CENEM. Once the transit incidents are activated with the corresponding button appears a dialog window that allows filtering the incidents based on several categories and the level. Selecting an incident, information about it is shown (municipality, road direction and kilometres affected, time, cause and description). See Figure 43 for an example. A4CENEM also shows the transit cameras information in real time. See Figure 44.

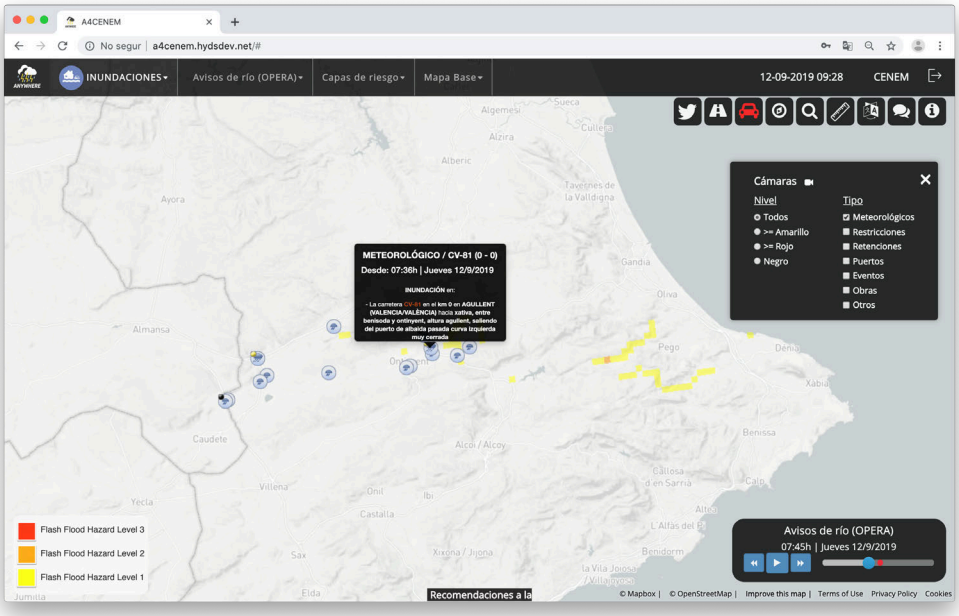


Figure 43. Example of transit incidents shown in real time in A4CENEM with all categories selected and showing all levels during the flooding event of 12-13 September 2019.

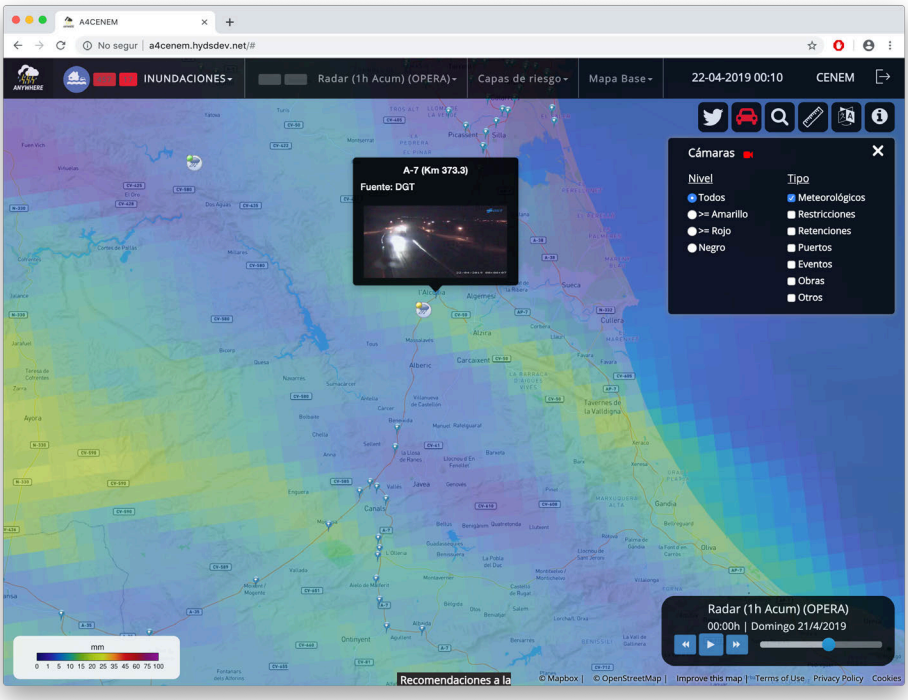


Figure 44. Example of transit cameras shown in real time in A4CENEM during the flood event of 22-23 March 2019.

4.1.3 Toolkits

A4CENEM includes the crowdsourcing tool developed by KAJO in the same way as A4Cat (see section 3.2.3.1).

Crowdsourcing information has been extensively used in A4CENEM in the flooding events of 22-23 March 2019 and 12-13 September 2019.

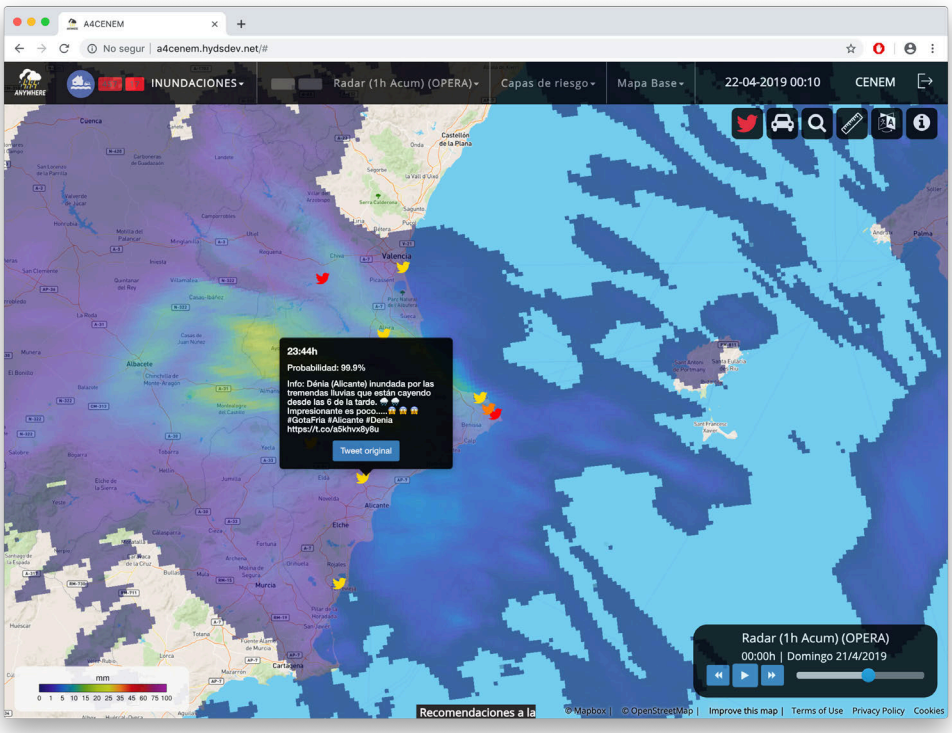


Figure 45. Example of crowdsourcing information shown in A4CENEM during the event of 22-23 March 2019.

4.1.4 Products

A4CENEM includes:

- All the Pan-European products of the MH-EWS.
- Several networks of sensors.
- Different meteorological warnings from the National Meteorological Agency.

The products are organized by hazard and mixed together and with local layers of information to help operation duties. A specific order and aggrupation are defined for each hazard.

Complete list of products is described in Table 11 (Floods), Table 12 (Forest Fires), Table 13 (Convective Storms), Table 14 (Wind), Table 15 (Storm Surges), Table 16 (Snow), Table 17 (Air Quality), Table 18 (Heat and Cold Waves), Table 19 (Droughts).

Table 111: A4CENEM's products for Floods. Details can be obtained in the corresponding page of the A4CENEM associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Floods

Product	Description and Source
Rain gauges (AEMET)	Local network of sensors. AEMET
Rain gauges (CHE)	Local network of sensors. CHE
Rain gauges (CHJ)	Local network of sensors. CHJ
Rain gauges (CHG)	Local network of sensors. CHG
River gauges (ACA)	Local network of sensors. ACA
River gauges (CHE)	Local network of sensors. CHE
River gauges (CHJ)	Local network of sensors. CHJ
River gauges (CHG)	Local network of sensors. CHG
Reservoirs (ACA)	Local network of sensors. ACA
Reservoirs (CHE)	Local network of sensors. CHE
Reservoirs (CHJ)	Local network of sensors. CHJ
Reservoirs (CHG)	Local network of sensors. CHG
Radar (15min Accum) (OPERA)	MH-EWS Pan-European product.
Radar (1h Accum) (OPERA)	MH-EWS Pan-European product.
Rainfall Warnings (OPERA)	MH-EWS Pan-European product.
River Warnings (OPERA)	MH-EWS Pan-European product.
Storm Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
Rain Accum 1h Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
Rain Accum 12h Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET

Product	Description and Source
Flood Warning (EFAS)	MH-EWS Pan-European product.
Precipitation forecasts (IFS-ECMWF)	MH-EWS Pan-European product.
Thaw Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET

Table 12: A4CENEM's products for Forest Fires. Details can be obtained in the corresponding page of the A4CENEM associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Forest+Fires

Product	Description and Source
Rule 30-30-30 (IFS-ECMWF)	Derived product from IFS-ECMWF. Calculated inside A4Cat.
Fire Weather Index (EFFIS)	MH-EWS Pan-European product.
Build up Index (EFFIS)	MH-EWS Pan-European product.
Duff Moisture code (EFFIS)	MH-EWS Pan-European product.
Drought code (EFFIS)	MH-EWS Pan-European product.
Fine Fuel Moisture code (EFFIS)	MH-EWS Pan-European product.
Initial Spread Index (EFFIS)	MH-EWS Pan-European product.
Fire Weather Index (EFFIS - MeteoFrance)	EFFIS forecasts based on MeteoFrance NWP data. Obtained through EFFIS platform.
Build up Index (EFFIS - MeteoFrance)	EFFIS forecasts based on MeteoFrance NWP data. Obtained through EFFIS platform.
Duff Moisture code (EFFIS - MeteoFrance)	EFFIS forecasts based on MeteoFrance NWP data. Obtained through EFFIS platform.
Drought code (EFFIS - MeteoFrance)	EFFIS forecasts based on MeteoFrance NWP data. Obtained through EFFIS platform.
Fine Fuel Moisture code (EFFIS - MeteoFrance)	EFFIS forecasts based on MeteoFrance NWP data. Obtained through EFFIS platform.
Initial Spread Index (EFFIS - MeteoFrance)	EFFIS forecasts based on MeteoFrance NWP data. Obtained through EFFIS platform.
Anomaly (EFFIS - MeteoFrance)	EFFIS forecasts based on MeteoFrance NWP data. Obtained through EFFIS platform.
Ranking (EFFIS - MeteoFrance)	EFFIS forecasts based on MeteoFrance NWP data. Obtained through EFFIS platform.

Fireline Intensity (RISICO-Europe)	MH-EWS Pan-European product.
Dead Fuel Moisture (RISICO-Europe)	MH-EWS Pan-European product.
Rate of Spread (RISICO-Europe)	MH-EWS Pan-European product.
Wind Effect (RISICO-Europe)	MH-EWS Pan-European product.
Meteorological Forecasts	A set of meteorological variables forecasts form (IFS-ECMWF and EFI-ECMWF): • Wind Gust Index. EFI • Maximum Temperature Index. EFI • Temperature. IFS • Precipitation. IFS • Wind. IFS • Rel. humidity (derived from IFS) MH-EWS Pan-European product.
Hotspots (NASA-FIRMS)	MODIS and VIIRS hotspots retrieved from NASA FIRMS (not filtered)
Hotspots (EFFIS)	MODIS and VIIRS hotspots retrieved from EFFIS (filtered)
Burnt areas (EFFIS)	Burned areas observed from satellite from two sources (obtained through EFFIS): • MODIS supervised, including reports. • VIIRS automatically processed by HYDS.

Table 13: A4CENEM's products for Convective Storms. Details can be obtained in the corresponding page of the A4CENEM associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Convective+Storms

Product	Description and Source
CAPE Index (EFI-ECMWF)	MH-EWS Pan-European product.
SHEAR Index (EFI-ECMWF)	MH-EWS Pan-European product.

Table 14: A4CENEM's products for Wind. Details can be obtained in the corresponding page of the A4CENEM associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Wind

Product	Description and Source
Anemometers (AEMET)	Local network of sensors. AEMET
Wind Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
Wind gust Index forecasts (EFI-ECMWF)	MH-EWS Pan-European product.
Wind forecasts (IFS-ECMWF)	MH-EWS Pan-European product.

Table 15: A4CENEM's products for Storm Surges. Details can be obtained in the corresponding page of the A4CENEM associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Storm+Surges

Product	Description and Source
Sea Status Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
"Rissaga" Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
"Galerna" Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
Sea Surface Level - Global	MH-EWS Pan-European product.
Sea Surface Level - Regional	MH-EWS Pan-European product.
Storm Surges Level	MH-EWS Pan-European product.

Table 16: A4CENEM's products for Snow. Details can be obtained in the corresponding page of the A4CENEM associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Snow

Product	Description and Source
Snow Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
Precipitation type forecasts (IFS-ECMWF)	MH-EWS Pan-European product.
Snowfall forecasts (IFS-ECMWF)	MH-EWS Pan-European product.
Snowfall index forecast (EFI-ECMWF)	MH-EWS Pan-European product.
Avalanche Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
Fog Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET

Table 17: A4CENEM's products for Air Quality. Details can be obtained in the corresponding page of the A4CENEM associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Air+Quality

Product	Description and Source
Particulate matters below 2.5 microns	MH-EWS Pan-European product.
Particulate matters below 10 microns	MH-EWS Pan-European product.
Nitrogen Dioxide (NO2)	MH-EWS Pan-European product.
Ozone (O3)	MH-EWS Pan-European product.
Sulphur Dioxide (SO2)	MH-EWS Pan-European product.
Carbon Monoxide (CO)	MH-EWS Pan-European product.
Dust Warnings (AEMET)	MH-EWS Pan-European product.

Table 18: A4CENEM's products for Heat and Cold Waves. Details can be obtained in the corresponding page of the A4CENEM associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Heat+and+Cold+Waves

Product	Description and Source
Thermometers (AEMET)	Local network of sensors. AEMET
Universal Thermal Climate Index (UTCI)	MH-EWS Pan-European product.
Heatwave probability (UTCI > 32ºC)	MH-EWS Pan-European product.
Temperature forecasts (IFS-ECMWF)	MH-EWS Pan-European product.
Maximum temperature Index forecast (EFI-ECMWF)	MH-EWS Pan-European product.
Rel. humidity forecast (IFS-ECMWF)	MH-EWS Pan-European product.
Heat Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET
Minimum temperature Index forecast (EFI-ECMWF)	MH-EWS Pan-European product.
Cold Warnings (AEMET)	Official Warnings from national Meteorological Service. AEMET

Table 19: A4CENEM's products for Droughts. Details can be obtained in the corresponding page of the A4CENEM associated Wiki: http://confluence.hyds.es/display/A4CATDOC/Droughts

Product	Description and Source
Standard Precipitation Index (SPI)	SPI for 1, 3, 6, and 12 months. MH-EWS Pan-European product.
Standard Precipitation Evaporation Index (SPEI)	SPEI for 1, 3, and 6 months. MH-EWS Pan-European product.
Standard Groundwater Index (SGI)	MH-EWS Pan-European product.
Standard Runoff Index (SRI)	SRI for 6 and 12 months. MH-EWS Pan-European product.
Deficits	Deficits for: • Precipitation • Soil Moisture • Groundwater • Runoff • Discharge MH-EWS Pan-European product.
Drought probability	MH-EWS Pan-European product.

4.1.4.1 Vulnerability and risk information

A4CENEM includes a set of vulnerability information for some hazards. Complete list of vulnerability information for each hazard is described in Table 20.

Table 20: A4CENEM's vulnerability and risk information. Details can be obtained in the corresponding page of the A4CENEM associated Wiki: http://confluence.hyds.es/display/A4CATDOC/A4CENEM+Capas+de+Riesgo

Hazard	Product	Description and Source
All	Population density	Population density map. JRC.
Flood	T10 Flooded areas	Areas Flooded with a return period of 10 years. DGA + ACA.
Flood	T50 Flooded areas	Areas Flooded with a return period of 50 years. DGA + ACA.
Flood	T100 Flooded areas	Areas Flooded with a return period of 100 years. DGA + ACA.
Flood	T500 Flooded areas	Areas Flooded with a return period of 500 years. DGA + ACA.
Flood	T10 Risk areas	Flooding risk with a return period of 10 years. DGA - SNCZI.
Flood	T100 Risk areas	Flooding risk with a return period of 100 years. DGA - SNCZI.
Flood	T500 Risk areas	Flooding risk with a return period of 500 years. DGA - SNCZI.
Flood	Riverbed network (ICV)	River network for the Comunidad Valenciana.
Flood	Flood Risk (ICV)	Flooding risk from PATRICOVA plan for the Comunidad Valenciana.
Flood	Flood danger (ICV)	Flooding danger from PATRICOVA plan for the Comunidad Valenciana.
Flood	Critical Points	Set of critical elements vulnerable against flooding (SEVESO industries, aeronautical infrastructures, nuclear power plants)
Forest Fires	High Risk Areas	Forest fire high risk areas from the Balearic Islands (Balearic Civil Protection).

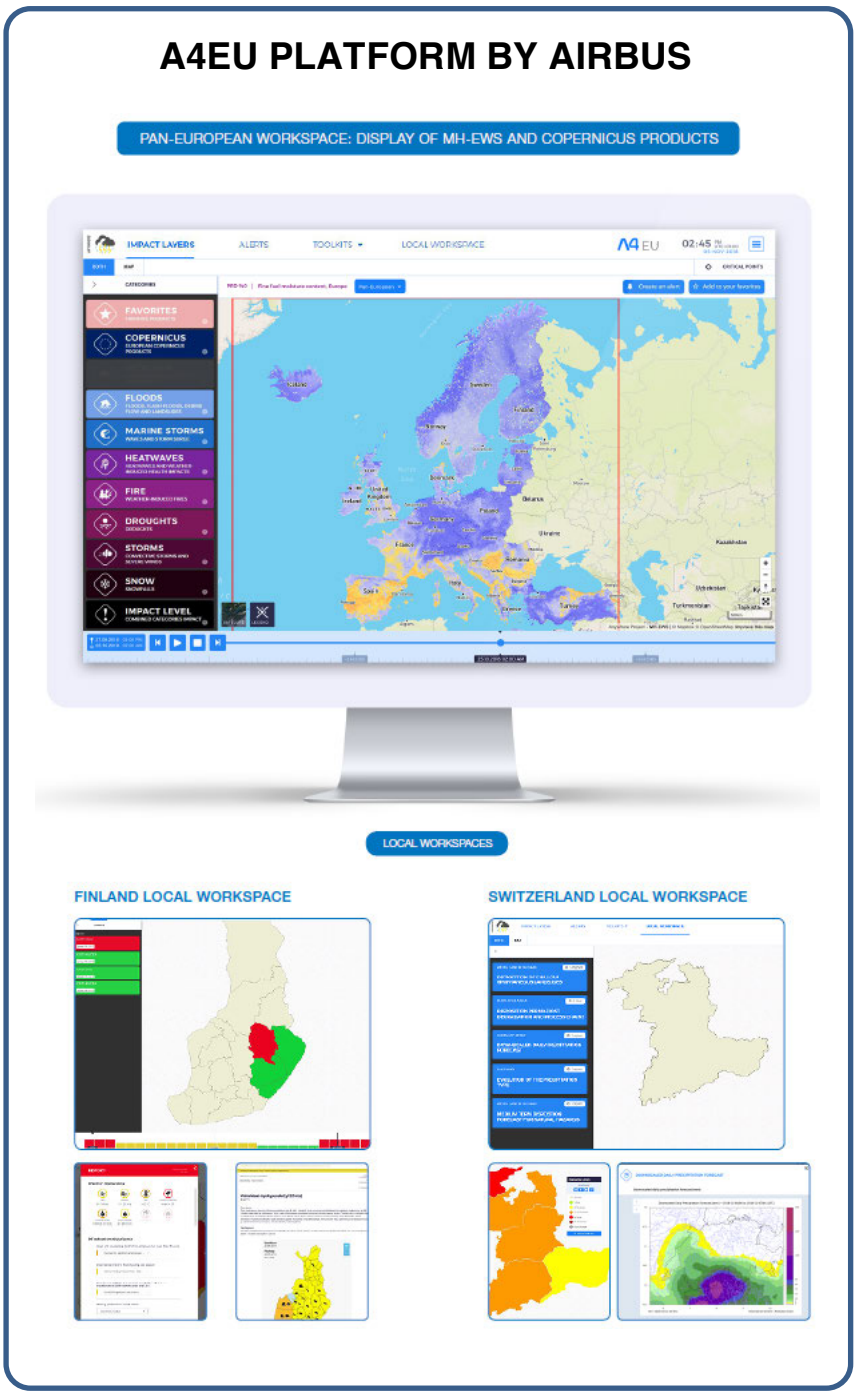
Hazard	Product	Description and Source
Forest Fires	Critical Points	Set of critical elements vulnerable against forest fires. (SEVESO industries, aeronautical infrastructures, nuclear power plants).
Storm Surges	T100 Flooded areas	Areas Flooded by the sea with a return period of 100 years. DGA + ACA.
Storm Surges	T500 Flooded areas	Areas Flooded by the sea with a return period of 500 years. DGA + ACA.
Storm Surges	T100 Risk areas	Flooding risk by the sea with a return period of 100 years. DGA - SNCZI.
Storm Surges	T500 Risk areas	Flooding risk by the sea with a return period of 500 years. DGA - SNCZI.

5 A4EU at Pilot Site Rogaland (Norway) – A4EU-A4Nor. Responsible Partner: AIRBUS

5.1 A4EU-A4Nor operational system description

Airbus platform has been developed to cover General Pan-European and local needs. The strategy has been to create a platform which allows the scalability of the tool and cover Generic and local needs in an easy and flexible manner. Doing so, will allow satisfying the maximum number of potential end users implementing in one single tool the specificities and commonalities that the emergency management teams across Europe may have. A platform that is able to integrate new common products with local existing tools provides a powerful advantage for end-user adherence.

- The A4EU platform developed by Airbus is structured in two levels with different workspaces embedded in the same system:
- 1st Level: Pan-European workspace, common and shared by all pilot sites (Norway, Finland and Switzerland). This workspace is used to visualize common Pan-European and local scale non-restricted products and toolkits (named A4EU-A4Nor)
- 2nd Level: Specific restricted local workspaces inside the A4EU platform for local tools and products when required (only available for Finland and Switzerland: A4EU-A4Finn and A4EU-A4Alps respectively). Those local workspaces are accessible through the common Pan-European workspace (A4EU-A4Nor) and complement the Pan-European information with the display of specific local needs.



1st level: **Pan-European workspace:**

Common and shared by all Pilot sites (Norway, Finland and Switzerland)

It contains: Non-restricted Pan-European product layers and common toolkits

A4EU-A4Nor

2nd level: **Local workspaces**:

Authorised users can also access to locally restricted workspaces

It contains: locally restricted products and tools

A4EU-A4Finn: Finnish users restricted workspace

A4EU-A4Alps: Swiss users restricted workspace

Figure 46. A4EU by Airbus Structure (A4EU-A4Nor + A4EU-A4Finn + A4EU-A4Alps)

The choice of having workspaces on two levels has been done to be able to integrate to the general needs that are needed by every pilot site, the local needs that were specific to each pilot sites and not relevant for the others. Those Local needs are not shared by other pilot sites and including them in the shared workspace would have created a main interface not adapted to all users.

The selected choice of two workspaces allows the platform to provide at the same time a first workspace that can be used by any potential site and a site dedicated lower level area in which each one can have its own local information.

All pilot sites have collaborated with their ideas and inputs during the development of the Pan-European workspace (they all access and use the common MH-EWS and Copernicus provided products that are displayed in this interface). Nevertheless, Rogaland (Norway) pilot site, being the sole without having also a locally restricted dedicated workspace, has been the main focal point for the Pan-European workspace development (this is the reason why this workspace has been renamed as A4EU-A4Nor).

Regular follow up meetings have been held with HSUS representatives for project follow up, system development and improvement based on users' feedback.

Local Workspaces are accessible via the common Pan-European workspace.

This chapter focus in the description of the 1st level of the A4EU platform by Airbus: the Pan-European A4EU-A4Nor workspace, which is accessible to all the pilot sites.

The local workspaces (A4EU-A4Alps for Canton of Bern pilot site and A4EU-A4Finn for South Savo pilot site) are described as a complement in chapters §6 and §7.

1st level: Pan-European workspace:

Common and shared by all Pilot sites (Norway, Finland and Switzerland)

It contains: Non-restricted Pan-European product layers and common toolkits

A4EU-A4Nor

2nd level: Local workspaces:

Rogaland pilot site has no dedicated local workspace

Figure 47. A4EU Workspaces used by Rogaland Pilot Site

5.1.1 System

The following diagram presents an overview the System run principle for the A4EU platform:

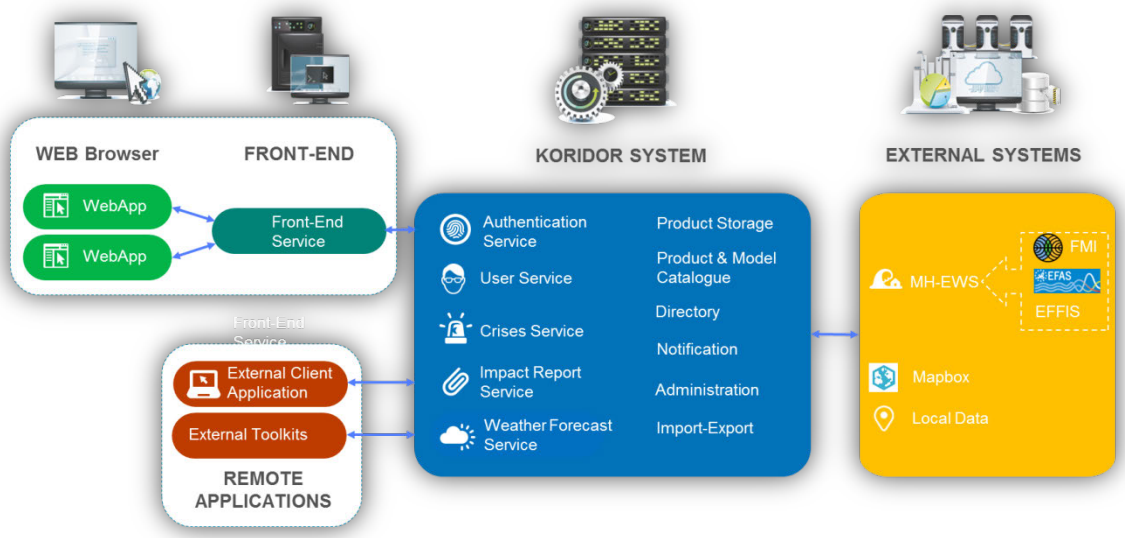


Figure 48. A4EU by Airbus System Overview

The platform has SSO (single sign on) system implemented: single login system for A4EU platform and A4BusinessHub (aw-businesshub.eu). Site is in HTTPS protocol to improve communication security. Access rights management is secured via authorization. The platform has been developed on web standard OAuth2 to improve data security.

Dedicated servers are at disposition of the project. Those systems have been designed and selected to secure efficient connection with source interfaces and users. The platform is connected to MH-EWS, Geospatial European services (Copernicus weather services) and local data providers.

Authentication service allows managing access rights, which means that the interface can be customized automatically depending on the user.

Airbus System connects regularly to MH-EWS to check catalogue updates. If that's the case, products are downloaded and integrated in the A4EU platform by Airbus.

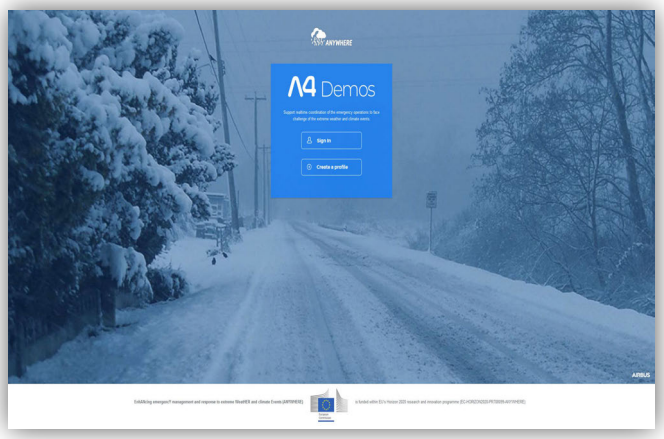
Visual cartographic data are downloaded each time a user selects a layer to be displayed (either through MH-EWS or Copernicus server).

5.1.2 Functionalities

5.1.2.1 Access

A4EU platform is accessible via a **login web interface**. User can sign in or sign up if its user has not been yet created or to recover her/his password. A confirmation via email is performed for every sign up or password recovery.

Access to Local Workspaces is granted by specific authorization from the pilot sites.



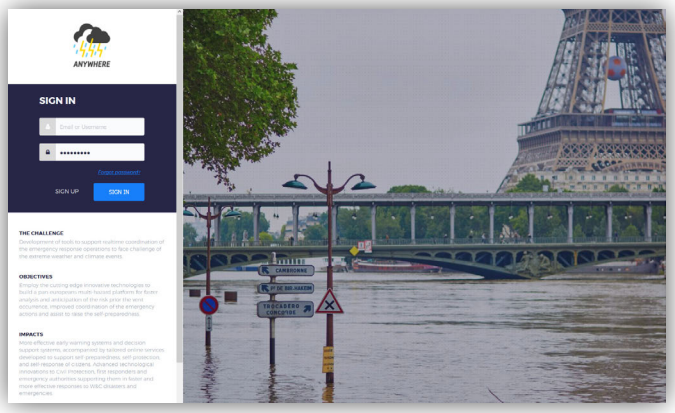


Figure 49. Login pages

5.1.2.2 Login sessions

For security reasons, Login session has been set to 4h. A notification timer appears to inform the user from 10 minutes prior to disconnection.

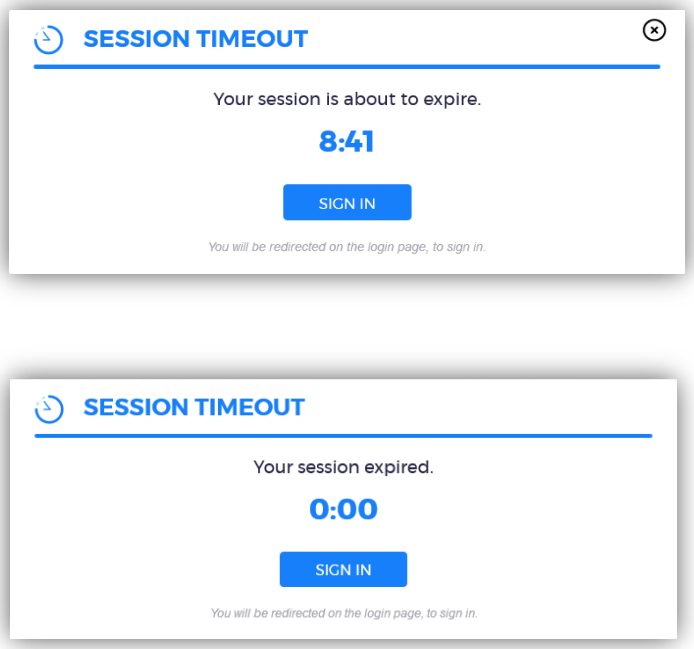


Figure 50. Session timeout alert window

A4EU tool displays the Pan-European and local MH-EWS products related to the sub-site hazards. Different map layers (layer= A set of coherent low-level information packaged together than can be display on a map) are available through the products menu available on the left side of the main screen. A timeline provides the timeframe overview allowing monitoring for risk evaluation and decision support.

5.1.2.3 Menus

The menus are clear and navigation through the platform is fluid.

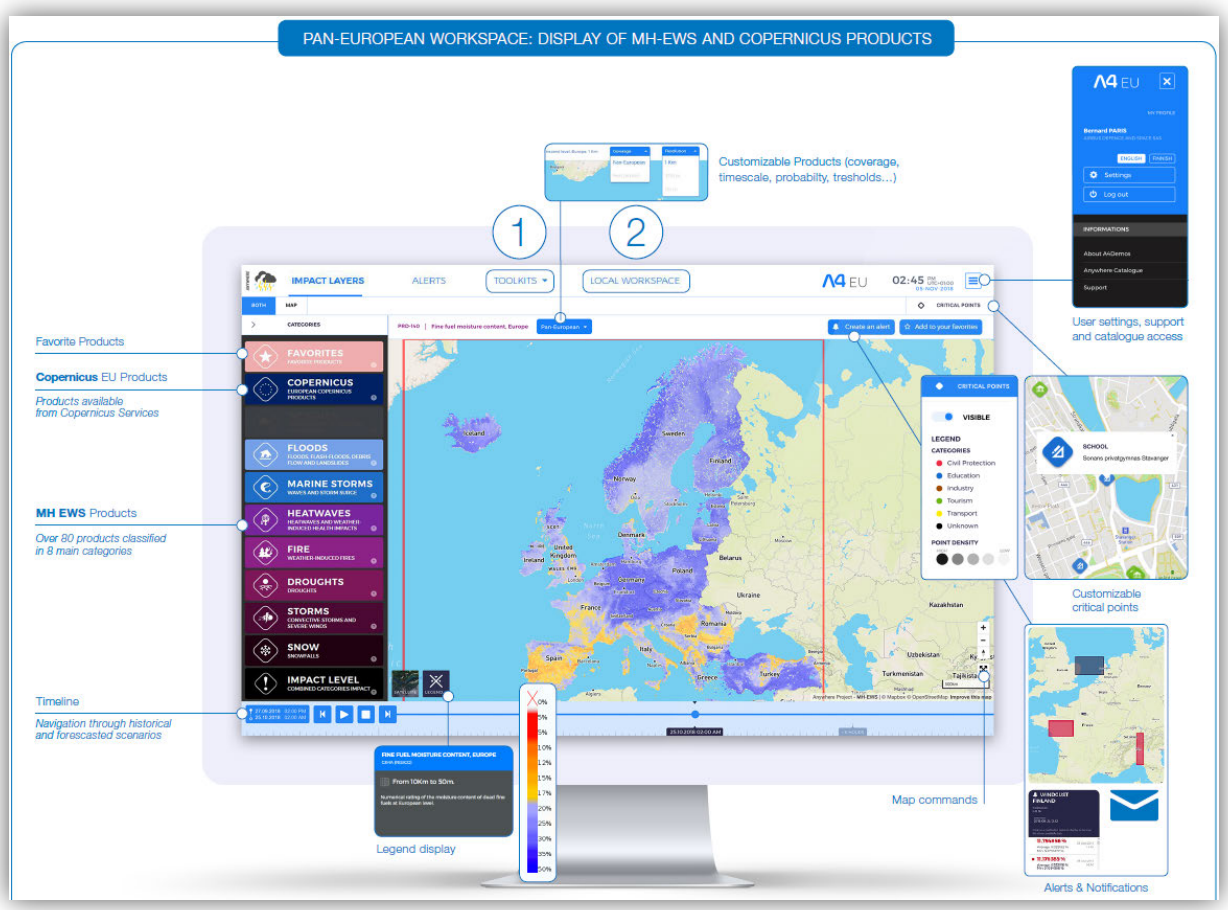


Figure 51. Pan-European Workspace (A4EU-A4Nor) main screen and menus ①Toolkits: Access to toolkits menu ②Local Workspace: Access to local restricted area.

The top banner menu provides access to the the Local Workspace acces, the Toolkits menu and Alerts.

The impact layers menu is selected by default:

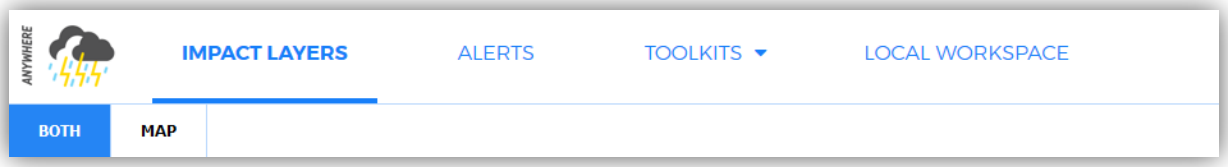


Figure 52. Main Menu bar with "Impact Layers" selected

5.1.2.4 Layers Display

The Impact layers menu provides access to the different layers and the main features linked with the products. The main categories and products are further explained in §5.1.4.

Each category provides access to a list of layers that after selection are displayed in the map.

5.1.2.5 Online map interface

The **online map interface** is based on the open source mapping platform, Mapbox (www.mapbox.com), and provides the user zoom and pan capabilities besides the possibility to display the map on satellite or standard map view.

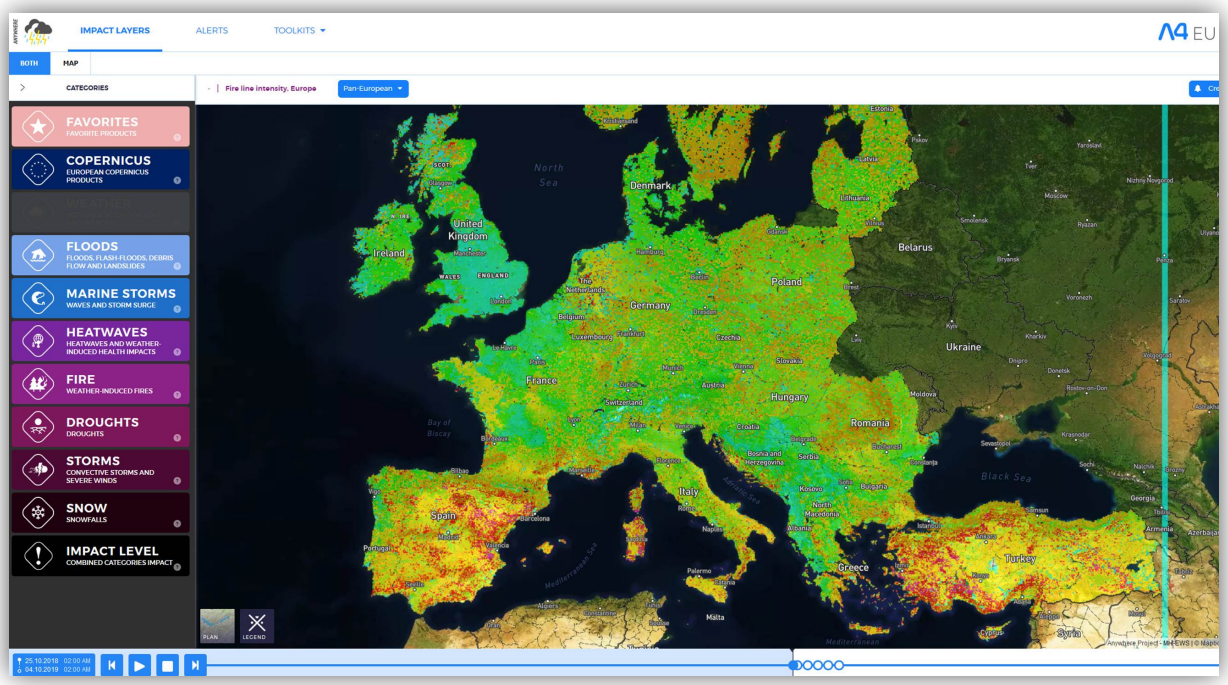


Figure 53. Pan-European workspace (A4EU-A4Nor) main screen with an example of layer display over satellite map view.

5.1.2.6 Legends

The interface also provides the user the possibility to display layer legends, with a description of the product and its associated colour scale and update frequency information.

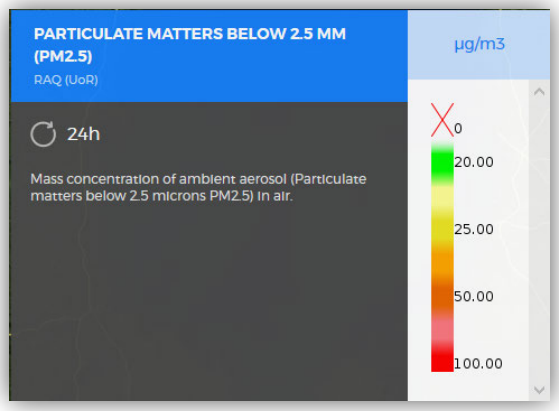


Figure 54. Legend example

5.1.2.7 Timeline

A timeline has been implemented to allows visualizing the products on a selected time, being able to select past, current time or forecast of the layer impact (always when product has available data which is not always the case) (see figure 55). The timeline can jump between dates or to automatically play in the map the evolution of the predictions to display successively and automatically the different state of the product and the layers on the map.

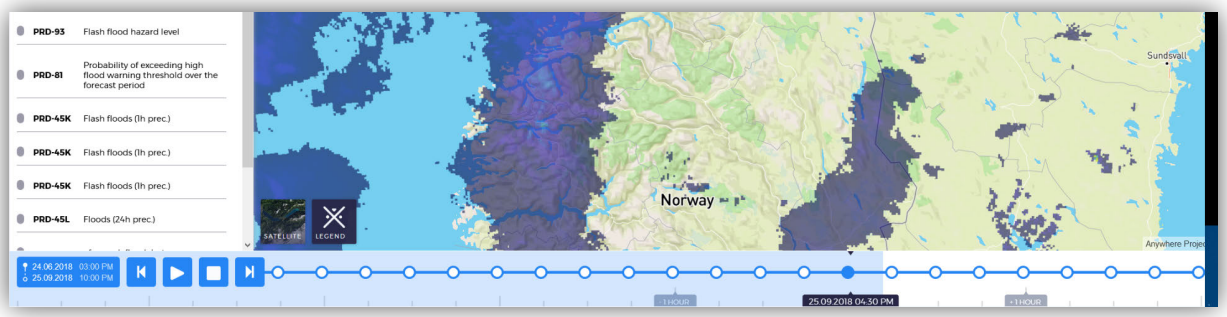


Figure 55. Interactive timeline to display the products on different timeframes

5.1.2.8 Generic Point Of Interest (POIs)

Generic Point Of Interest (POIs) layer is available and displayed in the map. The POIs layer is stored on its own server infrastructure. POIs are sorted by 5 different categories (tourism, civil protection, education, transport and industry). A list of local POIs has been provided so they can be identified in the map.

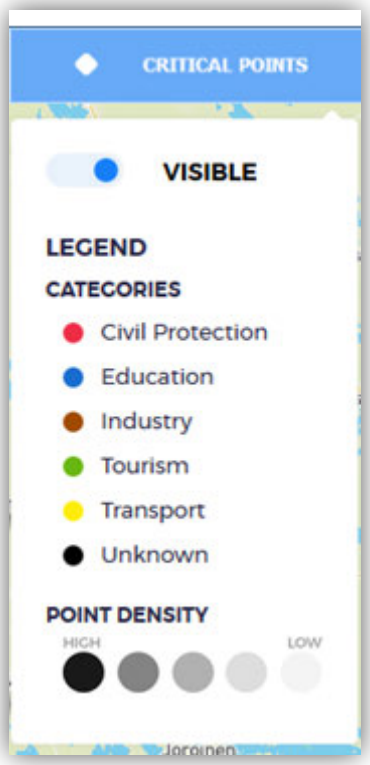


Figure 56. Point of Interest Menu where 5 main Categories are identified.

At high level, POIs are represented on a density cloud:

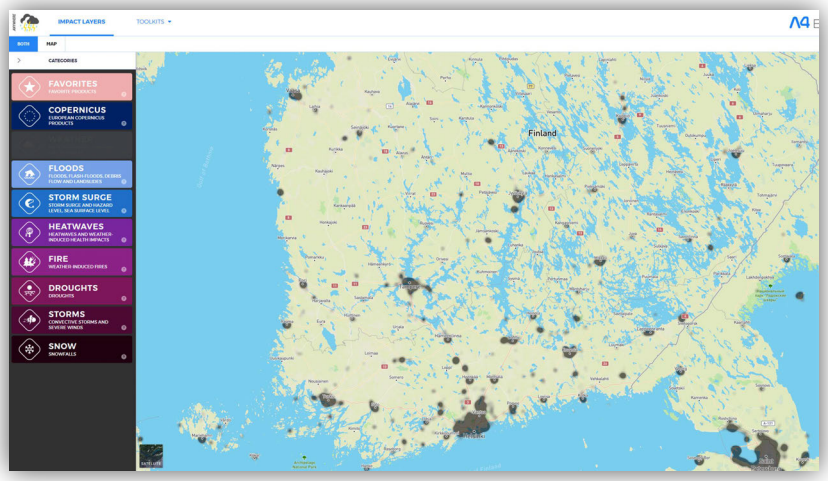


Figure 57. Pan-European view. Point of Interest density view on Finland.

When zooming, the cloud becomes concrete POIs over which we can click to get general information:

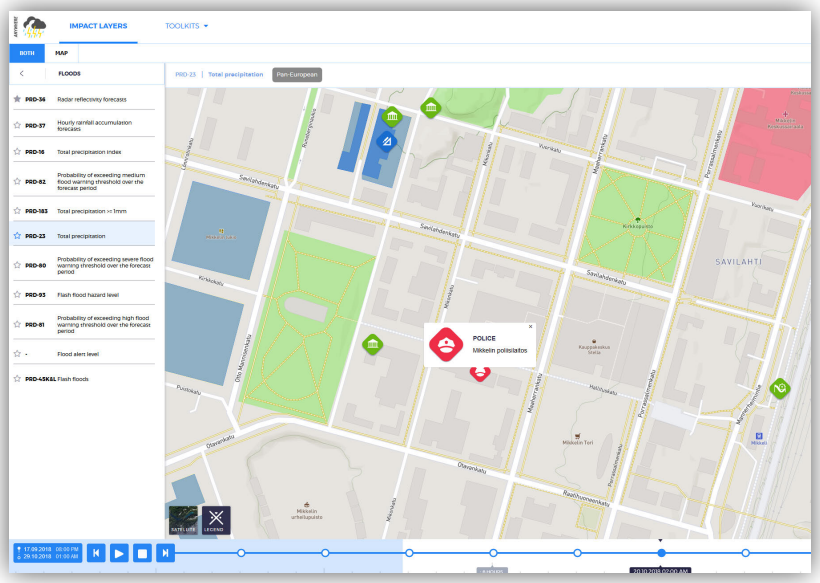


Figure 58. Point of Interest example on zoomed area.

5.1.2.9 Favorite layers

Due to the large amount of products available on the tool, the platform has incorporated a Favorites feature to easy the day to day of the user.

Each user can add products to her/his favorite list:

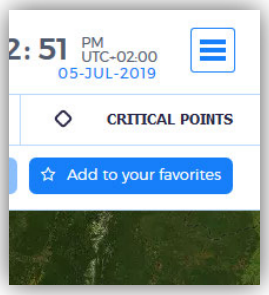


Figure 59. Button to add layer to user's favorite list.

Favorite products will be accessible on a specific area within the product category menu list:

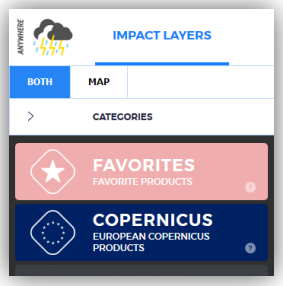


Figure 60. User's favorite layer list access

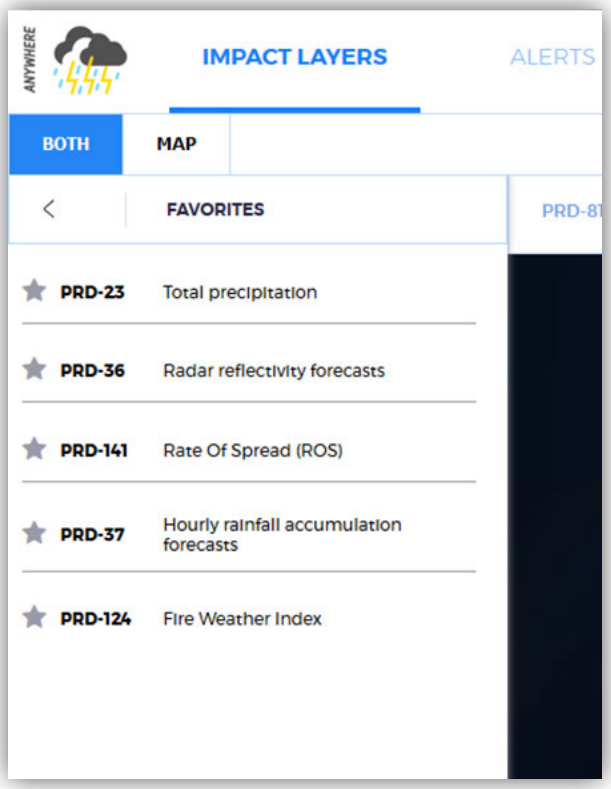


Figure 61. Example of User's favorite layer list

5.1.2.10 Alerts and Notification system

With the objective of easing the operability of the platform, Airbus has developed an Alert and Notification system. This option provides to each user the possibility to set-up hers/his own alerts on the different layers and receive notifications by email.

- Alert: Defined conditions (area, thresholds and time frame to be surveilled) on a layer on which the user wants to be notified ("notification") when values are identified outside the defined thresholds.

Each user is able, for a given product, to:

- Set the area in the map to be surveyed
- Set the thresholds beyond which he wants to be alerted
- Set the time period to be surveyed

- Decide if she/he wants to be also notified by email when the alert is triggered.
- Check in the A4EU system the different notifications for a given alert.

User's ALERT information is accessible via the main Menu bar

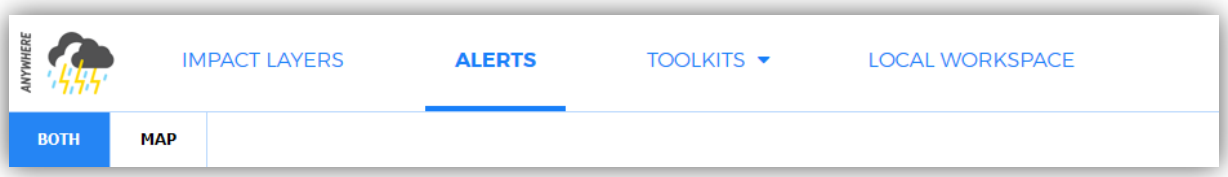


Figure 62. Alerts menu access

Users can create alerts for any given layer (layer must be selected in advance)

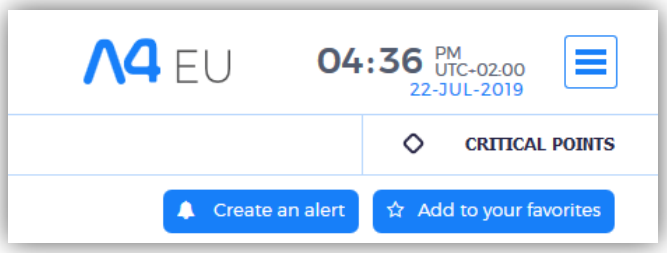


Figure 63. Button to initiate the creation an alert on a layer

The user has then to define the bounding box for the alert perimeter and sets the parameters of the alert: name, timeframe and thresholds. The user can also select if he/she wants to be notified by email every time the thresholds are trespassed.

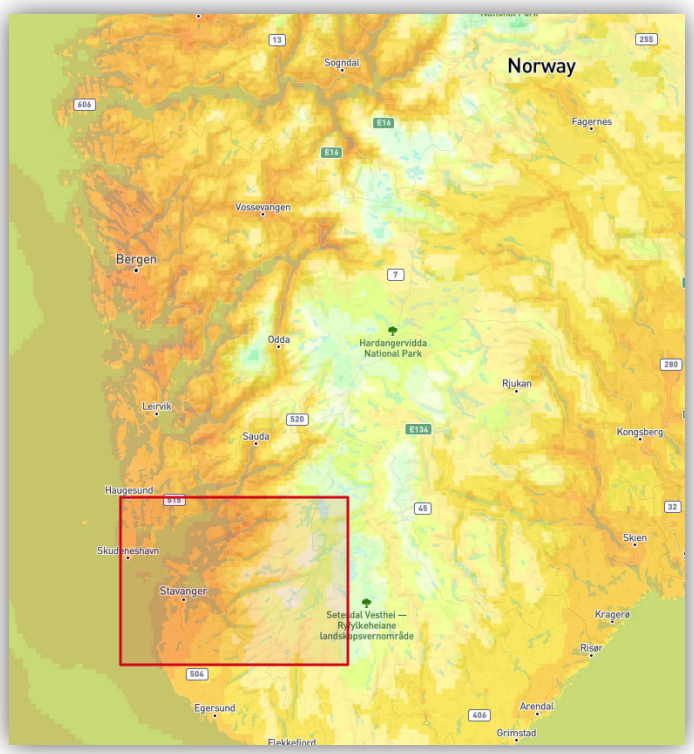


Figure 64. Definition of Alert geographical perimeter: Bounding box

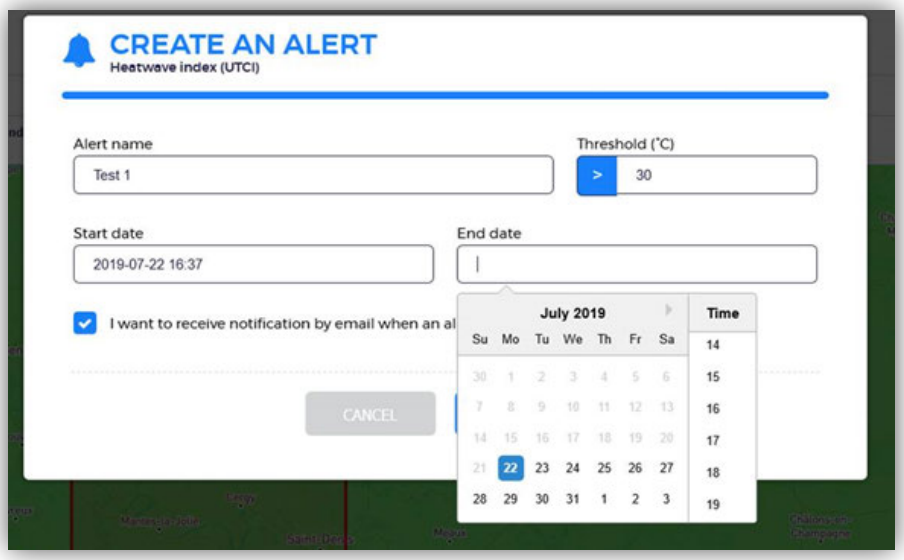


Figure 65. Alert parameters definition window (with option for email notification)

All alerts set by the user are accessible via the ALERTS menu on the top menu Bar. Each time an alerts is triggered (analysing all the future available data), it is indicated with a red notification counter in the alert menu and their related area in the map becomes red to facilitate its visual identification (if the alert has not been triggered the area remains in grey):

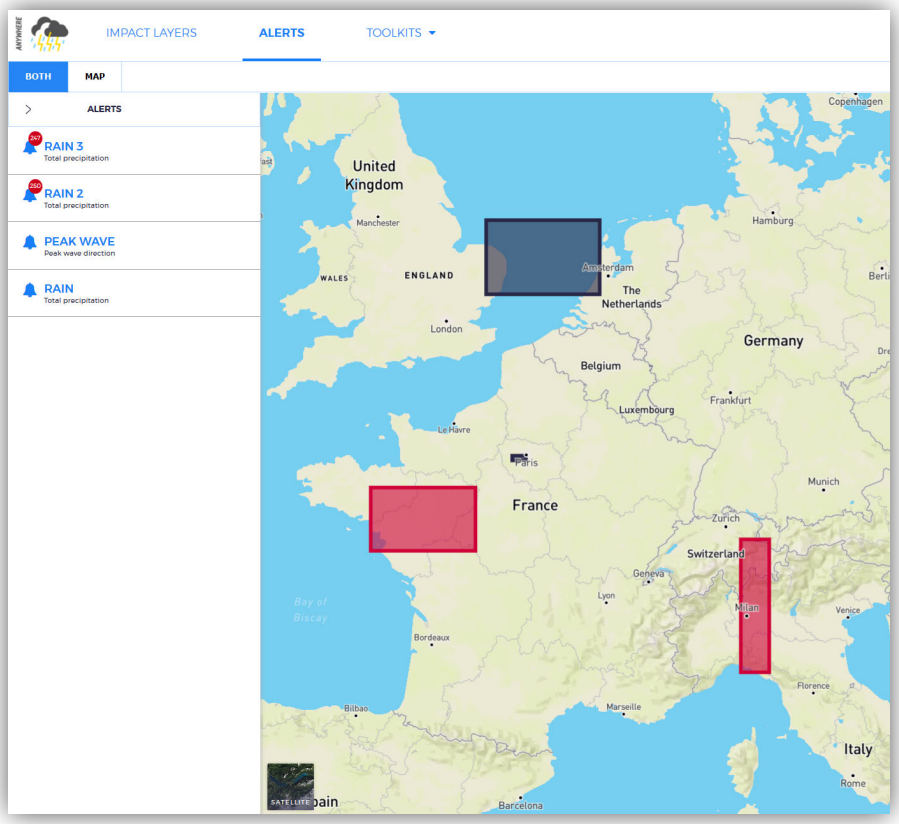


Figure 66. User Alerts menu with list of Alerts defined by a user and areas in red due to alert triggered.

For each created alert, a notification menu is available when clicking on the alert area (left side of the main screen). It provides information of the alert and the different notifications to ease user's evaluation (Figure 67):

- Information of Alert parameters defined by the user.
- If any notification has been triggered (identified values over the defined thresholds anytime in the future):

- Forecasted time for the notification
- Max, Min and Average value for the defined area
- Red dot as indicator for new notifications

When selecting one of the notifications, the map layer for the forecasted time for the alert is uploaded in the map to ease the operational analysis of the situation.

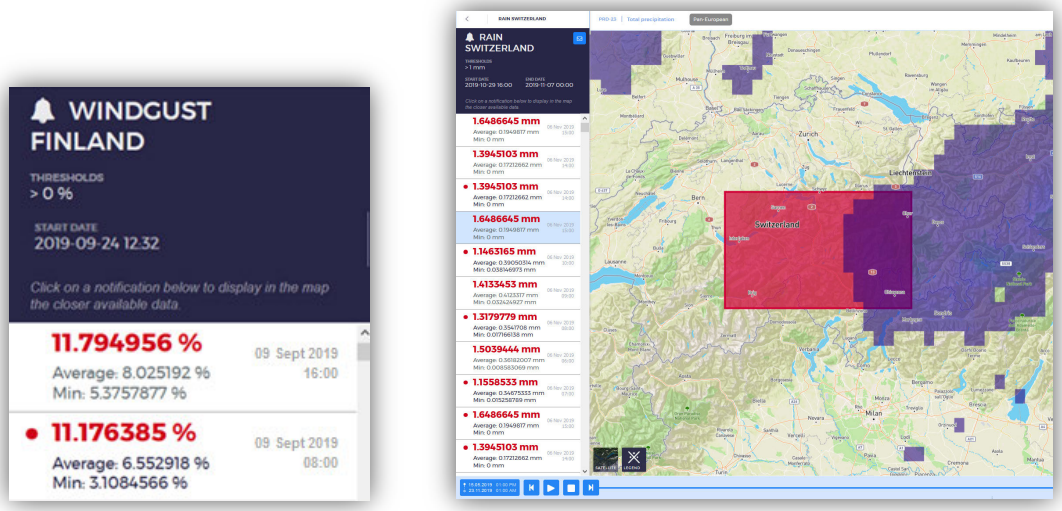


Figure 67. Example of Alert notification and example of layer update for operational analysis

If the user has selected the notification by email option, each time a notification is raised she/he will receive an email with the information of the notification (see figure 68):

Figure 68. Example of email Alert notification received by the user

5.1.2.11 Access to Toolkits & Local Workspaces (A4EU/A4Finn and A4EU/A4Alps)

The Pan-European workspace of the platform also provides to all the users (all pilot sites) the access to a series of the different Toolkits that have been developed during the project.

Toolkits are accessible on a drop-down menu accessible from the top banner.

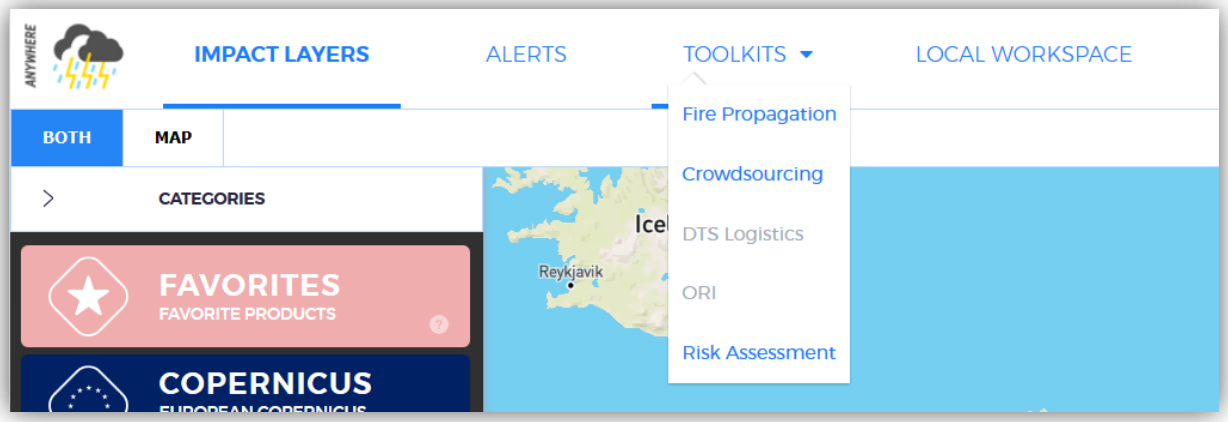


Figure 69. Toolkits access menu

The detailed description of the toolkits is available on §5.1.3. The platform is ready to integrate the other toolkits if necessary.

The Local Workspace access button on the top banner addresses to the local workspace when the user is authorized. In this case it provides access the Canton of Bern (Switzerland) pilot site users to their specific working area A4EU-E4Alps and for the South Savo (Finland) pilot site users to their specific working area A4EU-A4Finn. Both specific workspaces are descirbed on §6 and §7.

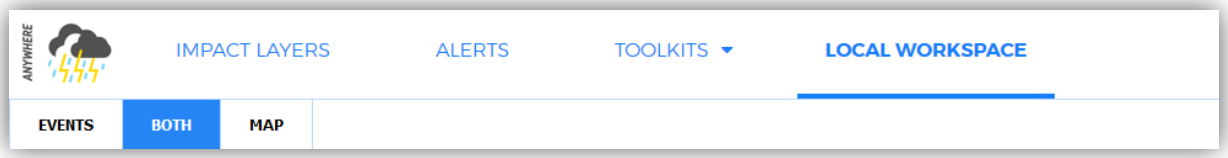


Figure 70. Local workspace access

5.1.2.12 User settings & support

On the top right of the screen the **user** has access to the **settings, support and information menu.**

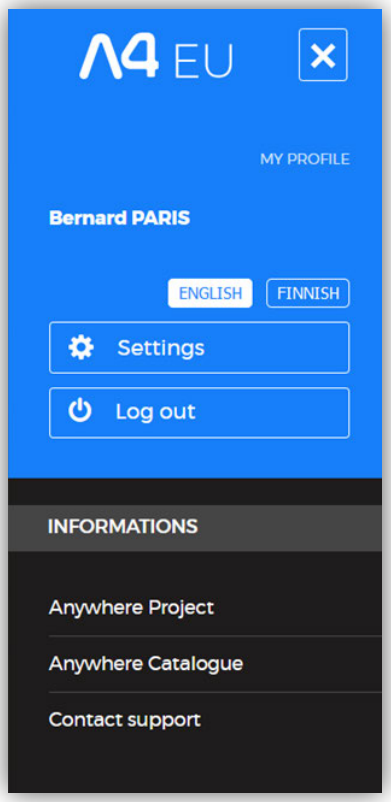


Figure 71. User settings menu

It provides the possibility to the user to customize the interface to his preferred language (currently English and Finnish languages are available) and update his settings (account information, password, authentication via QR code and secure Key) and access to the users sessions history and applications permissions information.

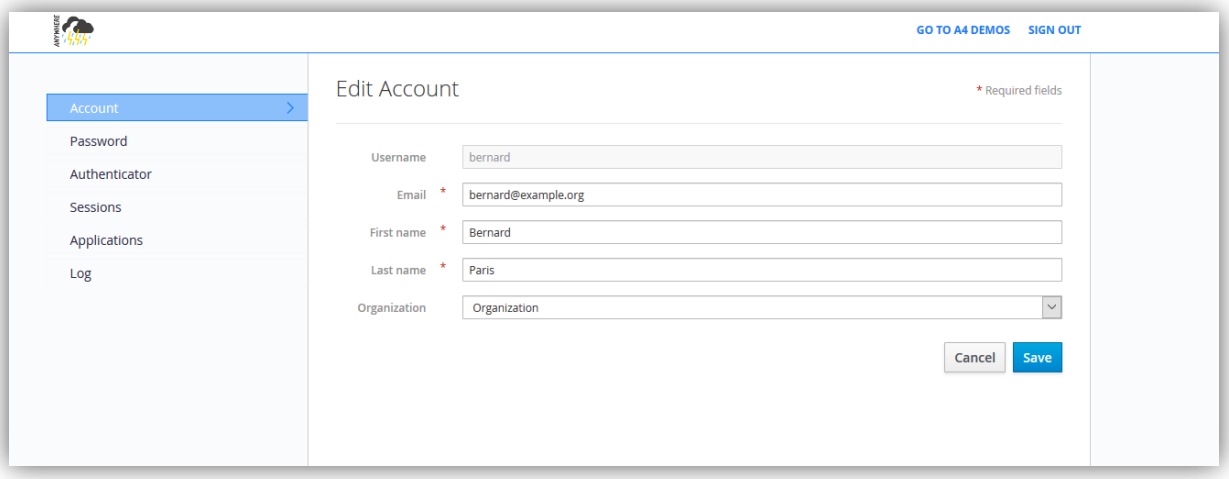


Figure 72. User settings interface

The menu also provides direct access to the Anywhere Project page and the catalogue of products for hazard forecasting and impact localization due to weather and climate events. It also provides the user a way to contact the developer for support or feedback.

5.1.3 Toolkits

Three toolkits are currently implemented in the tool.

5.1.3.1 Propagator (by CIMA):

Propagator toolkit allows the user simulate scenarios about duration, propagation direction and extent of forest fires. The toolkit is accessible by hovering over the “Toolkit” dropdown menu and then clicking on “Fire Propagation. The API has been integrated in the Airbus A4EU Interface and simulations are visible in the Pan-European environment.

Once the Propagator toolkit is selected, the A4EU interface is adapted to allow the user to parametrize the simulation.

The user has to integrate the following parameters to be able to start a simulation:

- Add ignition points (point, line, or polygon can be drawn in the map and edited or deleted).
- Add conditions (different conditions can be added to simulate fire evolution over the time):
    - wind speed: the wind speed in km/h
    - wind direction: the wind direction in degrees
    - and time: it defines the starting time of the new condition

When the user adds a condition, it appears in the table below the form. Through this table, user can remove a condition. User can use the wind rose to easily fill the wind direction input. If two conditions are introduced for the same time, the last one replaces the previous.

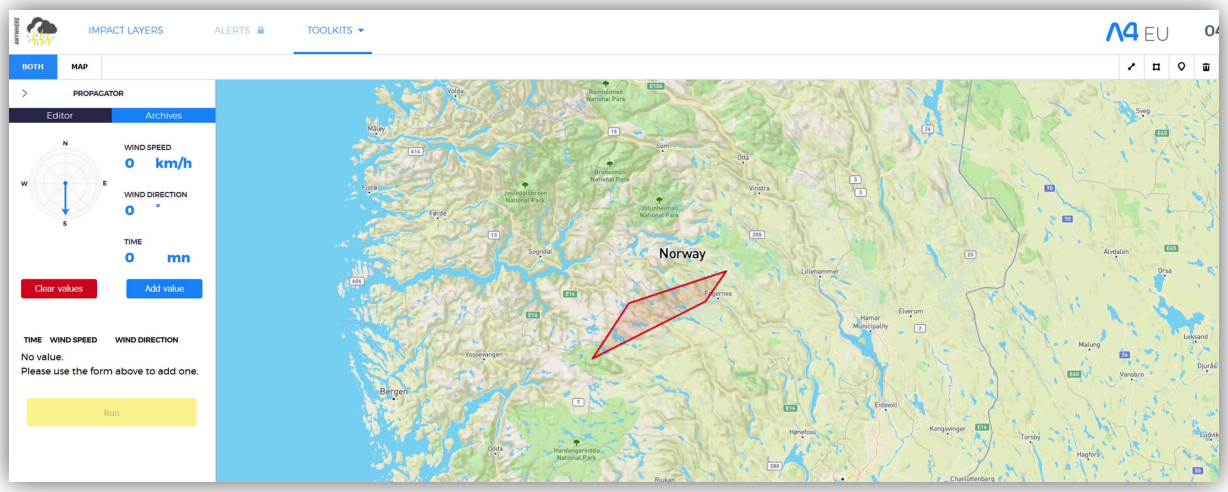


Figure 73. PROPAGATOR user interface.

Once the simulation is launched, the simulation displays in real time the fire expansion. User can hover a feature on the map to see in a popup the area covered in hectares (ha) and the time the fire took to expand to this step.

It will run until is stopped by the user or simulation reaches 72h. User can decide to abort the simulation at any time. Historic archives are also accessible to visualize previous simulations.

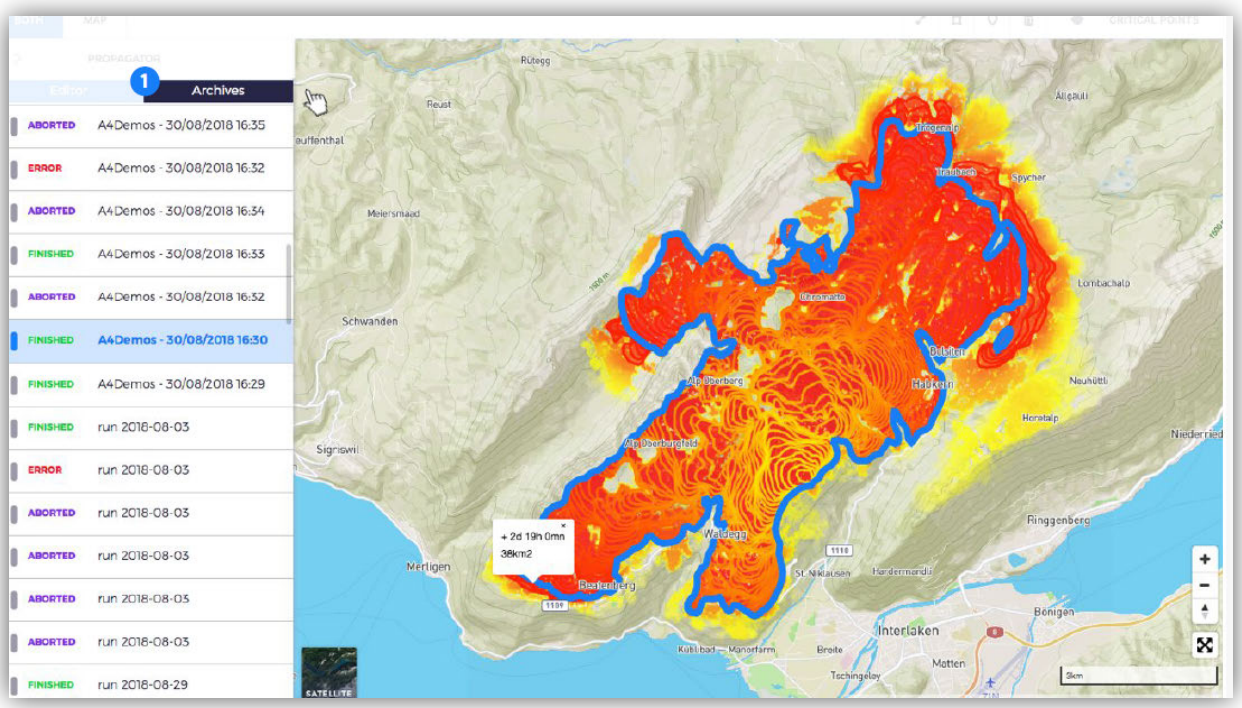


Figure 74. Example of PROPAGATOR simulation and historical archive menu

5.1.3.2 Crowdsourcing (by KAJO) toolkit:

Crowdsourcing (by KAJO) is a module that allows the collection of information from crowdsourcing (social networks, etc.) and integrates it for a better support of the risk assessment and decision making.

The tool analyses content of tweets and determines a flood risk probability according to its semantic content.

Crowdsourcing toolkit is accessible via the “Toolkit” menu. Its interface is integrated with the A4EU platform and provides which objective is to identify areas with high flood probability. Information of the tweets is available when clicking on each of the risk identified areas of the map.

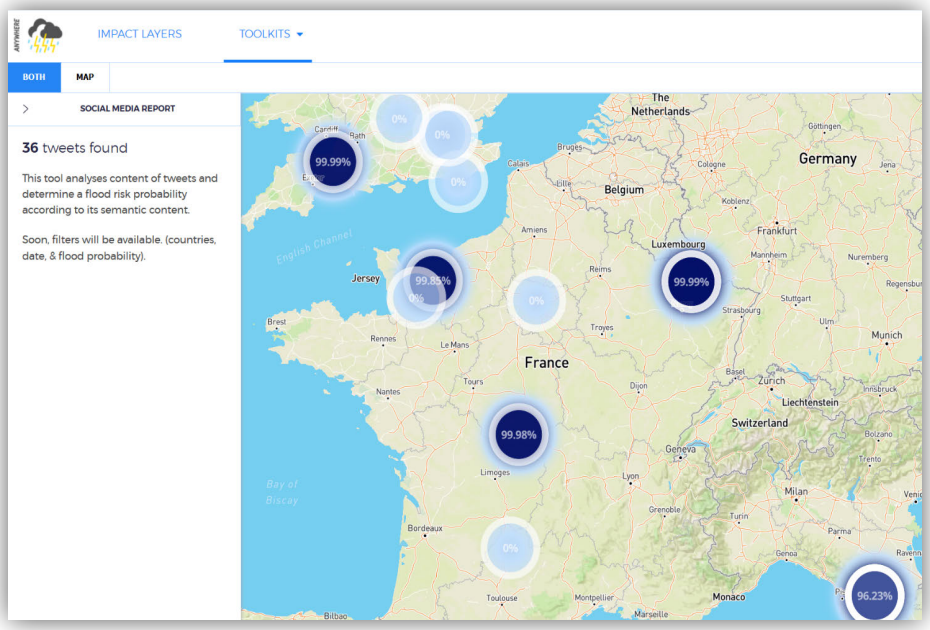


Figure 75. A4EU Pan European view. Example Crowdsourcing toolkit displaying in the map the flood related tweets and probabilities.

5.1.3.3 Risk assessment (SINTEF):

Implemented in Norway, it transforms the forecasts and hazard assessments into consequences of specific risk scenarios. Decision-makers can alter the risk models parameters (likelihood, consequence) based on their local insights, and observe how risk changes according to these alterations.

Through the A4EU access (in the “Toolkits” top drop down menu), the user is redirected to the Risk Analyser portal (ARA) where the user will log in and parametrize the risk assessment. Form ARA, the user can go back toA4EU acts as the final front end to visualize the output in a map based user interface.

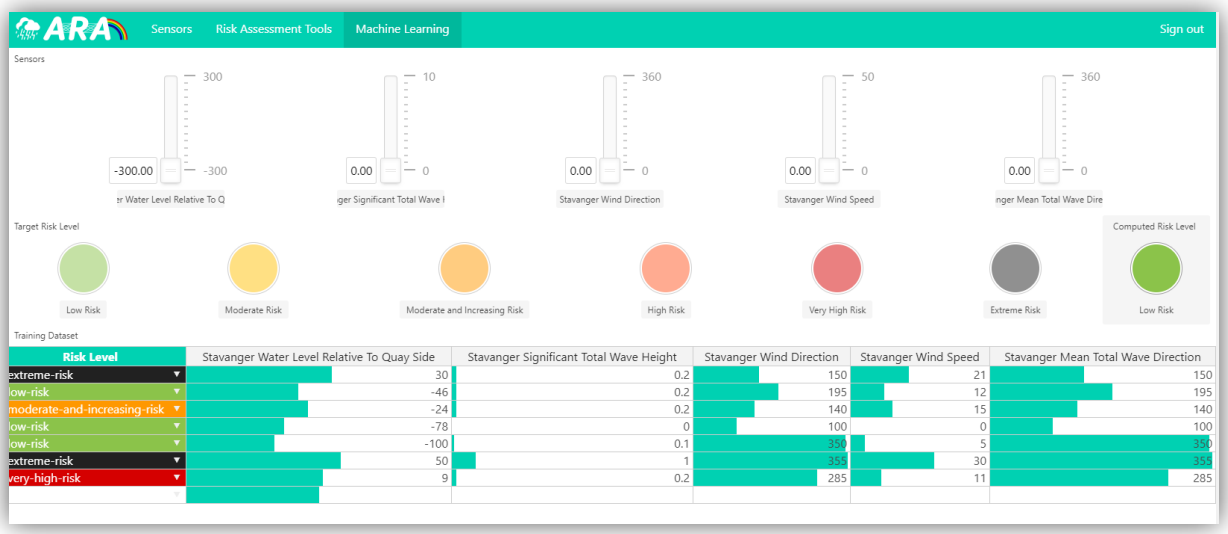


Figure 76. ARA interface

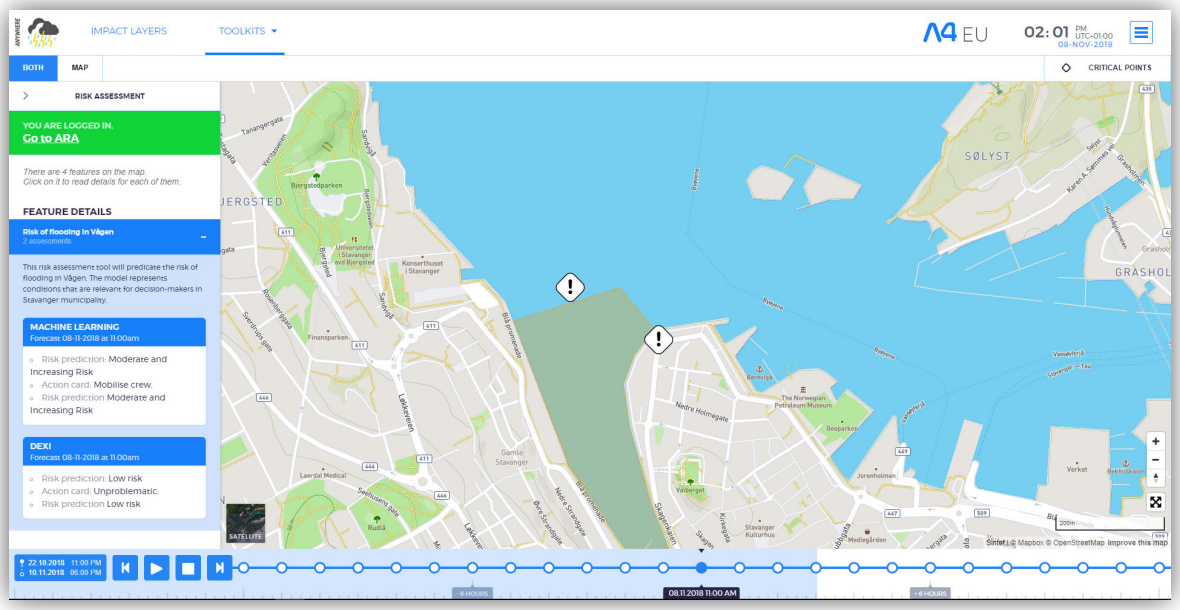


Figure 77. A4EU interface with ARA inputs

The A4EU interface also provides the user the possibility to get further information about the forecast, sensors or risk assessment shown in the map (by clicking on different items).

The time line below the map in the A4EU tools enables you to see past forecasts, sensors and corresponding risk assessments, as well as future forecasts and corresponding risk assessments:

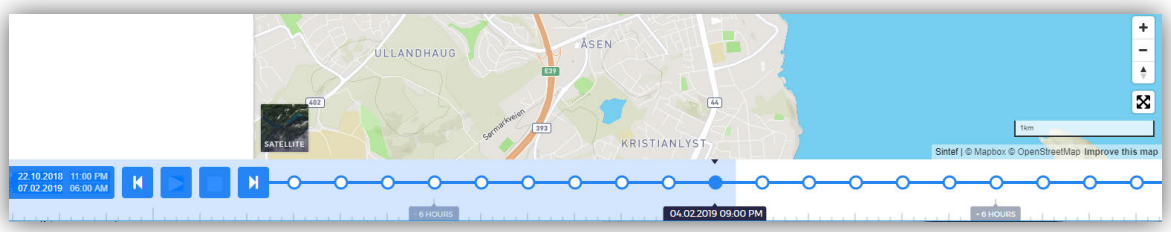


Figure 78. Time line in A4EU for ARA Risk Assessment

The time line is operated in the standard way explained in §5.1.2.7

5.1.4 Products

A4EU provides access to all available MH-EWS products, at Pan European or local level.

The platform is structured to display today Copernicus products (gathered in 1 Category) and the available MH-EWS product layers (gathered in 8 main categories) at Worldwide, Pan-European or local level:

Figure 79. Impact layers categories

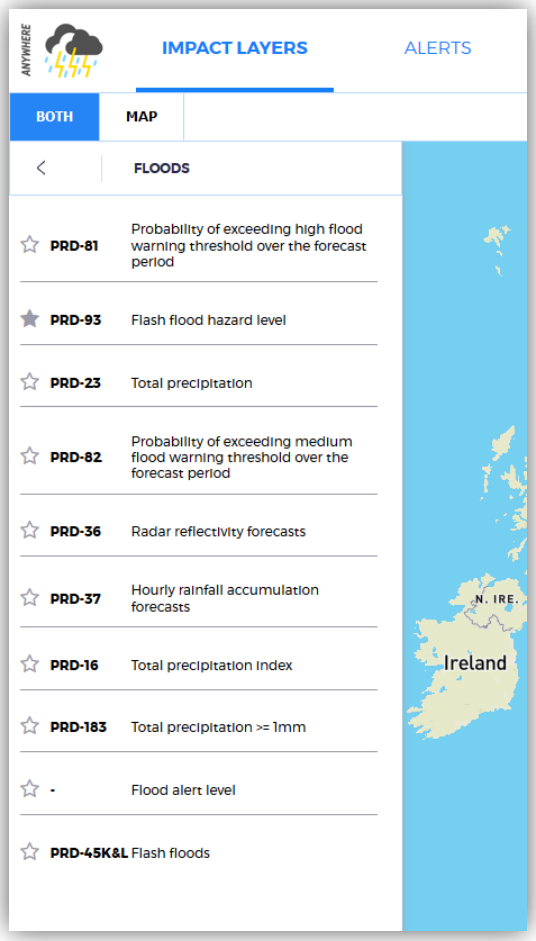


Figure 80. Example of MH-EWS layers available within Floods category

The Pan European products existing on MH-EWS are available on the platform for all users. Specific local products are also available for associated specific user groups.

When the same product is available at different coverage or resolution levels, the user can select between the different options in dedicated dropdown menus.

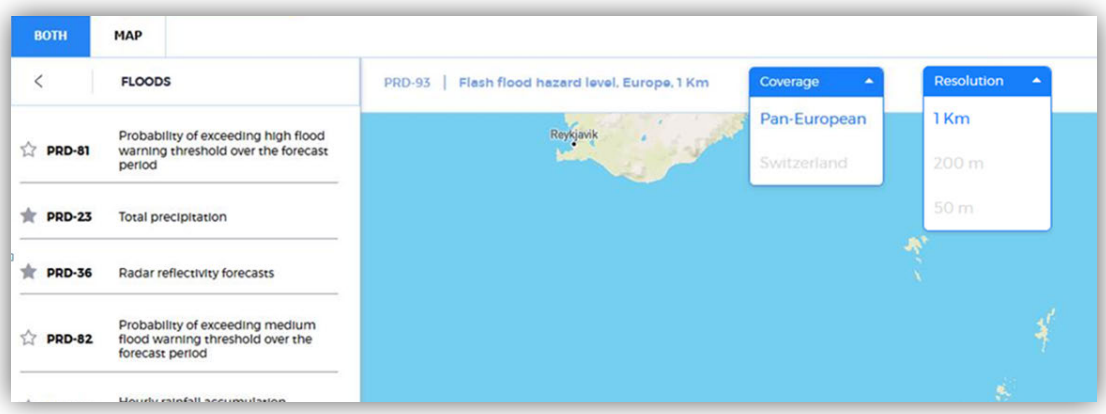


Figure 81. Example of drop down menu for a layer with several coverages (Pan-European and Local) and different resolutions.

Once a product is selected, it is displayed over the map based screen. Different map layers can be available for one product providing the timeframe overview allowing monitoring through time (past, present and future), via a timeline available at the bottom of the screen.

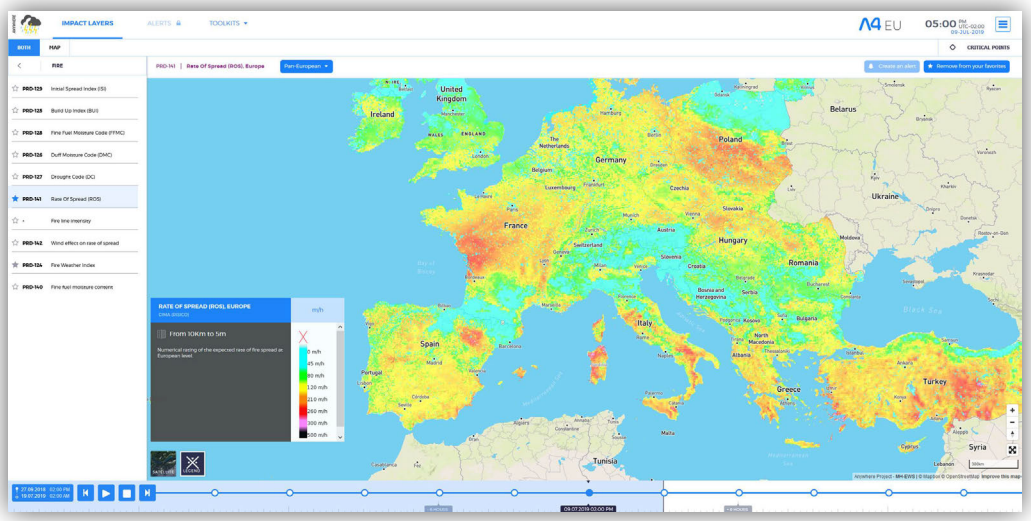


Figure 82. Example of layer display Display: Rate Of Spread product (ROS), in Fire category.

Some products have been created at local level. In this case they are only displayed for the selected region. Example

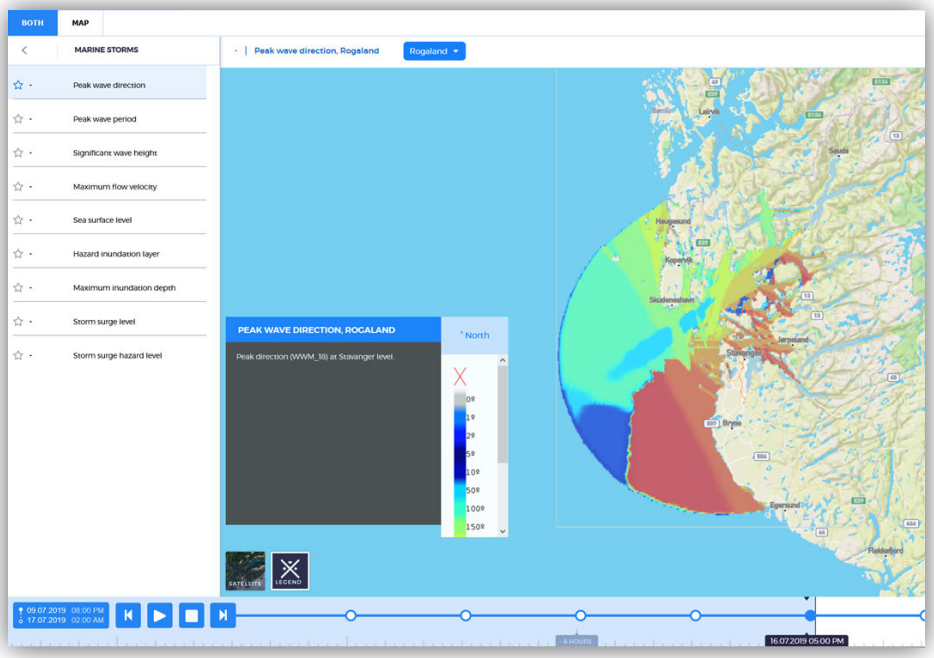


Figure 83. Example of layer display Peak Wave Direction product at Rogaland level resolution, in Marine Storms category

The same layer displayed at Pan-European level:

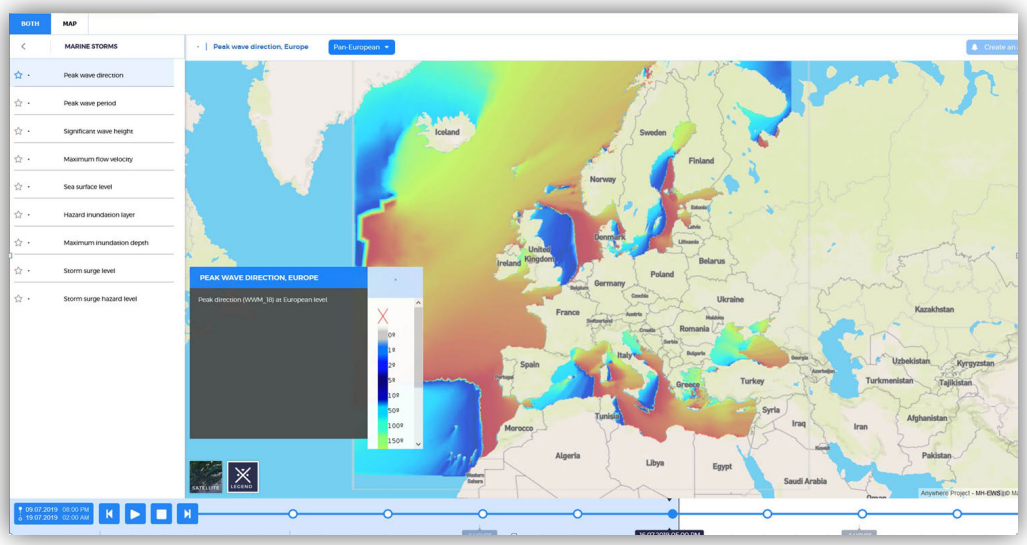


Figure 84. Example layer Display of Peak Wave Direction product at Pan-European level resolution, in Marine Storms category

The list of Products currently available in the Pan-European Workspace (A4EU-A4Nor) is listed in Table 21. The list is evolving during time, depending on end users requests upon the available products available on MH-EWS catalogue. The system can potentially display any layer provided by MH-EWS:

Table 21: list of layers available on A4EU Pan European workspace (A4EU-A4Nor)

Category	Product Name	Coverage	Description
COPERNICUS	Corine Land Cover	Pan-European	-
COPERNICUS	Urban Atlas	Pan-European	-
COPERNICUS	Imperviousness Density	Pan-European	-
COPERNICUS	Forest Type	Pan-European	-
COPERNICUS	Water Wetness	Pan-European	-
FLOODS	ifs_efi_precipitation_index	Pan-European	Total precipitation index
FLOODS	ifs_hres_precipitation	Pan-European	Precipitation
FLOODS	ffews_rain_accumulation_15min_opera	Pan-European	
FLOODS	ffews_rain_accumulation_1h_opera	Pan-European	Accumulation 1 hour
FLOODS	efas_severe_alert_prob	Pan-European	Total probability of exceeding severe alert threshold
FLOODS	efas_high_alert_prob	Pan-European	Total probability of exceeding high alert threshold
FLOODS	efas_medium_alert_prob	Pan-European	Total probability of exceeding medium alert threshold
FLOODS	ffews_river_warning_opera	Pan-European	Return period for 30 minutes accumulations
FLOODS	ifs_efi_precipitation_prob1	Pan-European	1 mm daily total precipitation probability
FLOODS	fmi_rain_accumulation_1h_prob20_35	Scandinavia	Probability of 1h rain accumulation between 20 and 35mm
FLOODS	fmi_rain_accumulation_1h_prob35_45	Scandinavia	Probability of 1h rain accumulation between 35 and 45mm
FLOODS	fmi_rain_accumulation_1h_prob45	Scandinavia	Probability of 1h rain accumulation greater than 45mm
FLOODS	fmi_rain_accumulation_24h_prob50_70	Scandinavia	Probability of 24h rain accumulation between 50 and 70mm
FLOODS	fmi_rain_accumulation_24h_prob70_120	Scandinavia	Probability of 24h rain accumulation between 70 and 120mm
FLOODS	fmi_rain_accumulation_24h_prob120	Scandinavia	Probability of 24h rain accumulation greater than 120mm

Category	Product Name	Coverage	Description
FLOODS	efas_eud_floodalert	Pan-European	Flood alert level issued by a deterministic forecast
MARINE STORMS	cfr_storm_surge_warning_europe	Pan-European	Storm surge return period
MARINE STORMS	cfr_sea_surface_level_europe	Pan-European	Sea surface level (elev)
MARINE STORMS	cfr_sea_surface_level_stavanger	Stavanger	Sea surface level (elev)
MARINE STORMS	cfr_storm_surge_level_europe	Pan-European	Storm surge level
HEATWAVES	ifs_efi_2m_max_temperature_index	Pan-European	Maximum temperature index
HEATWAVES	ifs_efi_2m_min_temperature_index	Pan-European	Minimum temperature index
HEATWAVES	ifs_hres_2m_temperature	Pan-European	2 meters temperature
HEATWAVES	utci_index	Pan-European	Universal Thermal Climate Index (UTCI)
HEATWAVES	raq_ozone	Pan-European	Mass concentration of ozone in air
HEATWAVES	raq_nitrogen_dioxide	Pan-European	Mass concentration of nitrogen dioxide in air
HEATWAVES	raq_sulphur_dioxide	Pan-European	Mass concentration of sulfur dioxide in air
HEATWAVES	raq_carbon_monoxide	Pan-European	Mass concentration of carbon monoxide in air
HEATWAVES	raq_particle_matters_below_10	Pan-European	Mass concentration of ambient aerosol in air
HEATWAVES	raq_particle_matters_below_2p5	Pan-European	Mass concentration of ambient aerosol in air
HEATWAVES	fmi_temperature_p100	Scandinavia	Temperature 100% percentile
HEATWAVES	utci_heatwave_probability	Pan-European	Mean UTCI (from IFS-ENS)
FIRE	risico_dead_fuel_moisture	Pan-European	Dead Fine Fuel Moisture Conditions
FIRE	risico_dead_fuel_moisture_finland	Finland	Dead Fine Fuel Moisture Conditions
FIRE	risico_dead_fuel_moisture_switzerland	Switzerland	Dead Fine Fuel Moisture Conditions
FIRE	risico_rate_of_spread	Pan-European	Potential rate of spread
FIRE	risico_rate_of_spread_finland	Finland	Potential rate of spread
FIRE	risico_rate_of_spread_switzerland	Switzerland	Potential rate of spread
FIRE	risico_wind_effect	Pan-European	Wind effect on rate of spread
FIRE	risico_wind_effect_finland	Finland	Wind effect on rate of spread
FIRE	risico_wind_effect_switzerland	Switzerland	Wind effect on rate of spread
FIRE	intial spread index (ISI)	world wide	intial spread index (ISI)
FIRE	build up Index (BUI)	world wide	build up Index (BUI)
FIRE	Fine Fuel Moisture Code (FFMC)	world wide	Fine Fuel Moisture Code (FFMC)
FIRE	Druff Moisture Code (DMC)	world wide	Druff Moisture Code (DMC)

Category	Product Name	Coverage	Description
FIRE	Drought Code (DC)	world wide	Drought Code (DC)
FIRE	risico_fireline_intensity	Pan-European	Potential fireline intensity
FIRE	risico_fireline_intensity_finland	Finland	Potential fireline intensity
FIRE	risico_fireline_intensity_switzerland	Switzerland	Potential fireline intensity
DROUGHTS	wur_standard_precipitation_index_1m_p50	Pan-European	Forecasted Standardized Precipitation Index 50% percentil, time scale 1 month
DROUGHTS	wur_standard_precipitation_index_3m_p50	Pan-European	Forecasted Standardized Precipitation Index 50% percentil, time scale 3 months
DROUGHTS	wur_standard_precipitation_index_6m_p50	Pan-European	Forecasted Standardized Precipitation Index 50% percentil, time scale 6 months
DROUGHTS	wur_standard_precipitation_index_12m_p50	Pan-European	Forecasted Standardized Precipitation Index 50% percentil, time scale 12 months
DROUGHTS	wur_standard_precipitation_evaporation_index_1m_p50	Pan-European	wur_standForecasted Standardized Precipitation Evaporation Index 50% percentil, time scale 1 month
DROUGHTS	wur_standard_precipitation_evaporation_index_3m_p50	Pan-European	Forecasted Standardized Precipitation Evaporation Index 50% percentil, time scale 3 months
DROUGHTS	wur_standard_precipitation_evaporation_index_6m_p50	Pan-European	Forecasted Standardized Precipitation Evaporation Index 50% percentil, time scale 6 months
DROUGHTS	wur_standard_groundwater_index_p50	Pan-European	Forecasted Standardized Groundwater Index 50% percentil
DROUGHTS	wur_standard_runoff_index_6m_p50	Pan-European	Forecasted Standardized Runoff Index 50% percentil, time scale 6 months
DROUGHTS	wur_standard_runoff_index_12m_p50	Pan-European	Forecasted Standardized Runoff Index 50% percentil, time scale 12 months
DROUGHTS	wur_runoff_deficit_p50	Pan-European	Standardised Forecasted Drought deficit volume runoff, 50% percentil
DROUGHTS	wur_discharge_deficit_p50	Pan-European	Standardised Forecasted Drought deficit volume discharge, 50% percentil
DROUGHTS	wur_soil_moisture_deficit_p50	Pan-European	Standardised Forecasted Drought deficit volume soil moisture, 50% percentil
DROUGHTS	wur_precipitation_deficit_p50	Pan-European	Standardised Forecasted Drought deficit volume precipitation 50% percentil

Category	Product Name	Coverage	Description
DROUGHTS	wur_groundwater_deficit_p50	Pan-European	Standardised Forecasted Drought deficit volume storage upper, 50% percentil
DROUGHTS	wur_discharge_drought_probability	Pan-European	Number of ensemble members in drought
DROUGHTS	edo_combined_drought_indicator	Pan-European	Combined Drought Indicator (CDI) from the European Drought Observatory (EDO)
STORMS	ifs_efi_10m_wind_gust_index	Pan-European	Wind gust index
STORMS	ifs_efi_cape_index	Pan-European	CAPE index
STORMS	ifs_efi_cape_shear_index	Pan-European	CAPE energy index
STORMS	sasse_storm_clusters	Pan-European	Storm clusters
STORMS	sasse_storm_cells	Pan-European	Storm cells
SNOW	ifs_efi_snowfall_index	Pan-European	Snowfall index
SNOW	ifs_hres_snowfall	Pan-European	Snowfall
SNOW	fmi_snowfall	Scandinavia	Snowfall
SNOW	ifs_ptype_precipitation_type	Pan-European	Precipitation type
SNOW	fmi_wind_gust_p100	Scandinavia	Wind gust 100% percentile
SNOW	fmi_freezing_rain_prob	Scandinavia	Probability of freezing rain
SNOW	fmi_freezing_drizzle_prob	Scandinavia	Probability of freezing dizzle
SNOW	fmi_temperature_p0	Scandinavia	Temperature 0% percentile
SNOW	fmi_snowfall_prob6	Scandinavia	Probability of snowfall greater than 6mm
SNOW	fmi_snowfall_prob4_6	Scandinavia	Probability of snowfall between 4 and 6mm
IMPACT LEVEL	FMI meteorological risk estimate	Finland	FMI meteorological risk estimate

6 A4EU at Pilot Site South Savo (Finland) – A4EU-A4Finn. Responsible Partner: AIRBUS

6.1 A4EU-A4Finn operational system description

As described in §5, A4EU platform by Airbus platform has been developed to cover General Pan-European and local needs.

A4EU platform by Airbus is a single platform used by different pilot sites. It is structured in two levels embedded in the same system with different workspaces per level (see §5.1.1 for details).

Finland pilot site's end users have access to the two levels of the A4EU Platform by Airbus, giving them access to two main workspaces:

- 1st level: The Pan-European workspace, common and shared by all pilot sites: It is used to visualize common Pan-European and regional non restricted products and toolkits (named A4EU-A4Nor)
- 2nd level: Specific restricted workspace for Finnish users (A4EU-A4Finn) accessible through the Pan-European workspace. This workspace complements the global workspace with specific local needs.

The Pan-European workspace (A4EU-A4Nor), accessible to Finland users as well as to the other pilot sites, has already been described in §5. Therefore, frequent references to §5 will be done in order of not duplicating information inside this report.

This chapter will focus in the description of the Finnish pilot site specificities developed in the A4EU platform by Airbus, both in the Pan-European workspace (A4EU-A4Nor) and in the locally restricted workspace (A4EU-A4Finn) which is accessible only to Finnish pilot site users.

Regular follow up meetings have been held with FMoI and FMI representatives for project follow up, system development and improvement based on users' feedback. Finnish pilot site users have collaborated along with the other pilot sites (Norway and Switzerland) during the development of the Pan-European workspace (A4EU-A4Nor) and have been the sole focal point for the development for its local workspace (A4EU-A4Finn).

The Finnish local workspace (A4EU-A4Finn) has been created with the objective of, based on different inputs (16 Local products, flexible user defined thresholds and user declared events on the tool) be able to automatically compute and identify

warning levels (global and per region) for a 48h forecast that will lead to specific decisions for the local JOTKE and ISTIKE teams (Finnish Emergency Services Departments).

Local workspace (A4EU-A4Finn) is accessible via the common Pan-European workspace.

1st Level: **Pan-European workspace:**

Common and shared by all Pilot sites (Norway, Finland and Switzerland)

South Savo (Finland) users have access to Non-restricted Pan-European layers, and common toolkits

A4EU-A4Nor

2nd Level: **Local workspace** (accessible through Pan-European workspace):

South Savo (Finland) users use it to access to locally restricted products and tools.

A4EU-A4Finn

Figure 85. A4EU by Airbus Workspaces used by Finnish Pilot Site

6.1.1 System

From a system point of view, being part of the A4EU platform by Airbus, its description is embedded in the description performed in §5.1.1

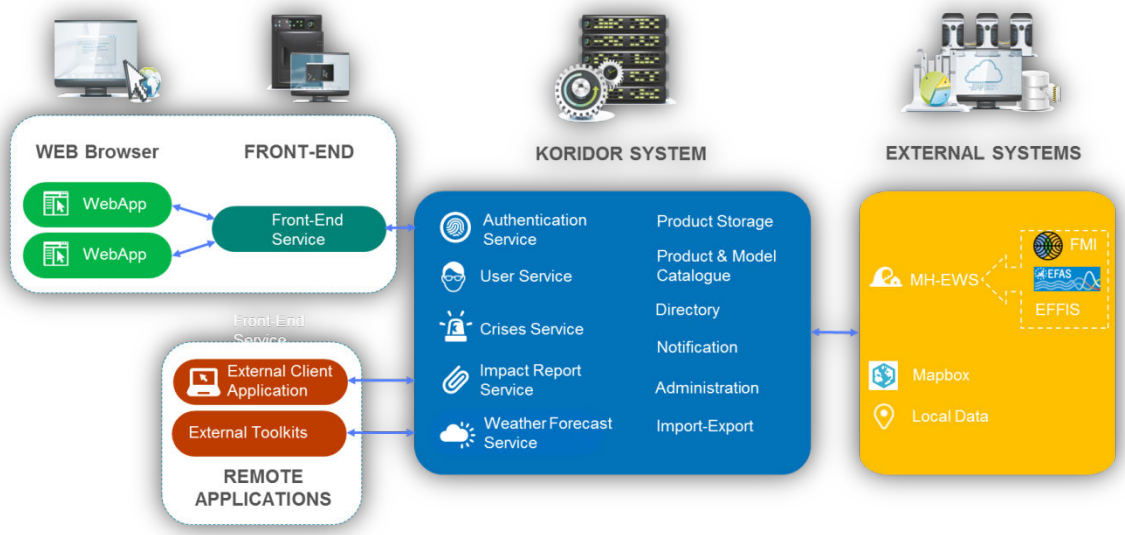


Figure 86. A4EU by Airbus System Overview

On top of the information provided in that §5.1.1, there is some complementary specificity related to the local products (those that are provided by a Local Data Provider) that can be relevant to be indicated.

Airbus platform is directly connected with MH-EWS to download local products (displayed either on A4EU-A4Nor Pan-European workspace or in A4EU-A4Finn local workspace depending on the scope) and to the FMI service to check and distribute Luova Alert Bulletins through KRIVAT system (Finnish State Security Network). Check and download of the different local products is performed by Airbus system regularly (pull mode).

A4EU-A4Finn backend system has been developed with the objective of automatize the local manual tools that were used on the pilot site previously to the Anywhere project. To be able to perform the required automatization a complete new algorithm with associated rules has been created, coded and validated in the system.

6.1.2 Functionalities

6.1.2.1 Pan-European Workspace:

Main functionalities for the Pan-European workspace have already been described in §5.1.2. This workspace (Pan-European A4EU-A4Nor) is common and shared by all pilot sites. As a complement to chapter §5 descriptions, some explicit requests from the Finnish pilot site needed specific developments:

- Regional products for the Finnish areas are available in the layers menu.
- Upon the request of the local site a series of Local Point of Interest has been added to the existing POI available layer. 169 local Fire Stations have been manually introduced to complement the available information.
- A new category has been created in the layers menu to incorporate in the map based background a municipal FMI Meteorological Risk Estimate layer.

6.1.2.2 Local Workspace

From the Pan-European workspace (A4EU-A4Nor), Finnish users can also access to their local workspace (A4EU-A4Finn) via a direct access on the top menu. This provide them access to the local products on top of the Pan-European layers and features that have been described in §5.

Users with granted rights, can access to the local A4EU-A4Finn interface by clicking on the “LOCAL WORKSPACE” button.

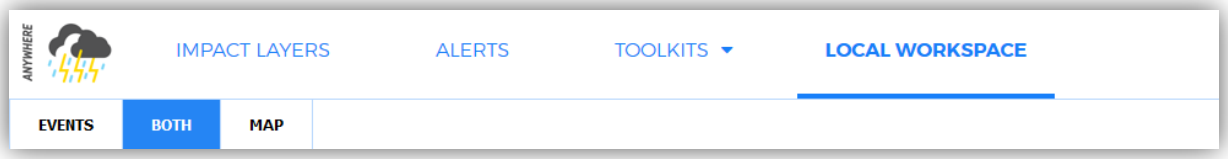


Figure 87. Local Workspace button on top menu to access to locally restricted area (A4EU-A4Finn)

User can easily jump between the local (A4EU-A4Finn) and Pan European (A4EU-A4Nor) workspaces by clicking on the “LOCAL WORKSPACE” and “IMPACT LAYERS” buttons.

A4EU-A4Finn is a decision support tool based on weather and impact data for ISTIKE area, (which is a joint situation and coordination centre in eastern Finland).

The four regions covered are: North Savo, South Savo, North Karelia and South Karelia.

The A4EU-A4Finn workspace is structured to provide the operational teams' different kind of information, each one shown in its own interface:

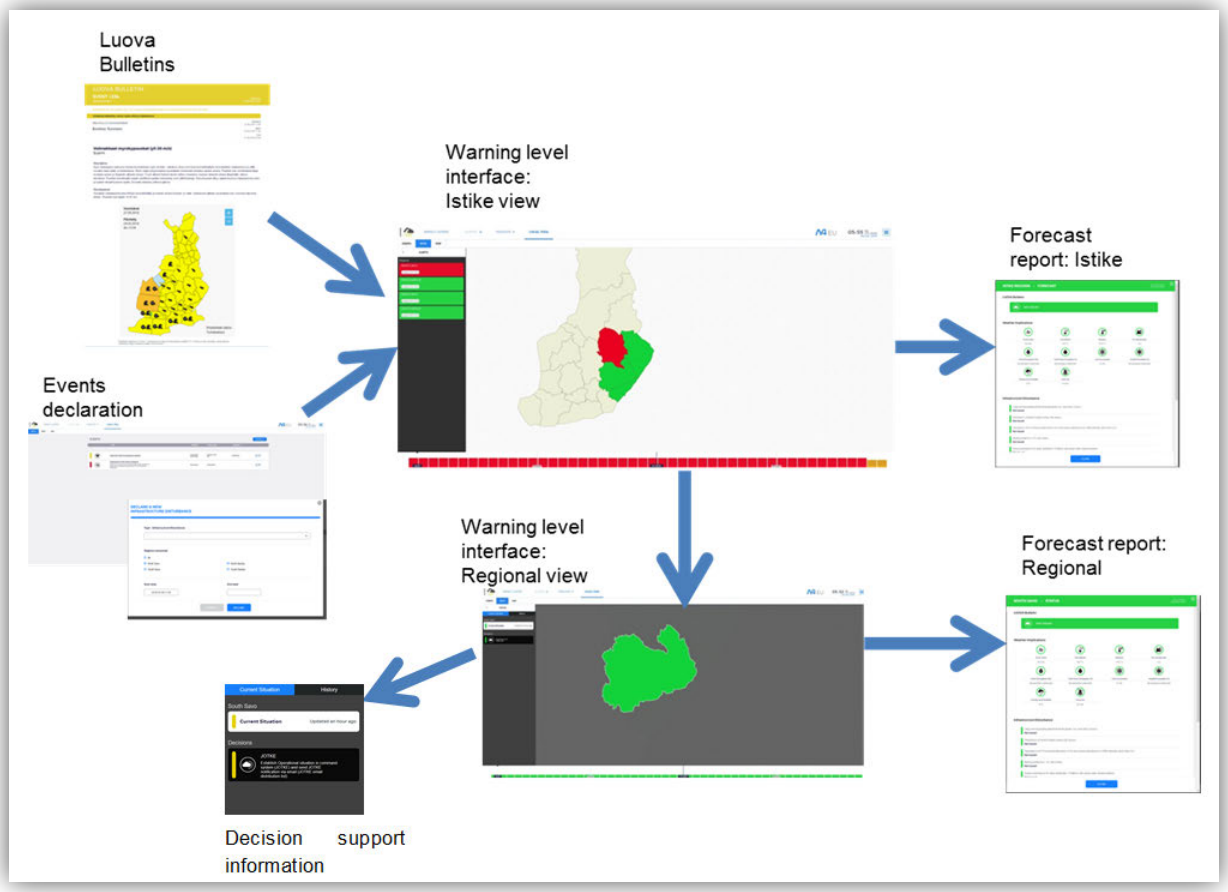


Figure 88. Schema of interfaces of local workspace for Finnish users (A4EU-A4Finn) within A4EU Platform by Airbus

1. Waring level interfaces:
    a. Global: This interface provides in the centre of the screen the global view of the 4 regions areas covered in the Istike area (North Savo, South Savo, North Karelia and south Karelia). Each region is coloured depending on the associated warning level. Warning level rationality is explained in chapter §6.1.4

At the bottom of the screen, a timeline is shown with the evolution of the warning level for the complete region per hour. The timeline covers a forecast for the following 48h. When hovering over the timeline, for each hour, a small summary of the situation appears. On the left part of the screen the user have access to information about the 4 regions and the Luova bulletins and the Decisions to follow depending on each situation.

b. Regional: This interface provides de view for a specific region with the same type of content as the Global view. It is accessible from the Global view, by clicking in the map in the selected region, or by clicking on the region list available on the left side of the screen. This screen provides the user the information and the timeline forecast for the next 48hours for this specific region.

2. Forecast report
   a. Global: An individual forecast report is available for each of the next 48h. They are accessible by clicking on each of the hours on the timeline at the bottom of the warning level interfaces. Each report shows the following information:
      i. Luova bulletin
      ii. 10 Weather implications
      iii. Events
   b. Regional: At regional level, also an individual forecast report is available for each of the next 48h. It's accessible on the timeline of each of the regional warning interfaces.

1. Luova bulletins: The platforms checks in a recurrent manner if a LUOVA bulletin has been made available by the FMI. If this is the case, Bulletins are available on the warning level interfaces left menu and displayed in a specific template.
2. Events declarations: an interface in A4EU-A4Finn has been created to allow users to declare events. Once an event is declared, it is taken into account in the algorithm for the risk level and the information of the event is displayed in:
   1. The events main page
   2. Each forecast report

Users have also the possibility to modify the threshold for the different Weather implications that will affect each individual warning and the algorithm to calculate the global and/or the regional warning level. The modification of those thresholds is done on a specific interface accessible from A4EU-A4Finn.

In the same interface, the content of messages of the different alert levels for the events can also be modified.

6.1.3 Toolkits

Finnish pilot site users, as the other pilot sites, have access to the different toolkits available in common and shared Pan-European workspace (A4EU-A4Nor) See §5.1.3. No specific toolkit has been developed for local use.

6.1.4 Products

Pilot Site South Savo (Finland) end users have different type of products available depending on if they are working in the Pan-European workspace (A4EU-A4Nor) or in their locally restricted workspace (A4EU-A4Finn)

6.1.4.1 Products in Pan European workspace

South Savo pilot site, as the other pilot sites (see §5.1.4), has access to all the products that are available in the Pan-European workspace. Nevertheless, some of the products are available at lower level for their specific region and are not restricted for local users. Through the Pan-European workspace they can access to:

- Common Pan-European products (MH-EWS and Copernicus provided).
- Specific Regional products: Regional/local products (MH-EWS): MH-EWS product containing information relative to a limited (local) area that is displayed on the map based interface. They are available through the common IMPACT LAYER menu. They are products that are available at Pan-European and at regional level with adapted quality of the information to local scale (ex: Fire line intensity) – see figure 89- or products that are specific and created locally (ex: FMI meteorological risk estimate at municipality level) –see figure 90.

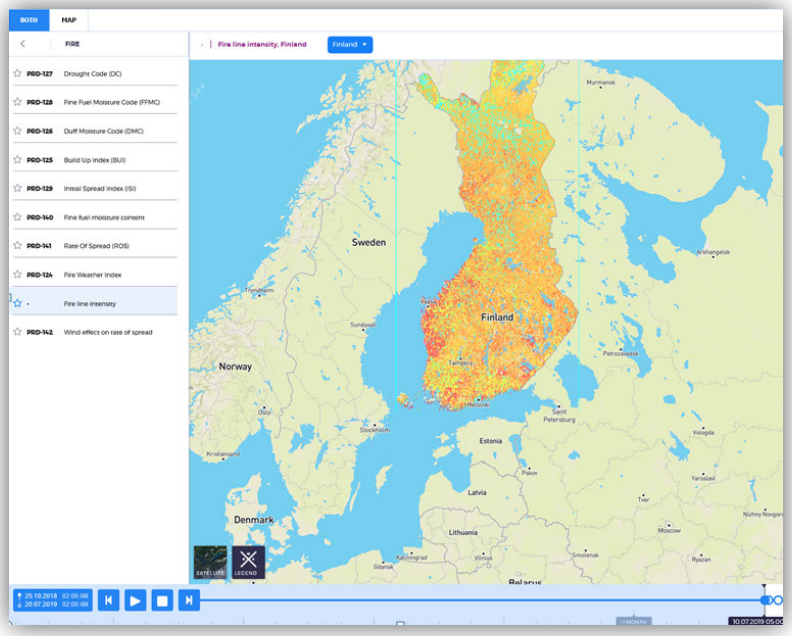


Figure 89. View of higher regional resolution for Finland on Fire line intensity product displayed in Pan-European workspace

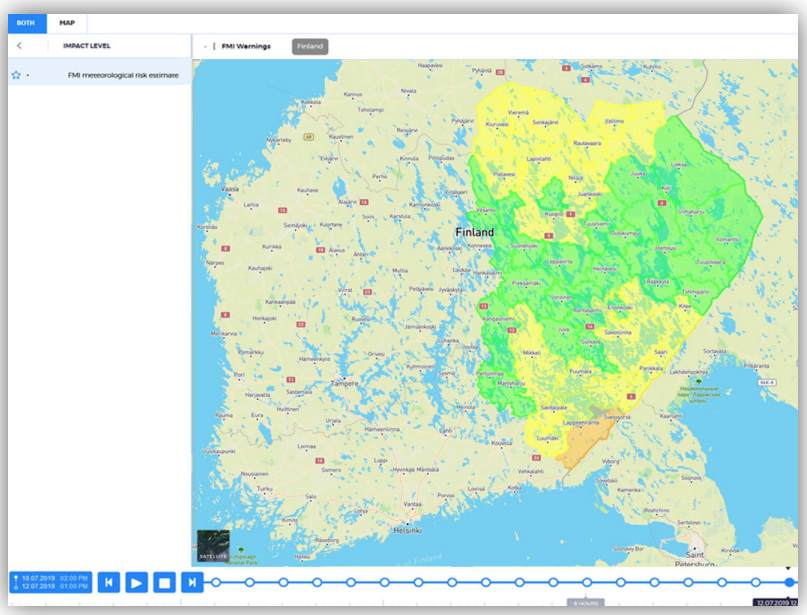


Figure 90. View of "FMI meteorological risk estimate" product for Finland displayed in Pan-European workspace

The complete list is available in §5 and listed in §5.1.4

6.1.4.2 Products on Local Workspace:

The objective of the local workspace is to provide more detailed information about the potential weather impacts and the decisions to follow for the emergency management teams. This is achieved by an algorithm that takes into account 16 local products uploaded by FMI in MH-EWS and information provided directly into the Airbus platform (Luova bulletins, events declaration) without using MH-EWS as intermediate.

All the information is computed to create risks levels per areas that will be translated into Istike and Jotke rescue centres operational decisions.

The different **inputs** to achieve the previous objective are:

- **Weather implications:** 10 different weather implications (with an associated risk level for each one) are created and displayed in a report as the output of analysing the 16 different products provided by the local site (see figures 91 and 92):
    - Severe Winds
    - Cold outbreak
    - Heatwave
    - Fire Warning Index
    - Floods (precipitation 24h)
    - Flash Floods (precipitation 1h)
    - Snow Accumulation
    - Snowfall (Precipitation 1h)
    - Freezing rain (Probability)
    - Snowload
- **Luova bulletins** (directly uploaded in the Airbus System): Specific Luova Bulletins are created by FMI and directly incorporated into the A4EU platform in a specific template. (See figure 93)
- **Events:** Events (9 different types) can be created by the users directly into the A4EU tool. Those events can be affected to one or various regions and a defined timeframe (date and time). Each of the events can have different risk levels that can be modified by the user. Specific templates have been created to be able to declare the following type of events (See figure 94 and 95):
    - Several Rescue Services Implications
    - Infrastructure Disturbance
        - Alerting problems in 112 call centers
        - Disturbance of district heating during cold season

- Disturbance of ICT/communication lines (12h) and serious disturbance to GSM networks (more than 2h)
- Large and long lasting electricity break (power cut, more than 2h)
- Serious disturbance for water distribution. Problems with waste water treatment plants.

▪ General Security

▪ Operational activities

- Multiple alerts (ongoing interventions or alerts waiting for response) within regional rescue departments area
- Catastrophe or other serious emergency

The main **outputs** of the algorithm are:

- **Warning level:** Warning level is the main output of the complex algorithm that, based on the current and forecasted weather information and other inputs, will automatically create a warning level which will determine the JOTKE and ISTIKE decision to follow. The warning level is calculated hourly for a 48h forecast at global (4 regions) see figure 97 and regional level (warning level per region) see figure 98. A summarized situation is available when hovering over the timeline (see figure 96) The algorithm takes into account:
  - Local measures of 16 different weather implications
  - Thresholds sets for each product,
  - Events declared
  - Risk levels associated to each product and event.

- **Decisions**: Depending on the warning level identified, different decisions have been set to support the ISTIKE and JOTKE rescue services. They are displayed on the left menu of the warning level interface (see figure 99):
  a. Decisions ISTIKE:
     i. R0 - No Decision
     ii. R1 - Ask Chief Officer in Charge (OIC) if ISTIKE Rescue Services Executive Group should be notified
     iii. R2 - Ask Chief Officer in Charge (OIC) if ISTIKE Rescue Services Executive Group should be notified
     iv. R3 - Ask Chief Officer in Charge (OIC) if ISTIKE Rescue Services Executive Group should be notified
     v. R3 - Notify ISTIKE (South Savo, North Savo, South Karelia, North Karelia) Rescue Services Executive Group via SMS

vi. R3 - Alert ISTIKE (South Savo, North Savo, South Karelia, North Karelia) Rescue Services Executive Group

b. Decisions JOTKE :

i. R0 - No decision

ii. R1 - Establish Operational situation in command system (JOTKE) and send JOTKE notification via email (JOTKE email distribution list)

iii. R2 - Establish or update JOTKE situation and send JOTKE alert via SMS

iv. R3 - Establish or update JOTKE situation and call to Chief Officer in Charge

Figure 91. Detail of weather implication

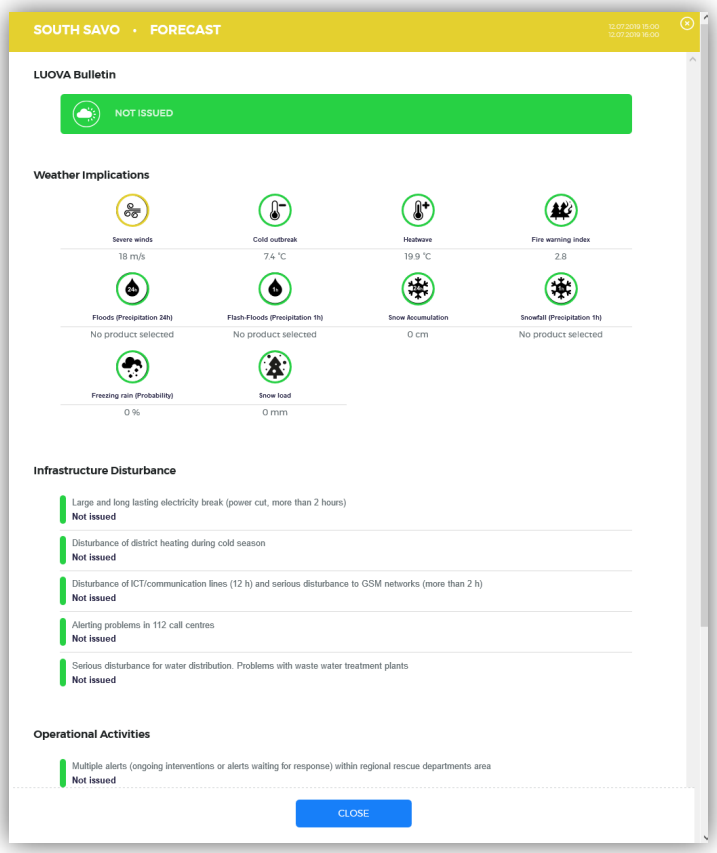


Figure 92. Example of forecast report showing Luova Bulletin availability, weather implications and events

Figure 93. Example of Luova bulletin displayed in A4EU-A4Finn

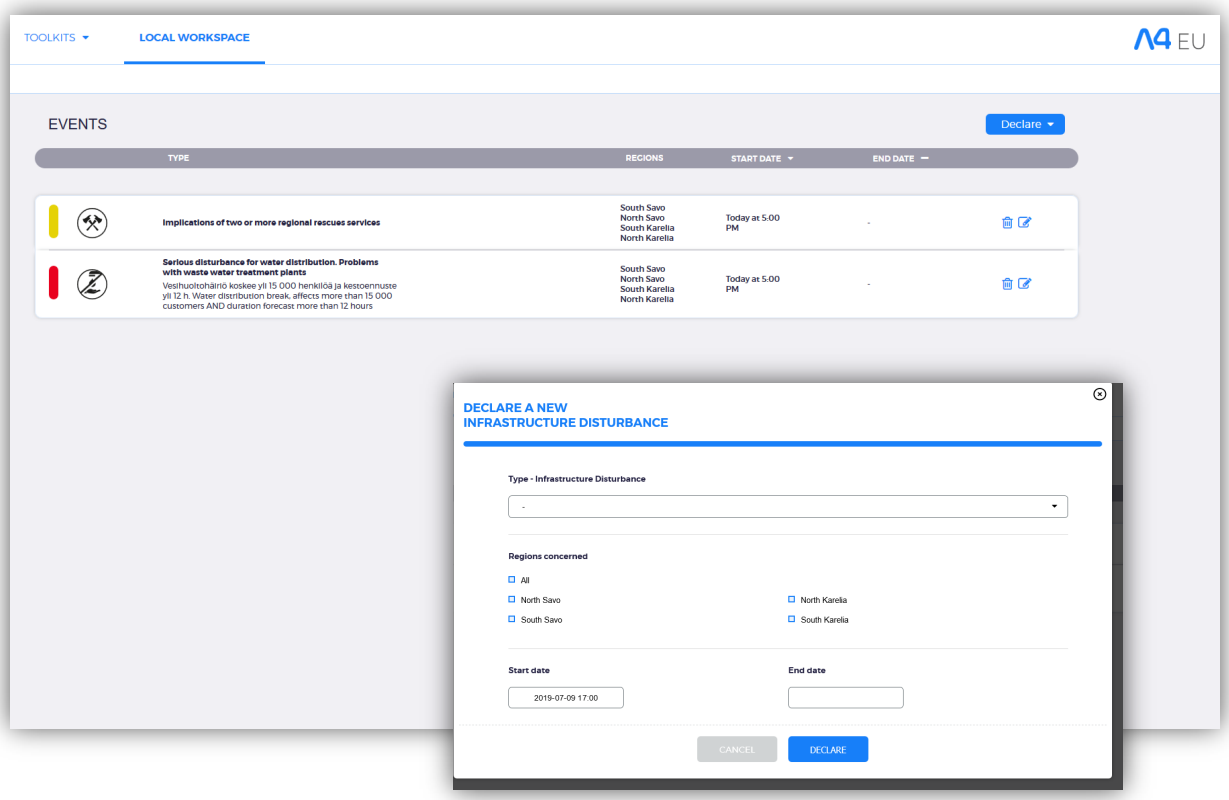


Figure 94. Example of Events main page and declaration template

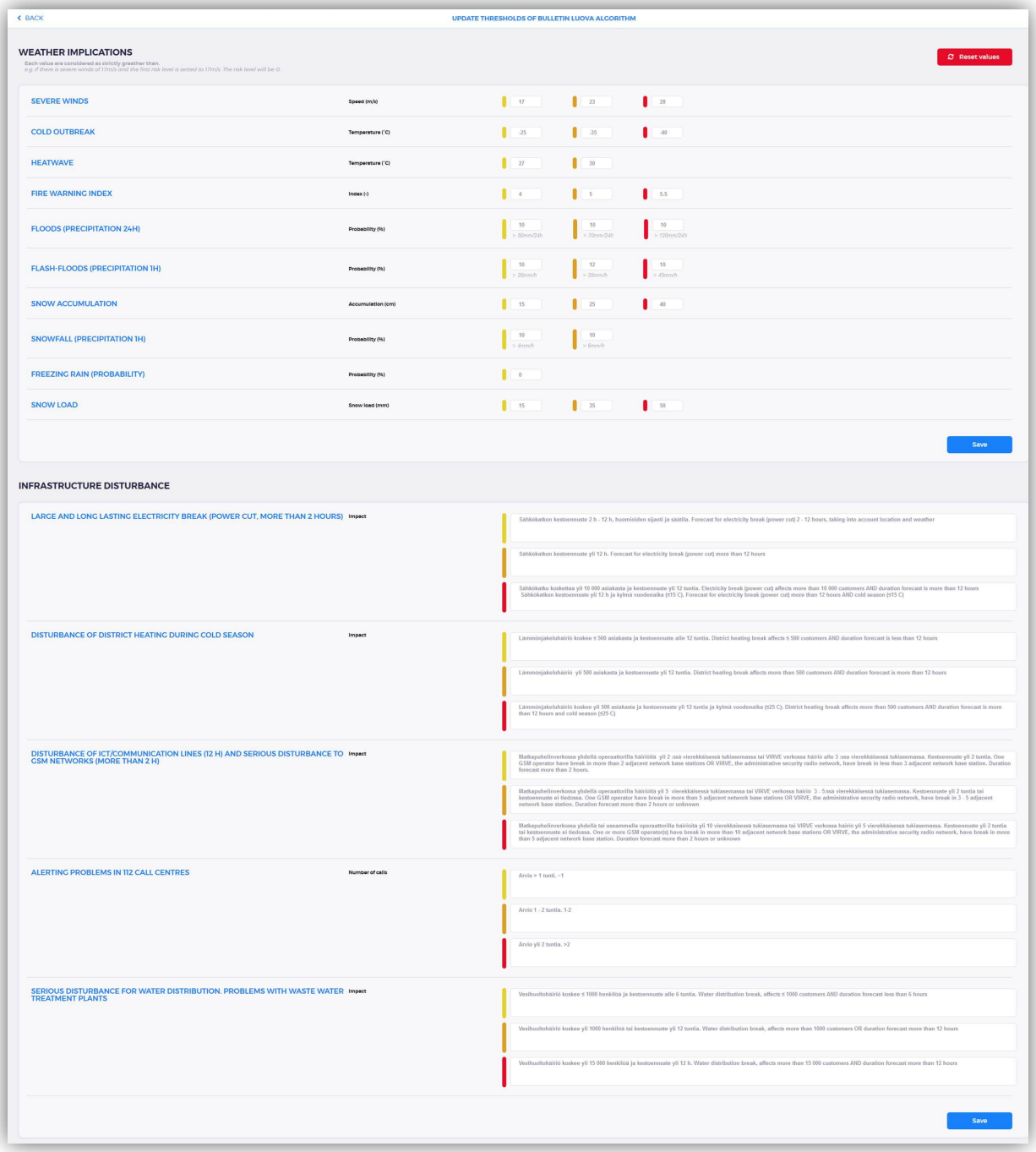


Figure 95. Interface for threshold and/or events modification

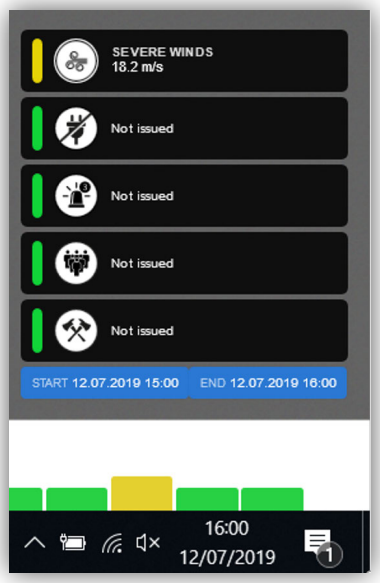


Figure 96. Summarized risk view over the timeline

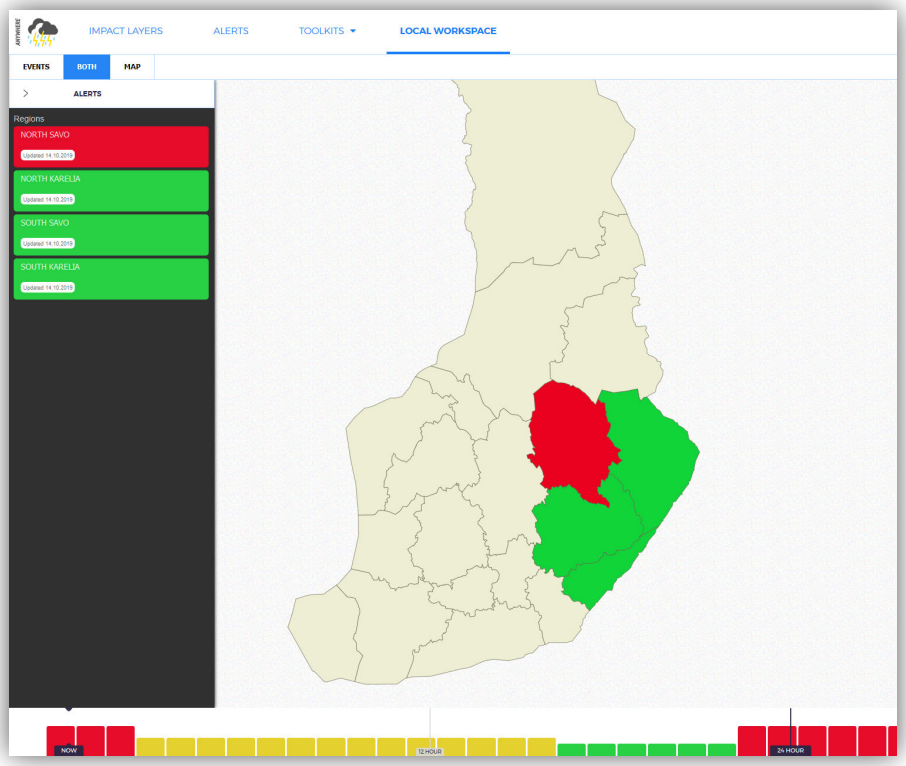


Figure 97. View of A4EU-A4Finn global warning level interface. Provides hourly forecast for the next 48h.

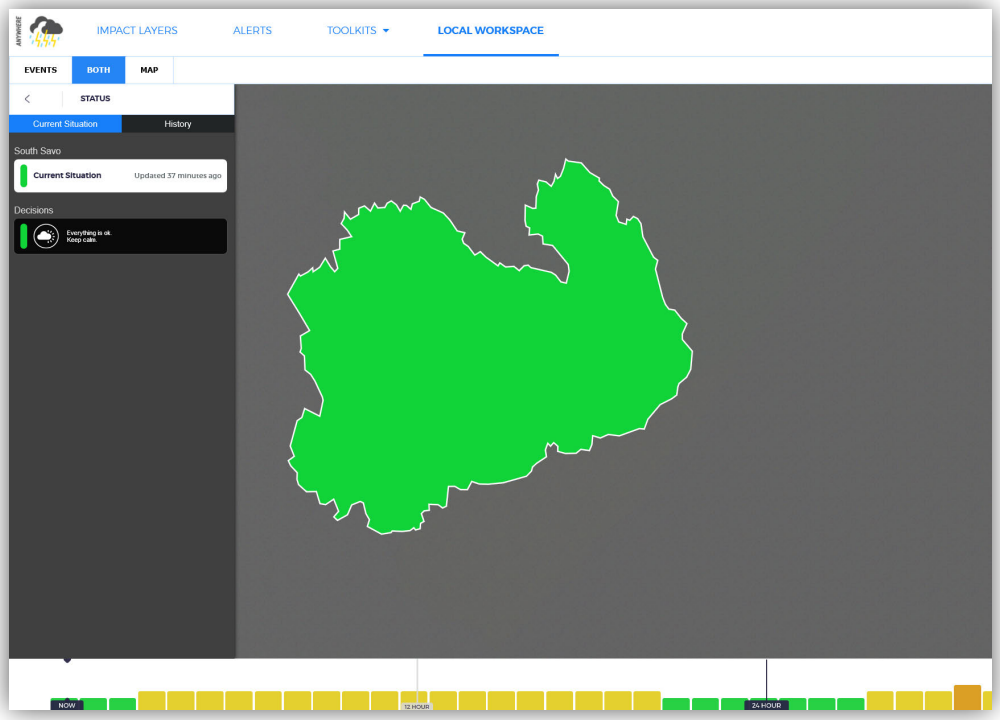


Figure 98. View A4EU-A4Finn Regional warning level interface

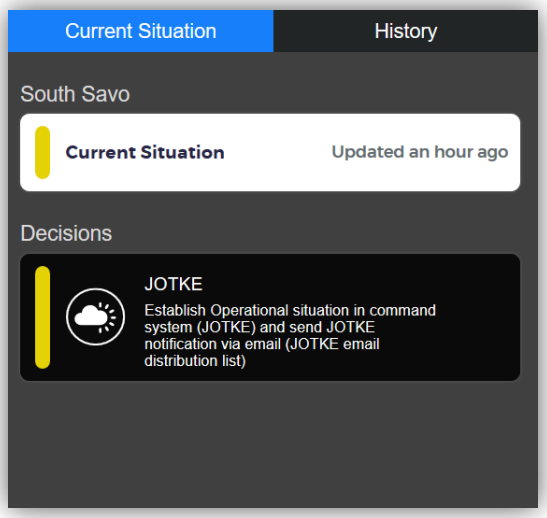


Figure 99. Decision support information

7 A4EU at Pilot Site Canton of Bern (Switzerland) – A4EU-A4Alps. Responsible Partner: AIRBUS

7.1 A4EU-A4Alps operational system description

As described in §5, A4EU platform by Airbus platform has been developed to cover General Pan-European and local needs.

A4EU platform by Airbus is a single platform used by different pilot sites. It is structured in two levels with different workspaces embedded in the same system.

Canton of Bern end users have access to the two levels of the A4EU Platform by Airbus, giving them access to two main workspaces:

- 1st level: The Pan-European workspace, common and shared by all pilot sites: It is used to visualize common Pan-European and regional non restricted products and toolkits (named A4EU-A4Nor)
- 2nd level: Specific restricted workspace for Canton of Bern users (A4EU-A4Alps) accessible through the Pan-European workspace. This workspace complements the global workspace with specific local needs.

The Pan-European workspace (A4EU-A4Nor), accessible to Swiss pilot site's users as well as to the other pilot sites, has already been described in §5. Therefore, frequent references to §5 will be done in order of not duplicating information inside this report.

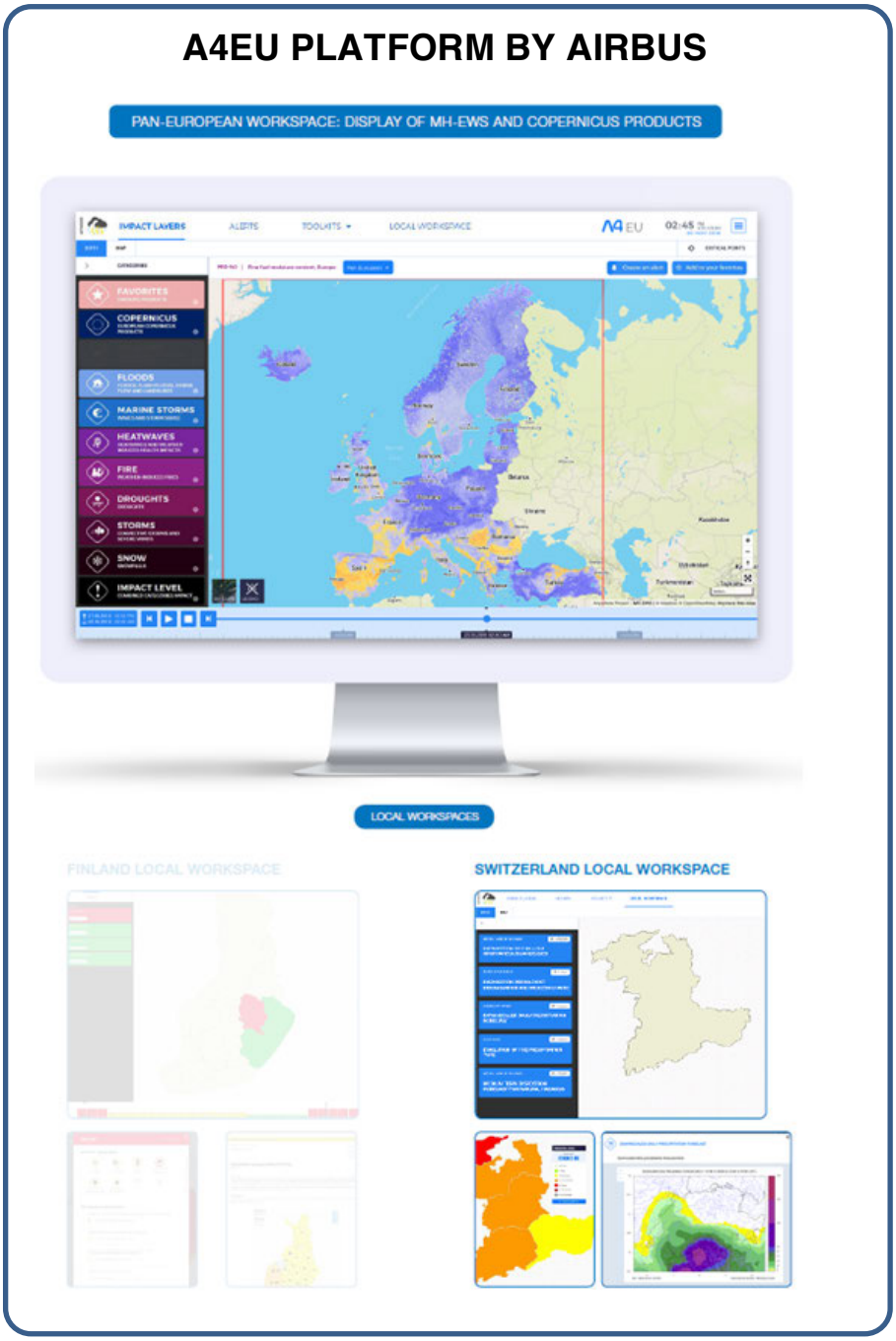
Canton of Bern pilot site users have collaborated along with the other pilot sites during the development of the Pan-European workspace, and have been the sole focal point for the development for its local workspace (A4Alps).

This chapter will focus mainly in the description of the local Swiss pilot site specificities in the A4EU platform developed by Airbus, both in the Pan-European workspace (A4EU-A4Nor) and in the locally restricted workspace (A4EU-A4Alps, which is accessible only to Swiss pilot site users).

Regular follow up has been held with local representatives (VOLBE) and local product providers for project follow up, system development and improvement based on user's feedback.

The Swiss local workspace has been created with the objective of completing the Pan-European workspace by displaying a series of local products affecting one or

more regions. Local workspace (A4EU-A4Alps) is accessible via the common Pan-European workspace.



1st level: **Pan-European workspace:**

Common and shared by all Pilot sites (Norway, Finland and Switzerland)

Finnish users have access to Non-restricted Pan-European layers and common toolkits

A4EU-A4Nor

2nd level: **Local workspace** (accessible through Pan-European workspace):

Canton of Bern (Switzerland) Pilot site users use it to access to locally restricted products and tools.

A4EU-A4Alps

Figure 100. A4EU by Airbus Workspaces used by Canton of Bern Pilot Site

7.1.1 System

From a system point of view, being part of the A4EU platform from Airbus, its description is embedded in the description performed in §5.1.1

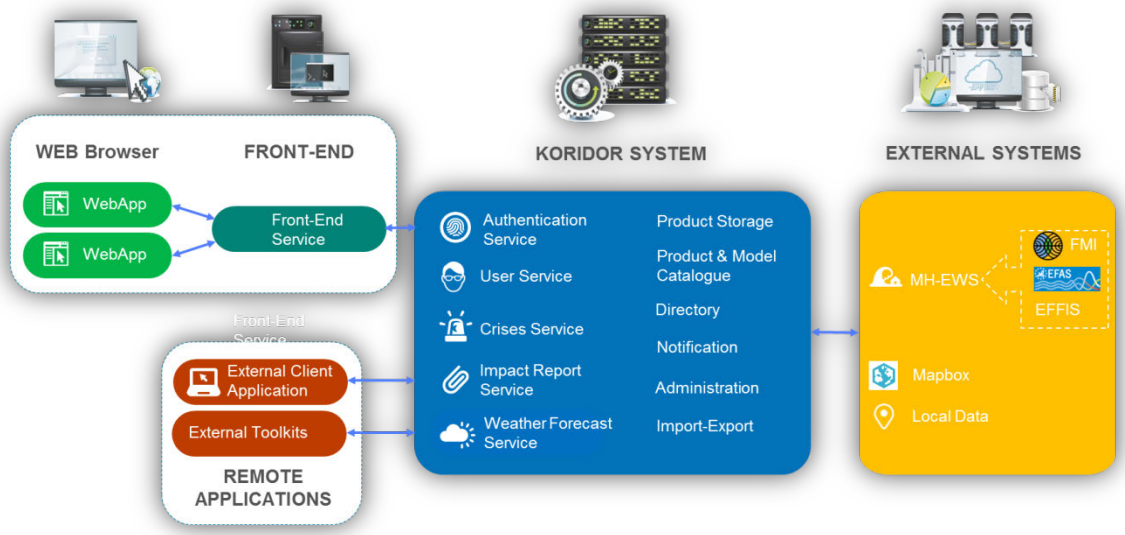


Figure 101. A4EU by Airbus System Overview

On top of the information provided in that chapter, there is some complementary specificity related to the local products (those that are provided by a Local Data Provider) that can be relevant to be indicated:

Local products that are displayed in A4EU-A4Alps are not processed by MH-EWS, but directly uploaded by the product provider on Airbus server, not using MH-EWS as intermediate.

Those products are uploaded in format on push system (FTPS) and stored in Airbus server and the system checks regularly for updates in order to integrate them to the platform.

Regional layers that are displayed in the Pan-European workspace are downloaded directly from MH-EWS;

7.1.2 Functionalities

7.1.2.1 Pan-European Workspace

Main functionalities for the Pan-European workspace are described in §5.1.2. As a complement to this chapter, some explicit requests from the pilot site needed specific developments.

- Regional products for the Swiss region have been added in the layers menu to be displayed over the map background.

7.1.2.2 Local Workspace

Local workspace (A4EU-A4Alps) is accessible via the top menu in the Pan-European workspace (A4EU-A4Nor).

User with granted rights access to the local A4EU-A4Alps interface by clicking on the "LOCAL WORKSPACE" button.

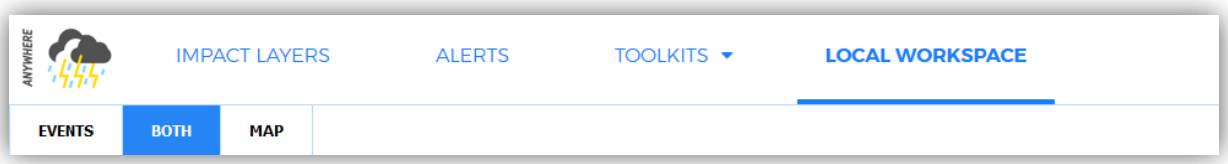


Figure 102. Access to local workspace (A4EU-A4Alps)

The user can easily navigate back to the Pan-European workspace by clicking on the "IMPACT LAYERS" button.

A4EU-A4Alps main interface has been designed to provide the user access to the available local products.

Available products are listed on the left menu (5 main groups), and they are accessible by clicking on its respective box:

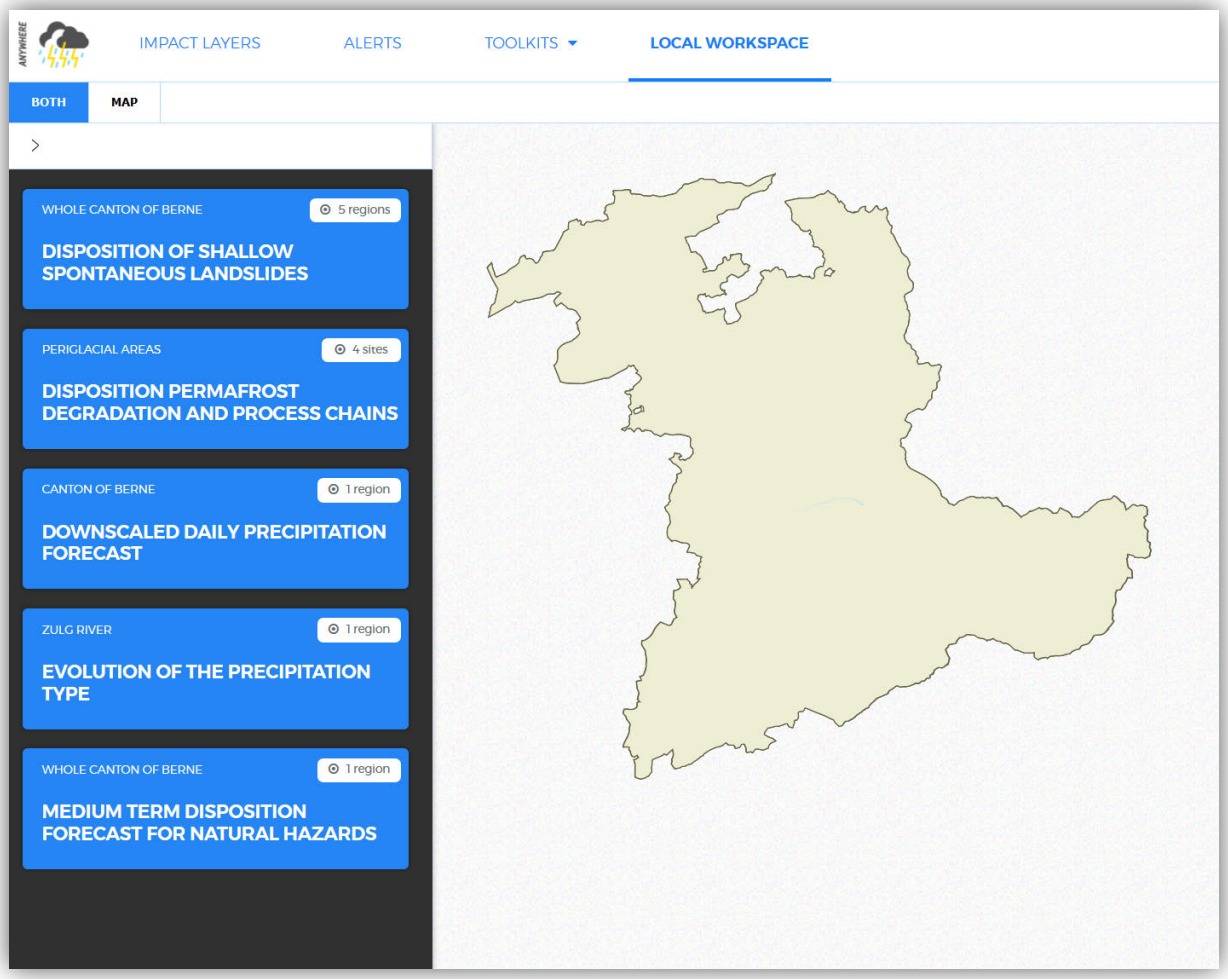


Figure 103. Canton of Bern local workspace (A4EU-A4Alps) main interface

Details of the products are available on a pop-up window appearing in the middle of the screen.

7.1.3 Toolkits

Swiss pilot site users have access to the different toolkits available in the Pan-European workspace (A4EU-A4Nor) See §5.1.3. No specific toolkit has been developed for local use.

7.1.4 Products

Canton of Bern pilot site end users end users have different type of products available depending on if they are working in the Pan-European workspace (A4EU-A4Nor) or in their local workspace (A4EU-A4Alps):

7.1.4.1 Products at Pan European Workspace:

Canton of Bern pilot site, as the other pilot sites, has access to all the products that are available in the Pan-European workspace (see §5.1.4). Nevertheless, some of the products are available at higher level for their specific region and are not restricted for local users. Through the Pan-European workspace they can access to:

- Common Pan-European products (MH-EWS and Copernicus provided)
- Regional/local products (MH-EWS): An MH-EWS product containing information relative to a limited (local) area that is displayed on the map based interface. They are available through the common IMPACT LAYER menu. They are products that are also available at Pan-European level but with adapted quality of the information to a local scale (ex: Fire line intensity or Flash flood Hazard level)

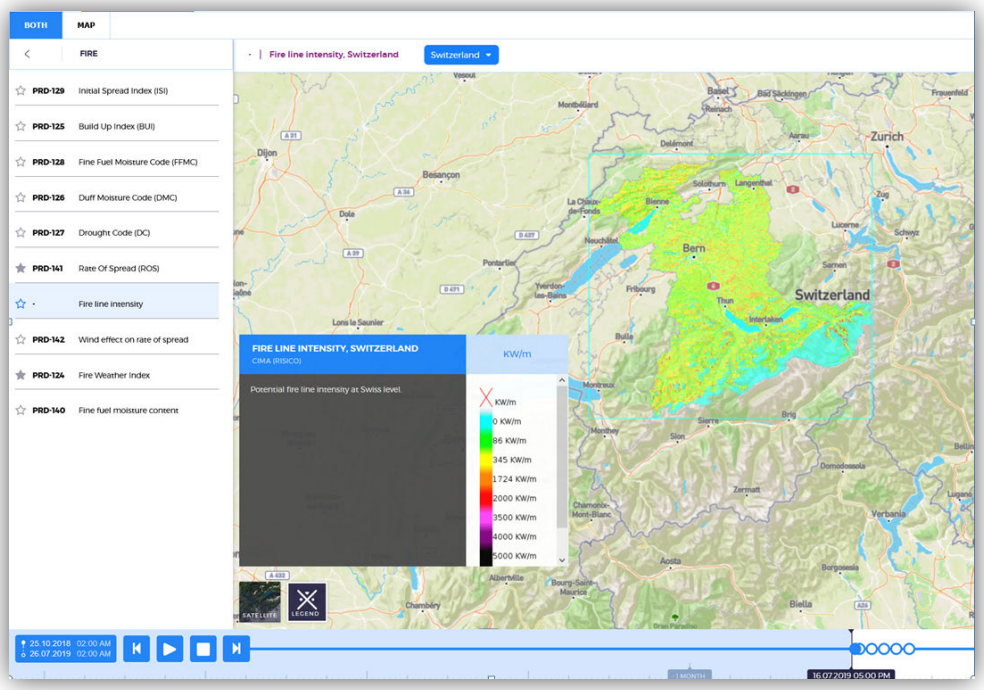


Figure 104. View of higher regional resolution for Canton of Bern area of Fire line intensity product displayed in Pan-European workspace

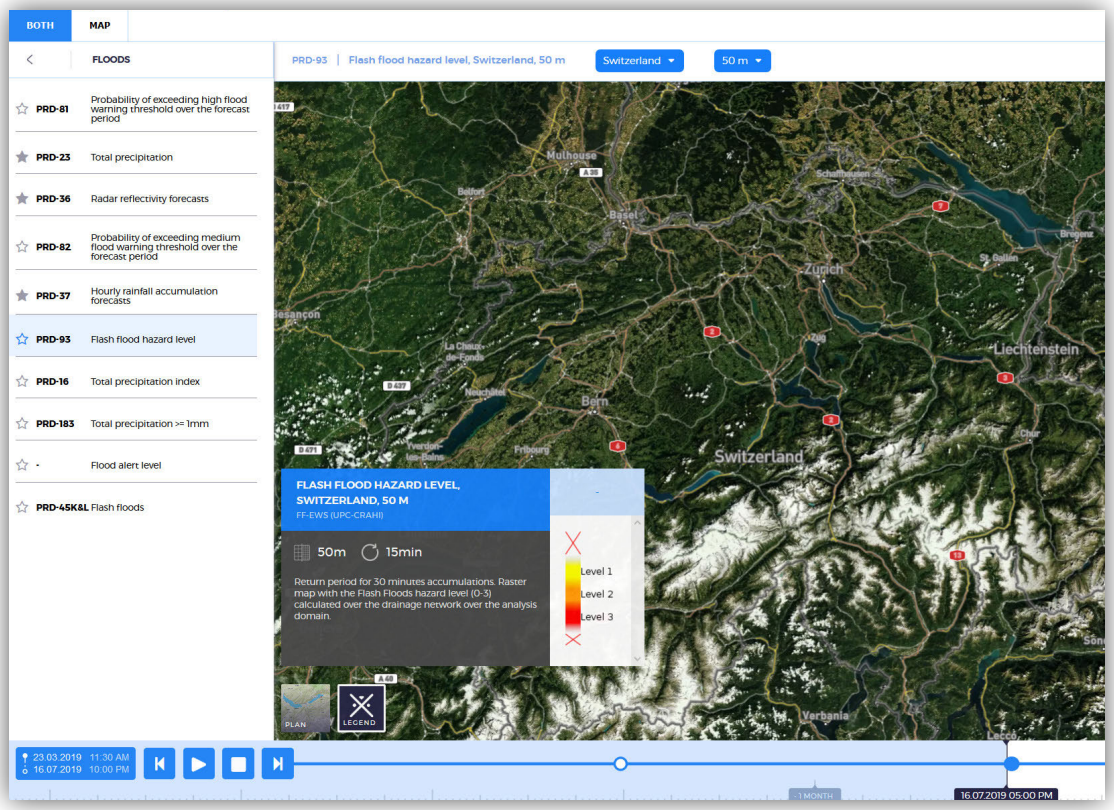


Figure 105. View of product Flash flood Hazard level with resolution of 50m, displayed in Pan-European workspace

The complete list is available in §5 and listed in §5.1.4

7.1.4.2 Products on Local Workspace:

The objective of the local workspace is to provide more detailed information and risks models about the potential weather impacts that cannot or don't make sense to be displayed in the Pan-European workspace. Those products are not processed by MH-EWS but directly provided by the product provider to Airbus servers.

On the date of the creation of this report, 5 major categories of products have been created. Each category can cover one or more regions.

- Dispositions of shallow spontaneous landslides – 5 regions
- Disposition permafrost degradation and process chains – 3 regions
- Downscaled daily precipitation forecast – 1 region

- Evolution of the precipitation type – 1 region
- Medium term disposition forecast for natural hazards - 1 region

In some cases, products can be displayed in a graphic map showing a very visual level of risk per region (see figure 106).

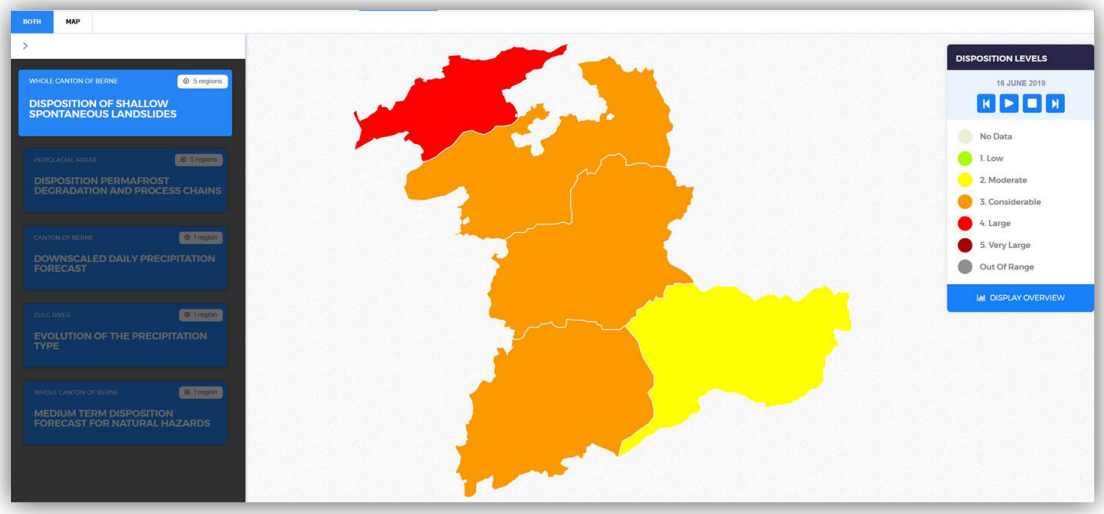


Figure 106. A4EU-A4Alps Disposition shallow landslides levels map

The maps are interactive and detailed graphs and information is available on specific pop-up windows when clicking on required region of the map or legend (see figures 107 and 108).

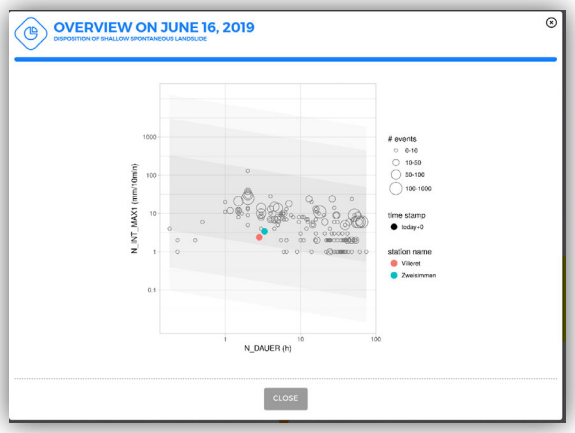


Figure 107. A4EU-A4Alps Disposition shallow landslides detailed display overview available from the interactive legend

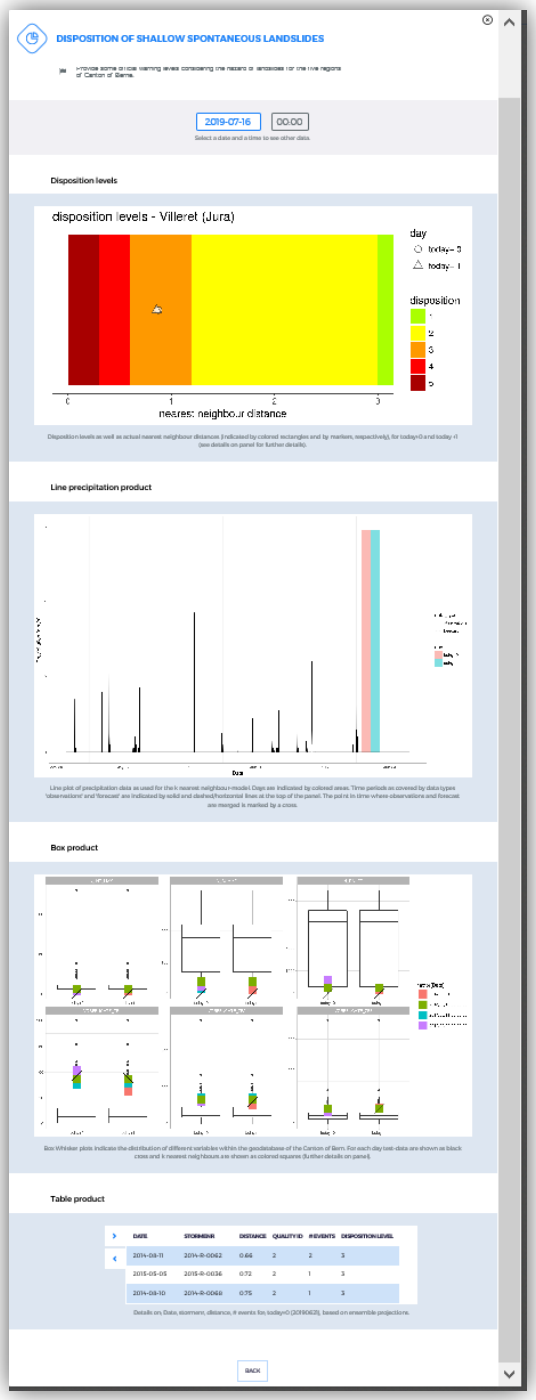


Figure 108. Regional level information for Shallow landslides available from the interactive map.

When the information is available, the user can navigate and have access to forecasted and historical data through the different available interfaces:

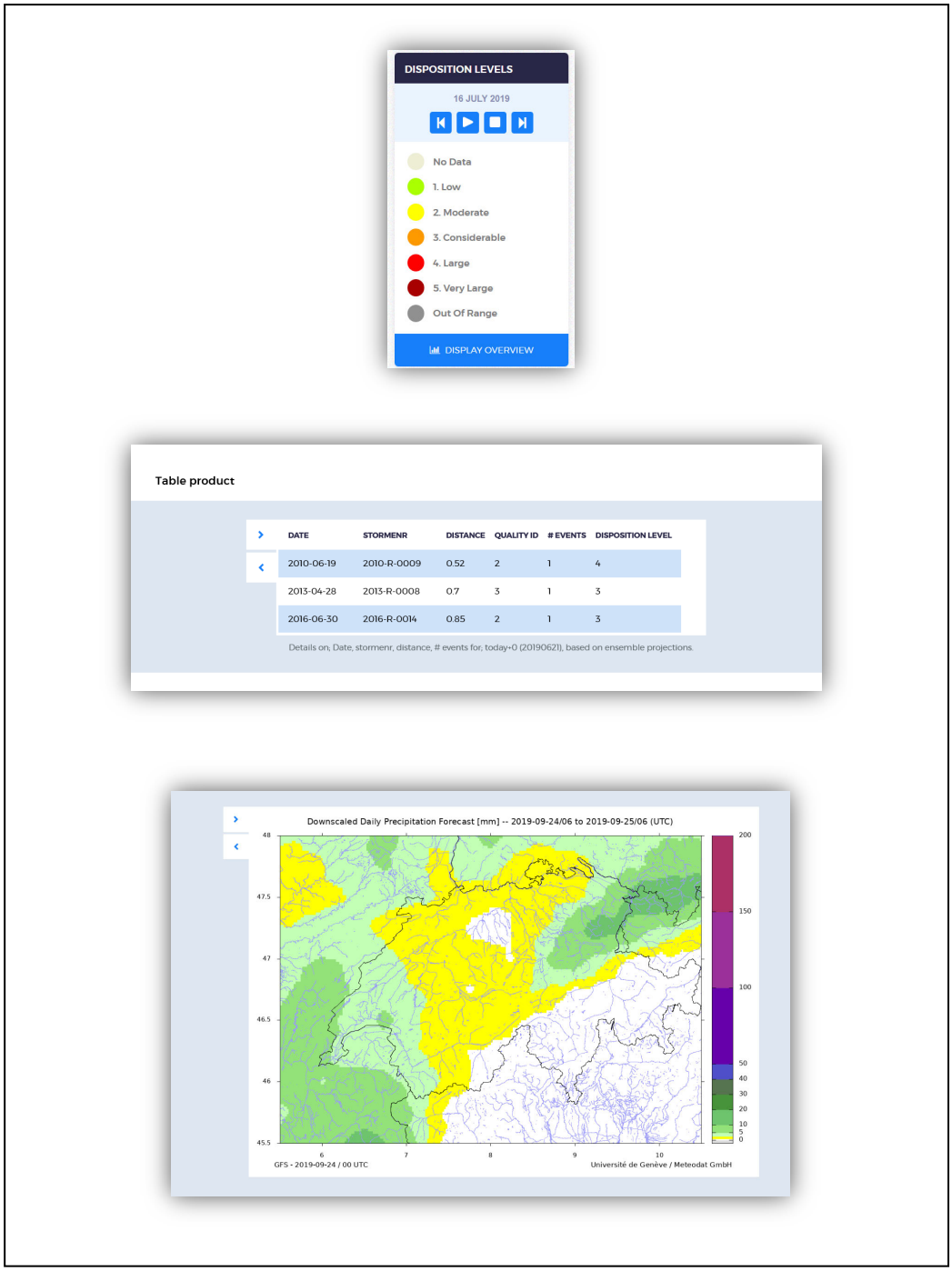


Figure 109. Examples of 3 different interfaces to navigate through forecasted and historical data. (From top to down: in the interactive map though player integrated on legend, arrows on table inside a product and arrows on map interface inside a product)

Products are also available with different content depending of the level of expertise of the user. User can select the level of information requested depending on his needs and skills to evaluate the information:

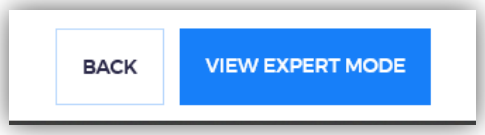


Figure 110. Button to transfer between normal and expert mode view.

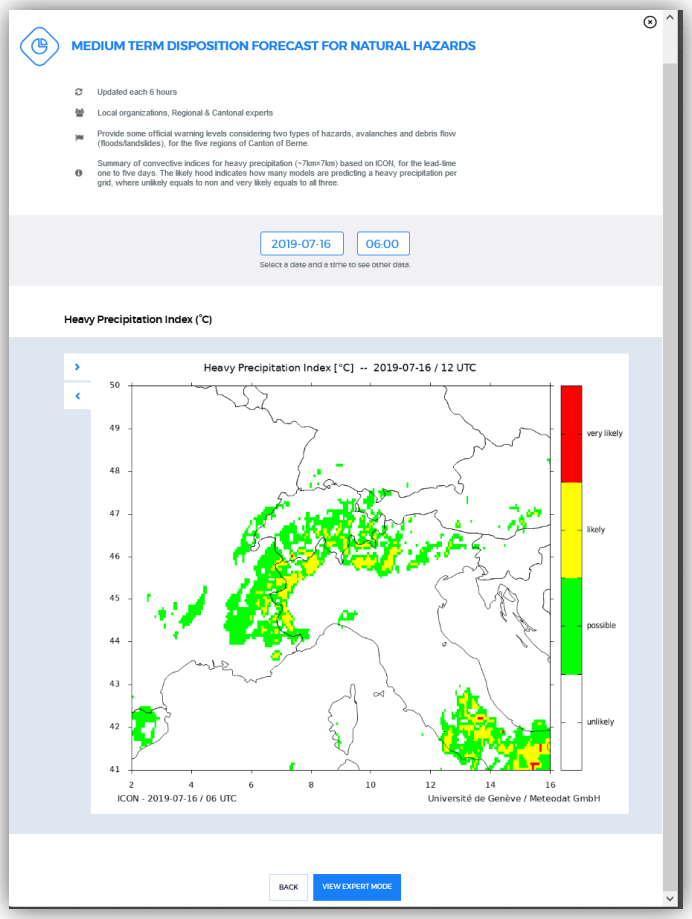


Figure 111. Example of Normal view for "Medium term disposition forecast for natural hazards" product

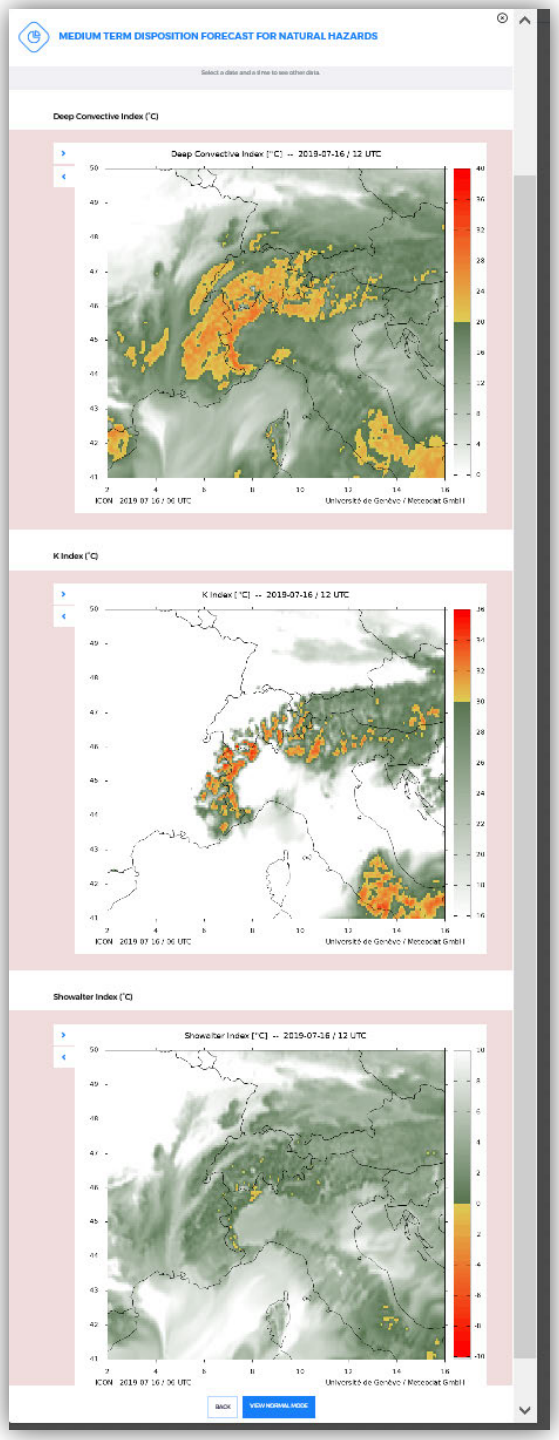


Figure 112. Example of Expert view for "Medium term disposition forecast for natural hazards" product with interactive map interface

8 A4EU at Pilot Site Corsica (France) – A4EU-A4Cor. Responsible Partner: PREDICT

8.1 A4EU-A4Cor operational system description

8.1.1 System

Accessibility of the platform is very simple. The platform could be accessed at https://www.wiki-predict.com/login, using the credentials provided to SIS2B. Connection is possible through computer as well as smartphone and tablet as you may see on the next figure.

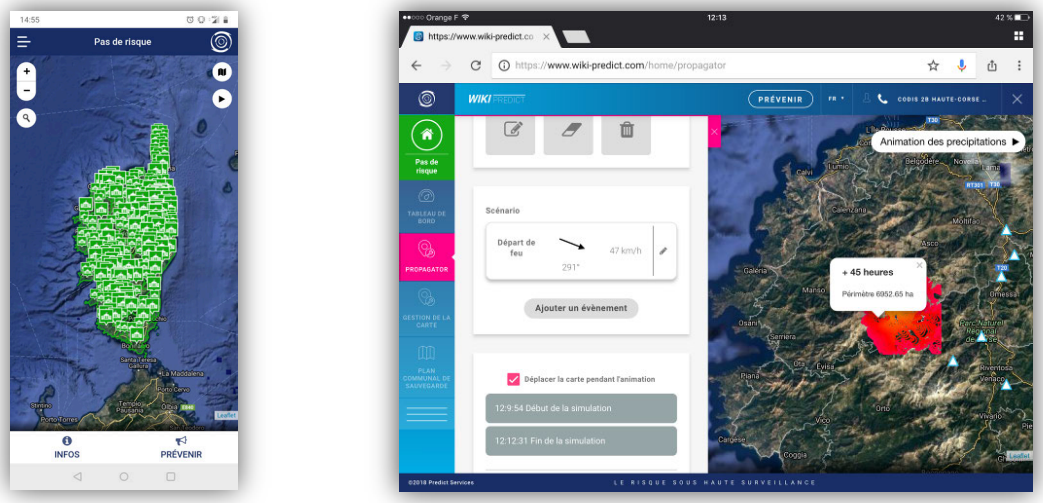


Figure 113. Screenshot of A4Cor Smartphone and tablet versions

As required, there is, on the left of the webpage, a complete folder dedicated at ANYWHERE layers.

The system is now mature and had been regularly used since September 2018, with the integration with the systems at SIS2B premises.

Several events have allowed the SIS2B team to test and validate the platform and products such as floods in Corse du Sud department (10th October 2018), floods in Haute Corse department (16th and 17th October 2018), storm ADRIAN (29th October 2018), forest fire in Calenzana (23rd February 2019), snowstorm on Monte Cinto massif (15th May 2019), and floods in northeastern Corsica (15th of July 2019).

8.1.2 Functionalities

SIS2B was provided with a platform where ANYWHERE products could be presented and run in order to afore decision-making process to cope with natural hazards.

The system is based on the well-stablished platform of PREDICT Services enriched by ANYWHERE layers and algorithms that already counts with a multichannel communication system to ensure a continuous information service on hydrometeorological risks.

SIS2B had a several training sessions with the CC resources to make them able to correctly use the platform. According to the users, it is worthy to have all of the tools available on the same web page, allowing the operator to select the required tools to use and the required layers to display and not be encumbered by unnecessary information that can jeopardize the analysis.

8.1.3 Toolkits

The A4Cor platform includes the API to run PROPAGATOR simulation. The interface counts with an Input menu (1) where the user could set the start point/line of fire, edit, delete and reset the data, Scenario menu (2) where wind direction(s), intensity (ies) and duration could be chosen and the Simulation panel (3). The API sends the input data to CIMA's server and recovers the isochrones (4) that are plotted on the map.

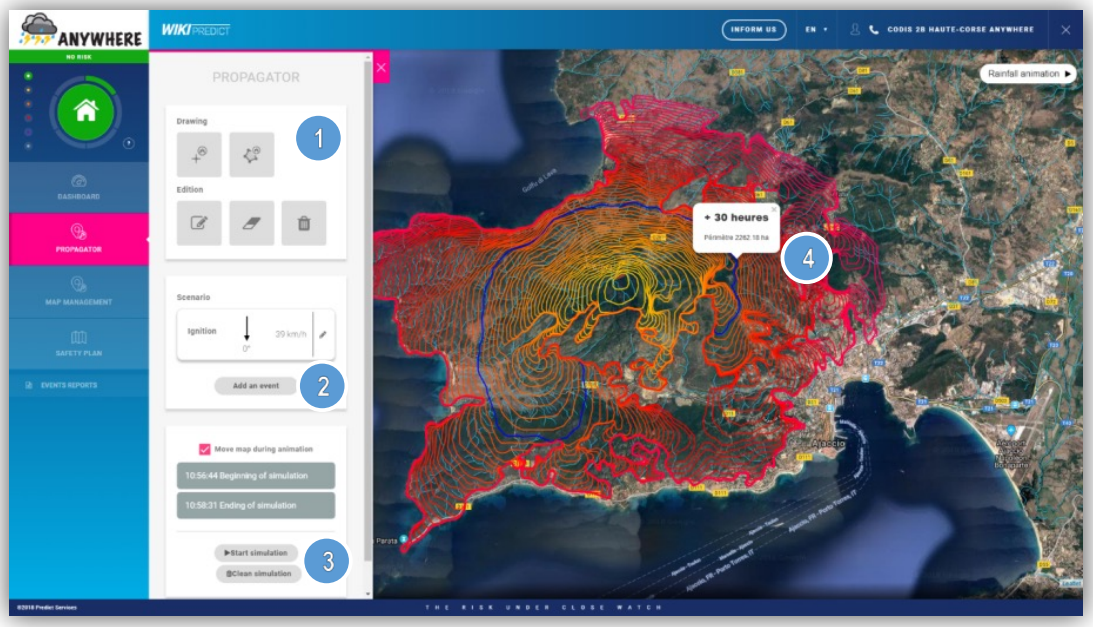


Figure 114. PROPAGATOR API interface

The A4Cor platform also includes the API Resilience index. The interface counts with data menu where the user could upload the building layer (1), upload the hazard layer (2) both on compressed file (zip, rar, etc…) and finally a run button (3) in order to operate the algorithm and cross the exposition and the type of each building in order to deliver a final resilience note from 1 to 5, being 1 the less resilient on the scale and 5 the most resilient. On the map, it is possible to identify the building and the classification of its resilience, presented on the Legend (4).

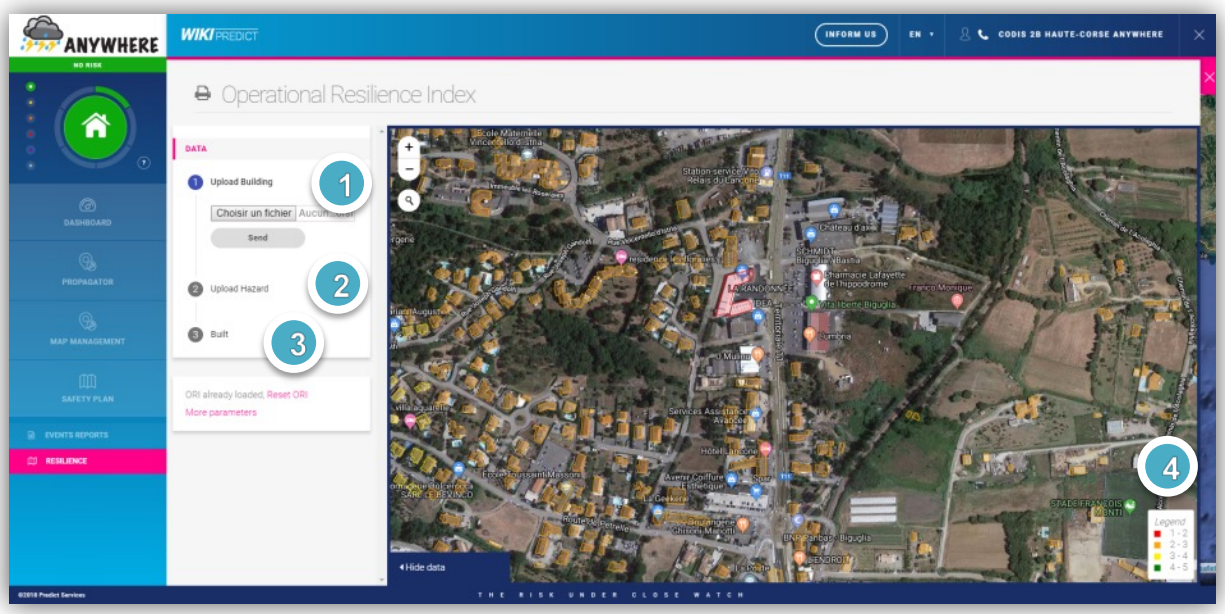


Figure 115. Resilience API interface

8.1.4 Products

The ANYWHERE tab on A4Cor platform is divided into seven (7) categories:

- Meteorological Forecast and Nowcast containing the following layers: OPERA: Rain accumulation 15 min, OPERA: Rain accumulation 1h, and OPERA: Rain accumulation 24h.

- Floods and Flash Floods containing the following layers: OPERA: river warning, Refined river warning for Corsica, Flood alert level issued by a deterministic forecast, Total probability of exceeding medium alert threshold, and Total probability of exceeding high alert threshold.

- Heatwaves containing the following layers: Universal Thermal Climate Index (UTCI), Heatwave probability, Forecast of temperature anomaly, Min temperature index, and Max temperature index.

- Weather-induced forest Fires containing the following layers: Fire Weather index, Build-up index, Fire danger risk, Drought code, Duff moisture code, Daly severity rating, Fine fuel moisture code, Initial

spread index, Dead fine fuel moisture conditions, Potential fireline intensity, Rate of spread, Dead fine fuel moisture conditions – Corsica, Potential fireline intensity – Corsica, Rate of spread – Corsica, and Effect of Wind – Corsica.

- Wind gusts containing the wind gust index (10 m) layer.
- Convective storms containing the following layers:
  CAPE index shear and CAPE index.
- Snowfall containing the following layers:
  Forecast snowfall accumulation, Snowfall index, Precipitation index and Precipitation types.

Each layer presents a submenu, containing an information pop-up with a brief explanation about the product (English and French), an animation button to launch the timeline application (when available), a star button to include the layer into the Favorites and an Opacity setter.

Besides all ANYWHERE products and data, the platform also counts with:

1. The level of mobilization and recommendation transmitted to the ensemble of cities under the authority of SIS2B according to the analysis of the situation drawn up by PREDICT Services team. This recommended crisis management status information, sent by on-call engineers, arises from the analysis of the hydrometeorological data which could threaten northern Corsica territory.
2. The maximum level observed among the ensemble of municipalities under SIS2B authority is identified and colored on the scale.
3. Info-risks pictograms (small symbols to represent a hydrometeorological risk), its nature and the actions to be carried out fed by the PREDICT Services team. By clicking on the pictogram, a bubble pops-up and gives information about the hazard dynamic.
4. All event reports produced by PREDICT Services for an important hydrometeorological event that occurred in the region (including the context, dynamics, mobilization required, main consequences, etc.) since 2011.
5. METEO France's local rainfall radar 2h animation (5min step and 1km² resolution).

6. Field feedback. The user could choose a pictogram that better represents the observed situation and locate it on the map, describing what it is happening and even uploading a picture. After a validation made by the PREDICT Services team, the information is shared with all the other users.
7. A message about the current and expected risks updated by PREDICT Services engineers at least twice a day (only in French).
8. Meteorological and hydrological forecast data. They refer to detailed maps and data on institutional websites relevant to SIS2B. This part was customized according to the user and its needs.
9. En/Fr (English / French) button to change the language of the whole website.
10. Cartographical layers such as map background, watercourses, river gauging station, municipal safeguard level of mobilization, etc.
11. Favorite ANYWHERE layers in order to ensure faster user's analysis.

Figure 116. Initial screen of A4Cor

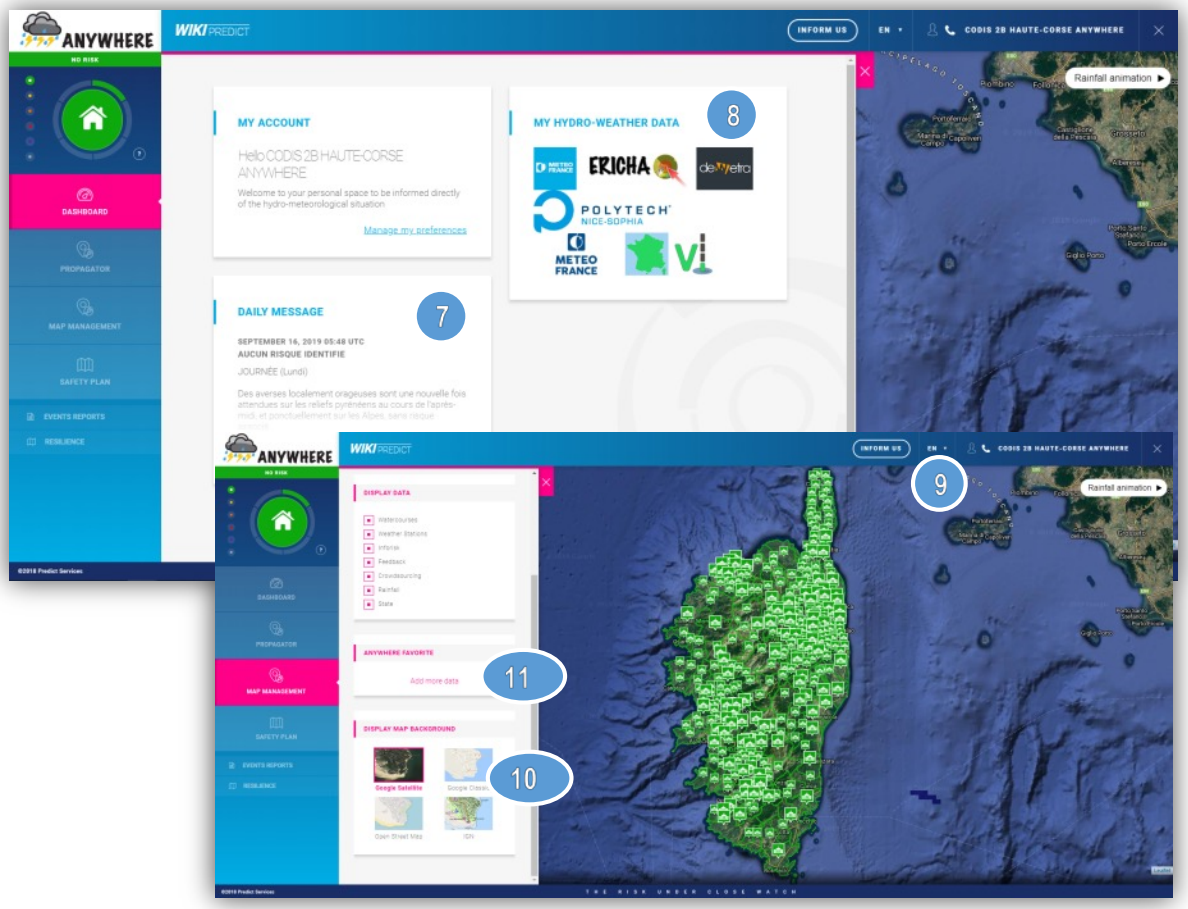


Figure 117. Main functionalities of A4Cor

The A4Cor platform allows SIS2B to watch over each one of its 236 municipalities on Corsica Island and by clicking on one of them they can access a second map containing the main issues of each territory arising from the IGN (French National Institute for Geographic and Forest Information) database. The data presented the so called Points of activity or interest (PAI) that locate buildings or sites with particular purposes such as administrative, industrial, transportation, health, water management and leisure. Those are sensitive points that, if impacted, could jeopardize the proper functioning of the city and the life of its inhabitants.

Furthermore, they can also visualize the PCS (acronym in French for Municipal Safeguard Plan), if it was already performed by the city and/or a PREDICT Services engineers.

Besides the exhaustive identification of each issue on the city and the actions to be carried out during crisis, it was created a map to allow the quick understanding of the hydrological context and support the decision-makers. In which, arrows indicate the risk level: green (safely, no issues), yellow (low risk), orange (medium risk), red (high risk), which depends on several factors: number of issues, exposure, urbanization and type of watercourses. As well, there are four types of arrows to characterize the different flow behavior: runoff, torrential, quick fluvial and slow fluvial depending on the catchment area.

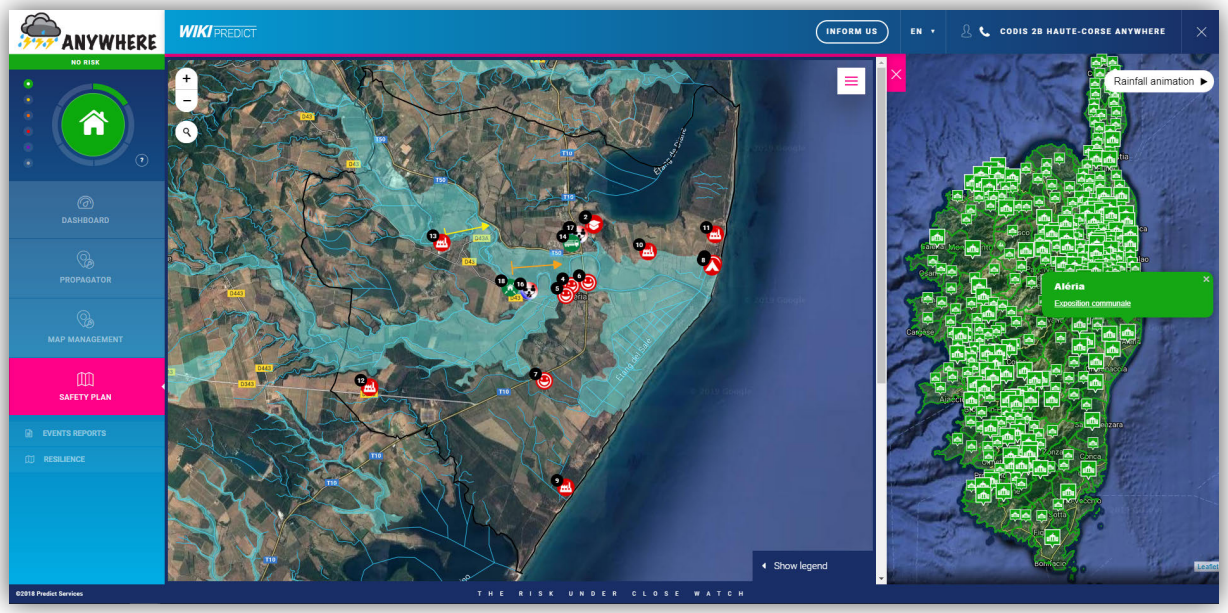


Figure 118. Zoom into Aléria issues, vulnerability and action plan

Moreover, on map management tab the user could choose to display the crowdsourcing results for floods and meteorological issues worldwide. The system inquires KAJO's sever constantly in order to show up the last few 90 minutes tweets related to climate hazards around the world, in 6 (six) languages: English, French, Italian, Spanish, Catalan and Deutsch.

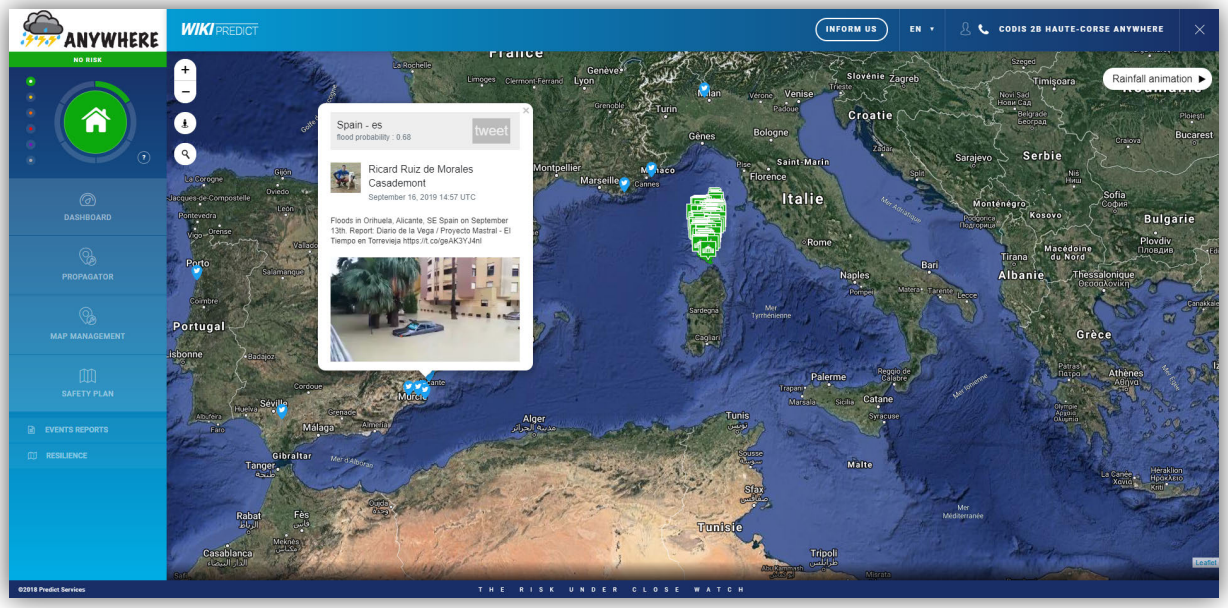


Figure 119. Crowdsourcing API output on A4Cor

9 General overview of the main features of each A4EU prototype

The objective of the following chapter is to provide a synthetized table view of the capabilities and functionalities of the different platforms created by each developer. The information is structured in the same order as in the previous chapters and gathered by each developer's scope (Pilot sites).

9.1 A4EU by CIMA (A4EU-A4Lig): Pilot Site Liguria (Italy):

		A4EU by CIMA
		A4EU- A4Lig (Liguria Pilot site)
SYSTEM	**Platform access**	HTTP access FTP/FTPS to receive data Access to different APIs to gather data
	Web based application and devices compatibility	Web based accessible via common Browsers. Tables/desktop compatible
	Connection to MH-EWS system	Connection to MH-EWS to gather Pan-European products. Connection to the MH-EWS to send local data/models in order to get high-resolution version of products (e.g. radar-based products, RISICO, etc.) or high resolution products only available at the pilot site scale
	User authentication service, Security implemented	Login with user authentication Products visualization rights depending on user
	User registration / management service	Internal (no public) user registration and user management
	TRL (Technology Readiness Level) status of the prototype	TRL-9
FUNCTIONALITIES	**Map interface (Geo Services)**	Map-based interface, able to visualize geolocalized information
	General Maps Included (Google, Open Street, Bing, etc.)	OpenStreetMap (Standard, Cycle Map, Transport Map,Humanitarian) Google maps (Hybrid, Map, Satellite, Terrain)

	Pilot Maps Included (Local/National Cartographic institutes, etc.)	yes
	Support local thematic cartography Included (infrastructures, administrative boundaries, etc.)	yes
	Zoom and pan capabilities	Zoom capabilities, auto zoom on the boundaries of the selected map
	Navigation timeline (past / observation / forecast)	Yes, database
	MH-EWS Products selection & display	Selection of MH-EWS products is done through menus and submenus. Products are sorted by 1) Observations 2) Forecasts 3) Static maps 4) Tools. 1) Observation and 2) Forecast are grouped by hazard product available in the area selected (e.g. if the zoom is set at pan-European level, all the products for each hazard will be shown; if the zoom is set on the Pilot site areas, only the products covering this specific area will be available). Products of the MH-EWS and local products are mixed together in order to help the operators in focusing on the specific risk situation. 3) Static maps menu is reporting in different folders the maps available in different areas (e.g. Liguria). Some static maps to support the Forest fire models are also available in other Pilot sites (e.g. Catalonia, Switzerland). A search menu is available allowing for a direct search of specific products or observation available.
	Local Products selection & display	

	Information support	A wiki is available on the main menu
	Feedback support	Yes, a specific communication service is available on the main menu (Kumalé tool)
	Search engine in the platform	yes
	Language support	Italian English Spanish
	User focus functionalities (risk identification)	yes a specific tool, named "Impacts" is available in the Tools menu. This product is able to combine all the exposed elements available (e.g. Schools, Hospitals) with the hazard maps (e.g. flooded areas) and provide to the user the information (e.g. contacts information and phone numbers, exact geo location, number of people living there) on the most exposed elements to the specific hazard observed/forecasted . The data base integrates data at Italian level with these shared al Regional and local level by the pilot site users.
	User communication module	Web based
	Multi-layer capacity	Yes, no limit to the number of layers that can be used
	Integration of automatic rules for the interaction between layers	No

	Impact forecasting: Integration of automatic rules between products and actions defined (thresholds that define actions: issue an alert, highlight some region, etc.)	Partially (see "User functionalities")
	Other Web interface features.	Yes, the systems displays on products available covering the selected area
	Integration of incidents in real time (112 calls, road traffic incidents, etc.)	Yes, by adding a new layers trough WebMapService (WMS)
	The prototype implements all the requests for improvements performed by the end-user during the demonstration period.	Yes
LAYERS / PRODUCTS	**MH-EWS products available.**	Al the MH-EWS Pan-European products are available. Local version of the MH-EWS data (e.g. Liguria Flood Prediction System, RISICO, etc.) is available.
	Integration and display of local vulnerability information	Yes

	Local vulnerability maps	Yes, European settlements map 10m resolution (Europe - source JRC) Schools (Italy - Civil Protection) Hospitals (Italy - Civil Protection) Railroads (Italy - Civil Protection) Roads (Italy - Civil Protection) Municipalities boundaries (Italy - Civil Protection) Provinces boundaries (Italy - Civil Protection) Regional boundaries (Italy - Civil Protection) Main catchments (Italy - Civil Protection) Secondary catchments (Italy - Civil Protection)
	Local critical points	Dams (Italy - Civil Protection) Flood Hazard Map (High) - (Italy - Civil Protection) Flood Hazard Map (Medium) - (Italy - Civil Protection) Flood Hazard Map (Low) - (Italy - Civil Protection) Flood Hazard Maps (T=50yrs) - (Italy - Global Assessment Report - UNDRR) Flood Hazard Maps (T=100yrs) - (Italy - Global Assessment Report - UNDRR) Flood Hazard Maps (T=100yrs) - (Italy - Global Assessment Report - UNDRR) Flooded areas (Genoa 2014) Fire Hazard Map - summer (Liguria) Fire Hazard Map - summer (Italy) Fire Hazard Map - winter (Liguria) Fire Hazard Map - winter (Italy) Fire Hazard Map - Wildland-Urban Interface (WUI) - summer (Liguria) Fire Hazard Map - Wildland-Urban Interface (WUI) - summer (Liguria) Genoa buildings Genoa catchments

		Genoa commercial activities Genoa CP collection point Genoa cultural sites Genoa Districts Genoa health facilities Genoa hospitals Genoa inhabitants Genoa metro network Genoa metro stations Genoa open air markets Genoa parks Genoa primary river network Genoa primary river network (covered) Genoa railway network Genoa relevant risk plants Genoa schools Genoa secondary river network Genoa secondary river network (covered) Genoa shops Genoa sport sites Genoa strategic buildings Genoa streets Genoa subways

	Integration and display of Local forecasting products (non MH-EWS)	Yes, Italian Radar network Italian Rain gauges network Italian Weather Station network Italian Stream gauges network
	Integration of local sources (sensors, webcams, etc.) implemented as interactive data	No
	Integration of different European products (MH-EWS) simultaneously in the same screen/visualization	Yes
	Integration of local products with European products (MH-EWS) simultaneously in the same screen/visualization	Yes
	Other regional / local information integrated.	
TOOLKITS	**Logistics Management tool (by RINA)**	No
	Crowdsourcing and social media communication skills (by KAJO)	No
	Propagator (by CIMA)	Yes
	Risk Assessment (by SINTEF)	No

	Other toolkits integrated (local)	Real time flood maps based on rainfall observation and hydrologic/hydraulic modelling

9.2 A4EU by HYDS (A4EU-A4Cat / A4EU-A4CENEM): Pilot Sites Catalonia (Spain) and CENEM (Spain)

		A4EU By HYDS	
		A4EU- A4Cat (Catalonia pilot site)	**A4EU-A4CENEM**
SYSTEM	**Platform access**	HTTP access FTP/FTPS to receive data Encrypted API to receive 112 calls Access to different APIs to gather data	HTTP access FTP/FTPS to receive data Access to different APIs to gather data
	Web based application and devices compatibility	Web based accessible via common Browsers. Mobile/tables/desktop compatible	Web based accessible via common Browsers. Mobile/tables/desktop compatible
	Connection to MH-EWS system	Connection to MH-EWS to gather Pan-European products. Connection to the MH-EWS to send local data in order to get high-resolution version of products (e.g. radar-based products, RISICO, etc.)	Connection to MH-EWS to gather Pan-European products.
	User authentication service, Security implemented	Login with user authentication Products visualization rights depending on user	Login with user authentication
	User registration / management service	Internal (no public) user registration and user management	Internal (no public) user registration and user management
	TRL (Technology Readiness Level) status of the prototype	TRL-9	TRL-9
FUNCTIONALITIES	**Map interface (Geo Services)**	Map-based interface, able to visualize geolocalized information	Map-based interface, able to visualize geolocalized information

	General Maps Included (Google, Open Street, Bing, etc.)	MapBox - Light MapBox - Satellite MapBox - Streets White + Country and Pilot boundaries	MapBox - Light MapBox - Satellite MapBox - Streets
	Pilot Maps Included (Local/National Cartographic institutes, etc.)	ICGC - Topographic (color) ICGC - Topographic (greyscale) ICGC - Ortophotomap (color) ICGC - Ortophotomap (greyscale)	Specific Local cartographic information depending on region: ICGC - Topographic (color) ICGC - Topographic (greyscale) ICGC - Ortophotomap (color) ICGC - Ortophotomap (greyscale) C. Valenciana: ICV - Topographic C. Valenciana: ICV - Ortophotomap C. Valenciana: SIOSE-ICV - Land use Balears: MUIB - Topographic Balears: MUIB - Ortophotomap Balears: MUIB - Land use
	Support local thematic cartography Included (infrastructures, administrative boundaries, etc.)	ICGC - Administrative boundaries (Municipal, county) ACA - Rivers, catchments and sub-cachements CHE - Catchments and sub-catchments DGA - Administrative catchments divisions Gencat - Train network Gencat - Road network	Global thematic cartography: IGN - Administrative boundaries IGN - Train network IGN - Road network DGA - Administrative catchments divisions Specific Local thematic cartography: Balears: Administrative boundaries (Municipal) Balears: Urban nucleus

	Zoom and pan capabilities	Zoom and pan capabilities over the geolocalized maps and information	Zoom and pan capabilities over the geolocalized maps and information
	Navigation timeline (past / observation / forecast)	Time-navigation capabilities. Navigation range predefined for each specific product	Time-navigation capabilities. Navigation range predefined for each specific product
	MH-EWS Products selection & display	Selection of MH-EWS products is done through menus and submenus. Products are sorted by hazard and then grouped by categorize based on operational needs (sensors observations, official warnings, forecasts, etc.). Products of the MH-EWS and local products are mixed together. Organization is set to help operation, not on source.	Selection of MH-EWS products is done through menus and submenus. Products are sorted by hazard and then grouped by categorize based on operational needs (sensors observations, official warnings, forecasts, etc.). Products of the MH-EWS and local products are mixed together. Organization is set to help operation, not on source.
	Local Products selection & display		
	Information support	Palettes in the viewer Associated Wiki linked from the viewer (with detailed information of the product, images, videos, links to the Project catalogue, etc.)	Palettes in the viewer Associated Wiki linked from the viewer (with detailed information of the product, images, videos, links to the Project catalogue, etc.)
	Feedback support	Feedback forms accessible from the viewer to report on (specific forms): Error of the platform Error of the forecasts Others	Feedback forms accessible from the viewer to report on (specific forms): Error of the platform Error of the forecasts Usefulness on an event Others
	Search engine in the platform	Search engine for geographical items (cities, towns, counties, municipalities, etc.). Coordinate locator and searcher integrated.	Search engine for geographical items (cities, towns, counties, municipalities, etc.). Coordinate locator and searcher integrated.

	Language support	Catalan (default) Spanish English	Spanish (default) Catalan English
	User focus functionalities (risk identification)	Warnings summary tables (with space-temporal links). Capacity to activate areas (municipalities, counties, etc.) with the level of warning. Capacity to activate elements (sensors, critical elements, etc.) with the level of warning.	Warnings summary tables (with space-temporal links). Capacity to activate areas (municipalities, counties, etc.) with the level of warning. Capacity to activate elements (sensors, critical elements, etc.) with the level of warning. Specific summary view of the meteorological forecasted warnings.
	User communication module	Web viewer	Web viewer
	Multi-layer capacity	NO. Only predefined views.	NO. Only predefined views.
	Integration of automatic rules for the interaction between layers	NO.	NO.
	Impact forecasting: Integration of automatic rules between products and actions defined (thresholds that define actions: issue an alert, highlight some region, etc.)	YES: Areas (catchments, municipalities, etc.) can be activated and highlighted depending on values in it (max, average..) and predefined thresholds. Sensors are activated and highlighted depending on thresholds. Critical elements are activated and highlighted based on different impact products (see	YES: Areas (catchments, municipalities, etc.) can be activated and highlighted depending on values in it (max, average..) and predefined thresholds. Sensors are activated and highlighted depending on thresholds. Critical elements are activated and highlighted based on different impact products (see

		explanation on the report).	explanation on the report).
	Other Web interface features.	Automatic product data reloading	Automatic product data reloading
	Integration of incidents in real time (112 calls, road traffic incidents, etc.)	112 Calls integrated in real time with on the fly filters (typology). Transit incidents (Servei Català de Trànsit) integrated in real time with on the fly filters (typology, level). Transit cameras (Servei Català de Trànsit) integrated in real time.	Transit incidents (DGT) integrated in real time with on the fly filters (typology, level). Transit cameras (DGT) integrated in real time.
	The prototype implements all the requests for improvements performed by the end-user during the demonstration period.	NO: Multilayer to be available in next version Notifications to be available in next version Historical mode to be available in next version	NO: Integration of some regional data is in progress Multilayer to be available in next version Notifications to be available in next version Historical mode to be available in next version

LAYERS / PRODUCTS	**MH-EWS products available.**	Al the MH-EWS Pan-European products are available. Local version of the MH-EWS (radar-based, RISICO, etc.) are available.	Al the MH-EWS Pan-European products are available.
	Integration and display of local vulnerability information		
	Local vulnerability maps	YES: Flooding extend maps (ACA) Flooding risk maps (INTC) Forest Fires Vulnerability Map (INTC) Forest Fires Risk Map (INTC) Forest Fires vegetation Map (2 sources) Storm surges extend maps (ACA) Storm surges risk maps (INTC)	YES (county-wide): Flooding extend maps (MAPAMA) Flooding risk maps (MAPAMA) Storm surges extend maps (MAPAMA) Storm surges risk maps (MAPAMA) YES (regional): C. Valenciana: Streams (ICV) C. Valenciana: Flooding risk areas (PATRICOVA) C. Valenciana: Flooding dangerous areas (PATRICOVA) Balears: Forest Fires Risk Map (112ib)
	Local critical points	YES: Flooding critical elements (>10 different sources) Forest Fires critical elements (>10 different sources) Snow critical elements and road segments (3 sources)	YES: SEVESO Industries (Level I and Level II) Nuclear facilities

	Integration and display of Local forecasting products (non MH-EWS)	YES: Meteocat Meteorological warnings AEMET Meteorological warnings Dynamic risk (CECAT) Rural Agents Forest Fire Risk forecast (DARPA)	YES: AEMET Meteorological warnings
	Integration of local sources (sensors, webcams, etc.) implemented as interactive data	YES: Meteocat Automatic Weather Stations AEMET Automatic Weather Stations CHE Rain gauges ACA Stream gauges CHE Stream gauges SmartyRiver Stream gauges ACA Reservoirs CHE Reservoirs XVPCA Air Quality Sensors	YES: AEMET Automatic Weather Stations CHE rain gauges CHJ rain gauges CHG rain gauges ACA Stream gauges CHE Stream gauges CHJ Stream gauges CHG Stream gauges ACA Reservoirs CHE Reservoirs CHJ Reservoirs CHG Reservoirs
	Integration of different European products (MH-EWS) simultaneously in the same screen/visualisation	NO	NO
	Integration of local products with European products (MH-EWS) simultaneously in the same screen/visualisation	YES: MW-EWS products together with local vulnerability information	YES: MW-EWS products together with local vulnerability information

	Other regional / local information integrated.	A4Cat integrates the Hotspots observed from satellite (MODIS and VIIRS platforms) obtained through two different sources: i) a real-time connection with NASA FIRMS (Not filtered). ii) a real-time connection with EFFIS (filtered). A4Cat integrated the burned areas observed from satellite from two sources (obtained through EFFIS): i) MODIS supervised, including reports. ii) VIIRS automatically processed by HYDS.	A4CENEM integrates the Hotspots observed from satellite (MODIS and VIIRS platforms) obtained through two different sources: i) a real-time connection with NASA FIRMS (Not filtered). ii) a real-time connection with EFFIS (filtered). A4Cat integrated the burned areas observed from satellite from two sources (obtained through EFFIS): i) MODIS supervised, including reports. ii) VIIRS automatically processed by HYDS. A4CENEM also includes all the information about the transport of dangerous goods compiling with the EU regulation. A4CENEM also includes all the SEVESO chemical industries (Level I and Level II) and nuclear plants location (perimeters)
TOOLKITS	**Logistics Management tool (by RINA)**	Not available	Not available
	Crowdsourcing and social media communication skills (by KAJO)	Crowdsourcing tool connected to A4Cat. Crowdsourcing information shown in real-time in the platform	Crowdsourcing tool connected to A4CENEM. Crowdsourcing information shown in real-time in the platform
	Propagator (by CIMA)	Propagator integrated in A4Cat. Using high-resolution versions of DEM and vegetation cover maps	Propagator is not prepared for the full territory of the country
	Risk Assessment (by SINTEF)	Not available	Not available

	Other toolkits integrated (local)	The tool to access the snow impact on the roads developed by UPC has been integrated: A4Cat shows the forecasted status of the road and the impact of the snow in critical elements. Snow impact on scholar bus networks is also shown.	Not available

9.3 A4EU by AIRBUS (A4EU-A4Nor / A4EU-A4Finn / A4EU-A4Alps): Pilot sites Rogaland (Norway), South Savo (Finland) and Canton of Bern (Switzerland)

		A4EU by AIRBUS		
		A4EU- A4Nor (Pan-European workspace, accessible to all pilot sites)	**A4EU- A4Finn (Finland local workspace)**	**A4EU- A4Alps (Canton of Bern local workspace)**
SYSTEM	**Platform access**	HTTPS protocol,	HTTPS protocol,	HTTPS protocol,
	Web based application and devices compatibility	Web based accessible via common Browsers. Mobile/Tables/desktop compatible	Web based accessible via common Browsers. Mobile/Tables/desktop compatible	Web based accessible via common Browsers. Mobile/Tables/desktop compatible
	Connection to MH-EWS system	direct connection to MH-EWS and Copernicus weather services	direct connection to MH-EWS for local products	Not connected to MH-EWS, Local products directly uploaded into Airbus servers (FTPS)
	User authentication service, Security implemented	SSO, OAuth2 (secured user connection)	SSO, OAuth2 (restricted to authorised users)	SSO, OAuth2 (restricted to authorised users)
	User registration /	controlled database	controlled database	controlled database

	management service			
	TRL (Technology Readiness Level) status of the prototype	TRL-7	TRL-7	TRL-7
FUNCTIONALITIES	**Map interface (Geo Services)**	Mapbased interface: Mapbox (satellite and street view)	Available to user through Pan-European workspace (see A4EU-A4Nor)	Available to user through Pan-European workspace (see A4EU-A4Nor)
	General Maps Included (Google, Open Street, Bing, etc.)	MapBox - Light MapBox - Satellite MapBox - Streets	Available to user through Pan-European workspace (see A4EU-A4Nor)	Available to user through Pan-European workspace (see A4EU-A4Nor)
	Pilot Maps Included (Local/National Cartographic institutes, etc.)	NO Not requested by user. System ready for specific local layer integration	NO Not requested by user. System ready for specific local layer integration	NO Not requested by user. System ready for specific local layer integration
	Support local thematic cartography Included (infrastructures, administrative boundaries…)	NO Not requested by user. System ready for specific layer integration	NO Not requested by user. System ready for specific layer integration	NO Not requested by user. System ready for specific layer integration

	Zoom and pan capabilities	Zoom and pan capabilities. Auto zoom per user when login	Available to user thorough Pan-European workspace (see A4EU-A4Nor)	Available to user thorough Pan-European workspace (see A4EU-A4Nor)
	Navigation timeline (past / observation / forecast)	Yes, adapted to Pan-European workspace	Yes, adapted to local workspace	Yes, adapted to local workspace
	MH-EWS Products selection & display	Main menu (Products within 8 main categories)	Pan European and map based MH-EWS products , available to user through Pan-European workspace (see A4EU-A4Nor) Local MH-EWS products (not map based), available to user through local workspace (see A4EU-A4Finn)	Pan European and map based MH-EWS products , available to user through Pan-European workspace (see A4EU-A4Nor) Local products not using MH-EWS, directly uploaded in Airbus server
	Local Products selection & display	Local non-restricted products integrated in categories, integrated in corresponding layer with specific selection menu	specific interface for locally restricted products display (16 products, Alerts and Luova bulletins) with warning level and decision	specific interface and menu for locally restricted products display (5 main products with regional and expert views)
	Information support	Legends with description and scale available for each layer. Catalogue accessible thought the	Description on Pan-European workspace	Products description available and integrated in the product

		user menu		
	Feedback support	YES	YES	YES
	Search engine in the platform	N/A interface automatically localized on user work area	N/A interface automatically localized on user work area	N/A interface automatically localized on user work area
	Language support	English, Finnish. (other languages can be integrated)	English, Finnish. (other languages can be integrated)	English
	User focus functionalities (risk identification)	Product alert system available. Each user can define her/his own alert perimeter & threshold per product. Surveillance Alert&notification system running 24h/7days, users no need to be logged in. Notifications sent per email to user when an alert is triggered	Local MH-EWS products alert on Pan-European workspace defined by each user. Local Workspace alert visual system per hour for the following 48h	Local MH-EWS products alert on Pan-European workspace defined by each user. Local Workspace visual system available in some of the products
	User communication module	User Alert system and Email notification, linked with alert system. User notification by email when	Local products integrated Pan-European workspace (See A4EU-A4Nor description)	Local products integrated Pan-European workspace (See A4EU-A4Nor description)

		alert is triggered		
	Multi-layer capacity	NO	NO	NO
	Integration of automatic rules for the interaction between layers	NO	NO	NO
	Impact forecasting: Integration of automatic rules between products and actions defined (thresholds that define actions: issue an alert, highlight some region, etc.)	YES Can be defined by each user on each layer. Alert and notification system integrated, visual identification on the map for affected area.	YES Threshold and warning system with associated decision support information Yes For local products integrated Pan-European workspace. (See A4EU-A4Nor description)	YES For local products integrated Pan-European workspace. (See A4EU-A4Nor description)
	Other Web interface features.	YES	YES	YES
	Integration of incidents in real time (112 calls, road traffic incidents, etc.)	NO Not requested by user. System ready for specific layer integration	NO Not requested by user. System ready for specific layer integration	NO Not requested by user. System ready for specific layer integration

	The prototype implements all the requests for improvements performed by the end-user during the demonstration period.	YES	YES, except: -User level rights inside A4EU-A4Finn -Change request on local map interface: alternative solution provided by displaying on Pan-European workspace. -Extension of login sessions to one week: Refused by developer due to breach of security protocol & standards compliance.	YES
LAYERS / PRODUCTS	**MH-EWS products available.**	YES All MH-EWS products that have been selected by the users are displayed.	YES Some of the local products are ingested from MH-EWS. Others are directly uploaded to Airbus System	MH-EWS is not used. Products are directly uploaded to Airbus system.
	Integration and display of local vulnerability information	YES Civil Protection, Education, Industry, Tourism, Transport. Local vulnerability areas have been included	YES Civil Protection, Education, Industry, Tourism, Transport. Pan-European workspace (A4EU-A4Nor) Local vulnerability areas have been included	YES Civil Protection, Education, Industry, Tourism, Transport). Pan-European workspace (A4EU-A4Nor) Local vulnerability areas have been included

	Local vulnerability maps	NO Not requested by pilot site. System ready for integration.	NO Not requested by pilot site. System ready for integration.	NO Not requested by pilot site. System ready for integration.
	Local critical points	YES Provided by the user, and geolocalized accessible through the Point Of Interest menu	Accessible to user through pan-European level workspace (see A4EU-A4Nor)	Accessible to user through pan-European level workspace (see A4EU-A4Nor)
	Integration and display of Local forecasting products (non MH-EWS)	NO (AEU-A4Nor is a workspace dedicated for Pan-European products)	YES	YES
	Integration of local sources (sensors, webcams, etc.) implemented as interactive data	YES Copernicus weather products with local sensors.	YES	YES
	Integration of different European products (MH-EWS) simultaneously in the	NO	NO	NO

	same screen/visualisation			
	Integration of local products with European products (MH-EWS) simultaneously in the same screen/visualisation	NO	NO	NO
	Other regional / local information integrated.	EU Copernicus weather services Tool ready to integrate local information if requested by pilot sites	EU Copernicus weather services in pan-European Workspace (see A4EU-A4Nor) System ready for integration if local information is available	EU Copernicus weather services in pan-European Workspace (see A4EU-A4Nor) System ready for integration if local information is available
TOOLKIITS	**Logistics Management tool (by RINA)**	N/A	N/A	N/A
	Crowdsourcing and social media communication skills (by KAJO)	YES	User can access through Pan European Workspace (see A4EU-A4Nor)	User can access through Pan European Workspace (see A4EU-A4Nor)
	Propagator (by CIMA)	YES	User can access through Pan European Workspace (see A4EU-A4Nor)	User can access through Pan European Workspace (see A4EU-A4Nor)

	Risk Assessment (by SINTEF)	YES	User can access through Pan European Workspace (see A4EU-A4Nor)	User can access through Pan European Workspace (see A4EU-A4Nor)
	Other toolkits integrated (local)	N/A	N/A	N/A

9.4 A4EU by PREDICT (A4EU-A4Cor): Pilot site Corsica (France)

		A4EU by PREDICT A4EU-A4Cor (Corse Pilot site)
SYSTEM	Platform access	Yes
	Web based application and devices compatibility	Yes
	Connection to MH-EWS system	Yes
	User authentication service, Security implemented	Yes
	User registration / management service	Yes
	TRL (Technology Readiness Level) status of the prototype	TRL-9
FUNCTIONALITITES	Map interface (Geo Services)	Yes
	General Maps Included (Google, Open Street, Bing, etc.)	Yes
	Pilot Maps Included (Local/National Cartographic institutes, etc.)	Yes

	Support local thematic cartography Included (infrastructures, administrative boundaries, etc.)	Yes
	Zoom and pan capabilities	Yes
	Navigation timeline (past / observation / forecast)	Yes
	MH-EWS Products selection & display	Yes
	Local Products selection & display	Yes
	Information support	Yes
	Feedback support	Yes
	Search engine in the platform	Yes
	Language support	Yes
	User focus functionalities (risk identification)	Yes
	User communication module	Yes
	Multi-layer capacity	Yes, not limited
	Integration of automatic rules for the interaction between layers	No

	Impact forecasting: Integration of automatic rules between products and actions defined (thresholds that define actions: issue an alert, highlight some region, etc.)	No
	Other Web interface features.	Yes
	Integration of incidents in real time (112 calls, road traffic incidents, etc.)	No
	The prototype implements all the requests for improvements performed by the end-user during the demonstration period.	Yes
LAYERS / PRODUCTS	**MH-EWS products available.**	Yes (see chapter 8)
	Integration and display of local vulnerability information	Yes
	Local vulnerability maps	Yes, PREDICT's vulnerability and exposure maps and Municipal Safeguard Plans (see chapter 8)

	Local critical points	Yes, PREDICT's vulnerability and exposure maps and IGN's points of activity or interest (see chapter 8)
	Integration and display of Local forecasting products (non MH-EWS)	Yes, Météo France's local forecasts
	Integration of local sources (sensors, webcams, etc.) implemented as interactive data	Yes, hydro gauging stations
	Integration of different European products (MH-EWS) simultaneously in the same screen/visualization	Yes
	Integration of local products with European products (MH-EWS) simultaneously in the same screen/visualization	Yes
	Other regional / local information integrated.	Yes

TOOLKITS	**Logistics Management tool (by RINA)**	No
	Crowdsourcing and social media communication skills (by KAJO)	Yes
	Propagator (by CIMA)	Yes
	Risk Assessment (by SINTEF)	No
	Other toolkits integrated (local)	Nice-Sophia's Resilience API

10 Conclusion

The main purpose of WP4 has been to design ANYWHERE prototype platforms for Decision support in Emergency Management Operation Services (A4EU, formerly named A4DEMOS) able to connect the products and services offered by the Multi-Hazard Early Warning System (MH-EWS) to any emergency management control centre in EU. At the same time they should be able to be easily customizable to the local needs and adaptable to the local data availability with the purpose of being a powerful support tool in the decision-making process during weather induced emergencies.

On top of that, it was requested to able to integrate complementary tools to add field emergency management operation capabilities, including 3rd-Party plug-ins (through APIs) and tailored products and services oriented to raise self-preparedness and self-protection of the population and the institutions with activities affected by the weather and climate events.

To achieve the previous, different prototypes have been developed on complete cooperation between developers and pilot sites. This has proven to be a successful and laborious task, being a continuous learning process between Emergency Operational Teams and system developers, following the co-creation and co-ownership philosophy promoted in WP1. Numerous discussions and developments have been done in order to be able to satisfy the local needs by keeping in mind the need to create prototypes that could be transposable to new locations at low cost development.

Pilot site representatives have been responsible to gather and transfer the end users' experiences and needs to the system developers who have done their best to develop A4EU systems that can satisfy their needs in the most simple and effective way.

All the prototypes can integrate and provide online access to the ANYWHERE MH-EWS products. They are also able to cross them with local layer of information providing support to the decision makers during weather induced emergencies but allowing different versions to able to customize the user experience and the interaction with the decision procedures tailored to the needs of the pilot site users.

The features of all the prototypes are very similar at higher level (Pan-European) and some differences start appearing when going into the local operational needs that every system has had to integrate to (local products, maps, layers, sensors…), and the end-user preferences expressed by the pilot sites. Local products and layers are

very specific to each site and have been deployed depending on the information available and requirements defined from each pilot site.

Some local choices have proven to be very interesting form an operational point of view and could provide ideas for development to the other prototypes always when potential future users are interested and source information is available and provided to the developers for integration.

The number of Toolkits implemented on each prototype also differs from system to system. This is due to the initial requests from end-users combined to the limited adaptability of some of the toolkits to the different sites at this stage of the project. This situation made them more suitable for some prototypes working with pilot sites where the toolkit was fully functional.

The four developers have designed their prototypes in a way that allow them to be implemented lately in any other emergency control centre in Europe (ensured by construction). This capacity to use any of the developed prototypes to supply the MH-EWS forecasts and impact assessment products to any PPDR (Public Protection and Disaster Relief organisations) user (internal and external to the project), has been seen by the Consortium as an opportunity to provide different options to the project to promote a successful market uptake of the ANYWHERE developments. The previous has been proven by at least two of the developers during this project, AIRBUS and HYDS who with the their same A4EU backbone have been able to support different pilot sites and their local needs (Rogaland, Canton of Bern and South Savo pilot sites for AIRBUS A4EU prototypes and Catalonia and CENEM for HYDS A4EU prototypes). According to the rest of developers, the same conclusion could be potentially extended to the other prototypes.

The resulting systems have been designed with the purpose of being a powerful support tool in the decision-making process during (and before) weather induced emergencies. They provide the emergency centres the capability to access to MH-EWS and local available products displayed in an ergonomic and user friendly way along with the basic features to easily analyse the potential weather hazards. The output information from the prototypes should offer efficient support to the decision makers during weather induced emergencies independently of their location. On top of providing a general solution to any emergency management centre in Europe, the A4EU prototypes are able to be customized to the local needs (effort depending on adaptations needed to meet local requirements) and, if required, to incorporate further Pan-European and local layers or tools.

In addition, it shall be highlighted the fact that, due to the built-in customisation capabilities of the A4EU platforms, it has been demonstrated their capacity to be able to integrate a variety of sources of information and visualisations, which enable them to be adapted to different scopes (local, regional, national, continental) and to expand its use and implementation “anywhere” in Europe (and also beyond). Examples:

- The platforms by CIMA and PREDICT, were systems already operating at national level and have demonstrated to be able to successfully integrate Anywhere’s products at regional level.
- The platform by AIRBUS has demonstrated its adaptability by being developed involving regions from three different countries.
- An additional prototype (the 7th, not foreseen initially) has been deployed during the Anywhere project at the CENEM (Spanish Emergency Control Centre) by HYDS widening the scope of Anywhere’s products to manage a whole country.

11 Acronyms

ACA: *Agència Catalana de l'Aigua*

AEMET: *Agencia Estatal de Meteorología*

API: Application Programming Interface

CDG: *Comune di Genova*

CENEM: *Centro Nacional de Emergencias* (Spanish Emergency Control Centre)

CECAT: Emergency Control Centre of the Civil Protection of Catalonia (INTC).

CHE: *Confederación Hidrográfica del Ebro*

CIMA: *Centro Internazionale in Monitoraggio Ambientale* - Fondazione CIMA

DARPA: *Departament d'Agricultura, Ramaderia, Pesca i Alimentació* (GENCAT)

DGT: *Dirección General de Tráfico*

DST: Decision Support Tool

Dx: Deliverable

FMI: ILMATIETEEN LAITOS (Finnish Meteorological Institute)

FMoI: MINISTRY OF THE INTERIOR (Finland)

GENCAT: *Generalitat de Catalunya* (Catalan Regional Government)

HSUH: HELSE STAVANGER HF

HTTP: Hypertext Transfer Protocol

HTTPS: Hypertext Transfer Protocol Secure

HYDS: Hydrometeorological Innovative Solutions

ICGC: *Institut Cartogràfic i Geològic de Catalunya*

IGN: *Instituto Geográfico Nacional* (Spain)

INTC: *Departament d'Interior* (GENCAT)

KAJO: KAJO SRO

MAPAMA: *Ministerio de Agricultura, Pesca y Alimentación* (Spain)

METEOCAT: Catalan Meteorological Service

MH-EWS: Multi Hazard Early Warning System

MSx: Milestone

NASA: National Aeronautics and Space Administration (USA)

NWP: Numerical Weather Predication

ORI: Operational Resilience Index

POI: Point Of Interest

PNG: Portable Network Graphics

PPDR: Public Protection and Disaster Relief organisations.

SINTEF: STIFTELSEN SINTEF

SIS2B: Service d'Incendie et de Secours de la Haute Corse

SSO: Single Sign On

SW: Software

UPC: Universitat Politecnica de Catalunya

URL: Uniform Resource Locator

VOLBE: Direction de L'economie publique du Canton de Berne

WP: Work Package