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Italy – Croatia

Digital Plan

Project DIGITAL PLAN

PILOT REPORT

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Done by LP GAL Molise



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Introduction

This introductory chapter outlines the objectives, reference framework, and operational procedures of the exercise designed to implement and test the platform developed within the framework of the Digital Plan Project**.** The document defines the methodological approach and the technical setup required to run the platform in parallel with the monitoring systems currently in use, through the installation of appropriate technological tools tailored to the specific context and needs of each participating territory.

These activities are part of the broader objectives of the Digital Plan Project, which include the implementation of pilot studies and the development of an IoT Wallet - a web-based platform designed to communicate with IoT-enabled sensing devices. The project foresees the design and launch of six pilot studies across the partner territories, involving the installation of IoT sensors and the simulation of relevant emergency scenarios. By integrating IoT sensors with existing urban and territorial infrastructures, the platform aims to contribute to the development of more efficient and effective civil protection solutions.

The IoT Wallet represents a strategic and operational tool that enables organizations and public authorities to better manage and respond to emergencies, while significantly enhancing their capacity to collect, aggregate, and analyze critical data. The platform



allows data from multiple sensors and communication protocols to be gathered and processed within a single digital environment. Thanks to its advanced graphical visualization capabilities, users can easily interpret complex datasets, monitor changes in real time, and support evidence-based decision-making processes during crisis situations.

Within this framework, the present task will lead to the implementation of six local pilot deployments in the partner territories. The main objective is to operate and test the newly created platform alongside existing monitoring systems, ensuring interoperability and evaluating performance under real operational conditions. The installation of IoT sensor networks and related technological components will be adapted to the environmental, infrastructural, and institutional characteristics of each pilot area.

The exercise specifically aims to test the IoT sensor systems installed in the following six pilot territories:

- One site within the GAL Molise area;
- One site in the Municipality of Fermo;
- One site within the AGRRA territory;
- One site in the Maiella National Park area;
- One site in the City of Dubrovnik;
- One site within the RERA territory.

The simulated scenario, set within a critical and climatically adverse context, will focus in particular on reproducing the direct and indirect impacts of an extensive meteorological event with moderate to heavy and widespread rainfall. The exercise will include simulated civil protection actions consistent with the hypothesized emergency scenario, enabling stakeholders to test coordination mechanisms, data transmission processes, real-time monitoring capabilities, and response strategies supported by the IoT Wallet platform.

Overall, this pilot phase represents a fundamental step toward validating the technological infrastructure and operational model proposed by the Digital Plan Project, paving the way for future scalability, replication, and long-term integration into territorial civil protection systems. The simulation scenario is based on the following rainfall thresholds in the field, which are the same for all sites:

Level	Code	Value (mm/3h)	Type of Alert
S0	**Green**	<20mm	None
S1	**Yellow**	20 mm	Warning
S2	**Orange**	40 mm	Pre-alert
S3	**Red**	60 mm	Alert

Objectives of the simulations (EXE):

The EXE aims to test:

• The functioning of an IoT sensor.

• The temporal increase in liquid or solid precipitation.

• The exceeding of pre-set rainfall thresholds.

• The automatic generation of alarms.

• The creation of graphical outputs and an event database.

Operational command structure:

For the management of the training exercise (EXE) the following command and control structure is composed by:

Coordinator EXE	X
Technical support EXE	X
Observer EXE	X
Observer EXE	X

Observer EXE	X
Evaluator EXE	X
Evaluator EXE	X
Evaluator EXE	X

Practice activity:

Time	Activity
06.00 a.m.	Short-range synoptic forecast
07.00 a.m.	Activation of the Operational Centre (COC)
08.15 a.m.	Start of precipitation
12.30 p.m.	Shutdown of the Operationl Centre (COC)
01.00 p.m.	End of the simulation/training exercise

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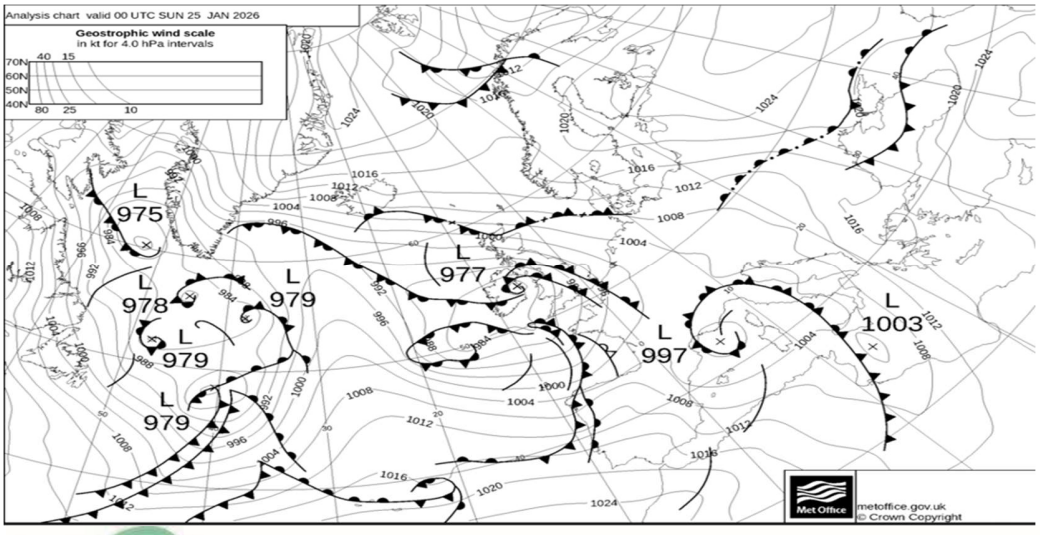
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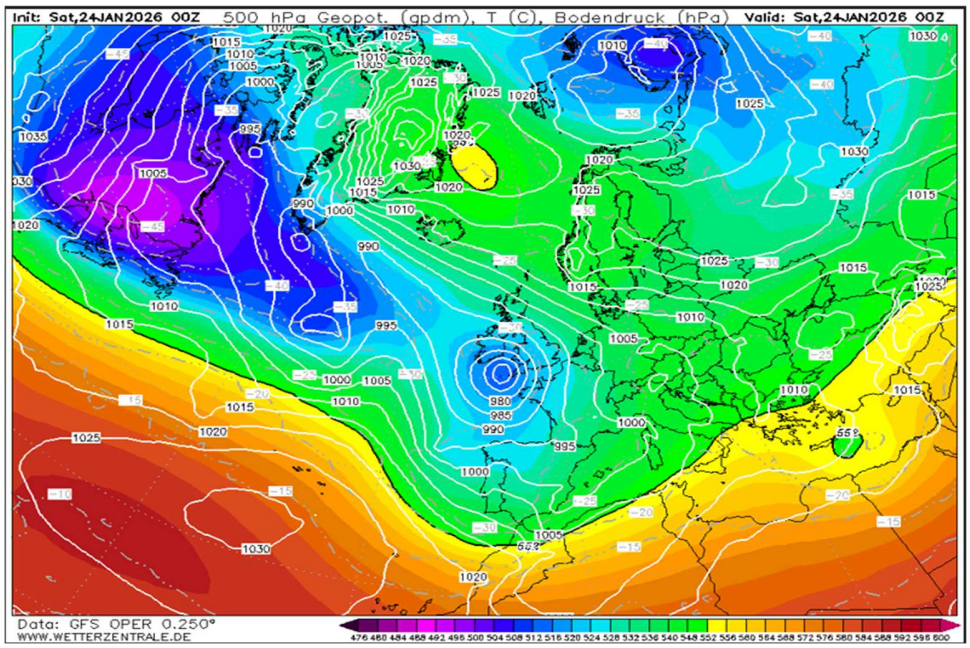
DIGITAL PLAN TRAINING EXERCISE - TESTING THE IOT PLATFORM AND SENSOR SYSTEM (DSS):

SYNOPTIC FORECAST ISSUED AT 5:00 AM ON JANUARY 25, 2026:

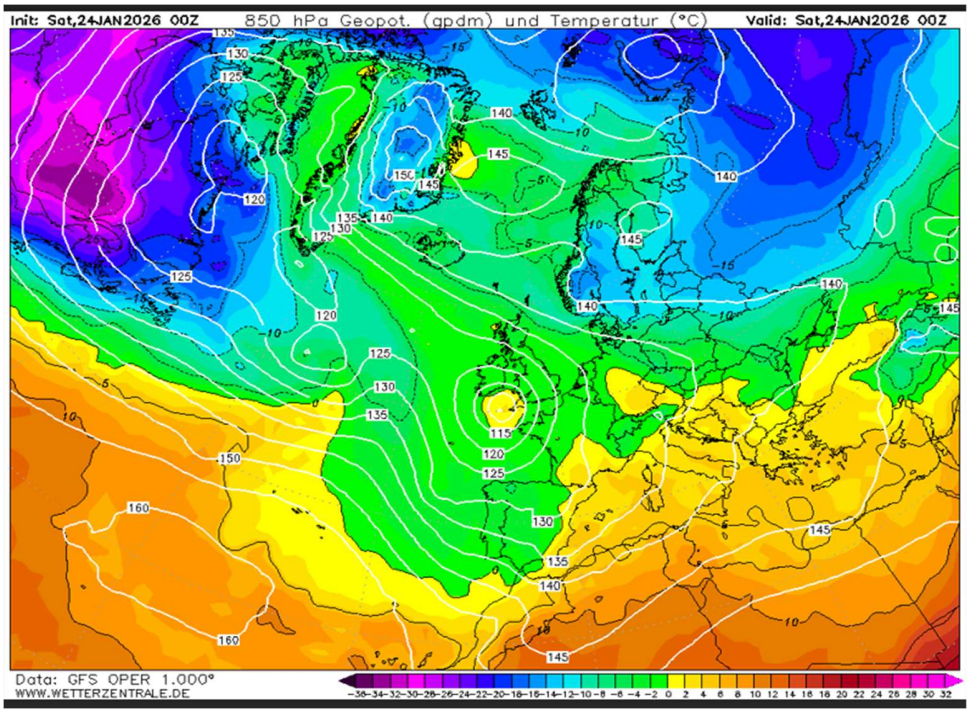
a) As can be seen from the synoptic charts (Pic. 1.1-1.4) and the attached radiosonde data (Pic. 1.5), a cyclonic system centered on the Gulf of Lion, with an active occlusion over the middle to upper Adriatic basin and associated with southwesterly currents at high altitude, will cause unsettled weather conditions, with widespread precipitation of moderate intensity in the early part of the day, with cumulative rainfall that could locally reach 50-70 mm in the 12 hours before noon. Precipitation will be snowy above 1500 m, with accumulations of fresh wet snow on the ground of up to 40-50 cm, with a high water equivalent (estimated at 120 kg/m^3 at 1500 m)..

a. 

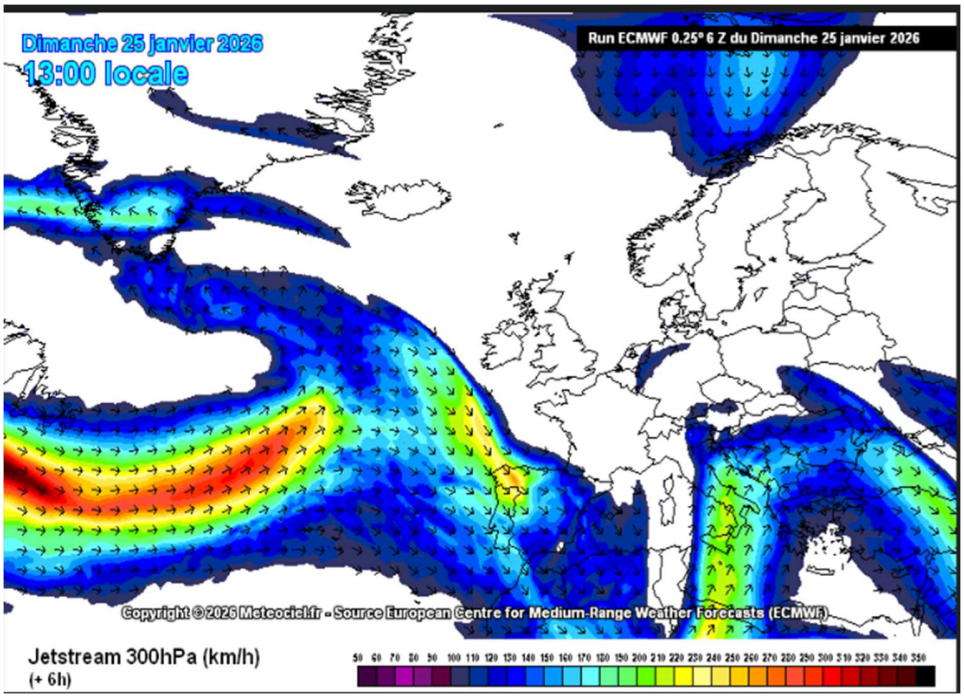
- Pic 1.1 - map of ground pressures and associated fronts



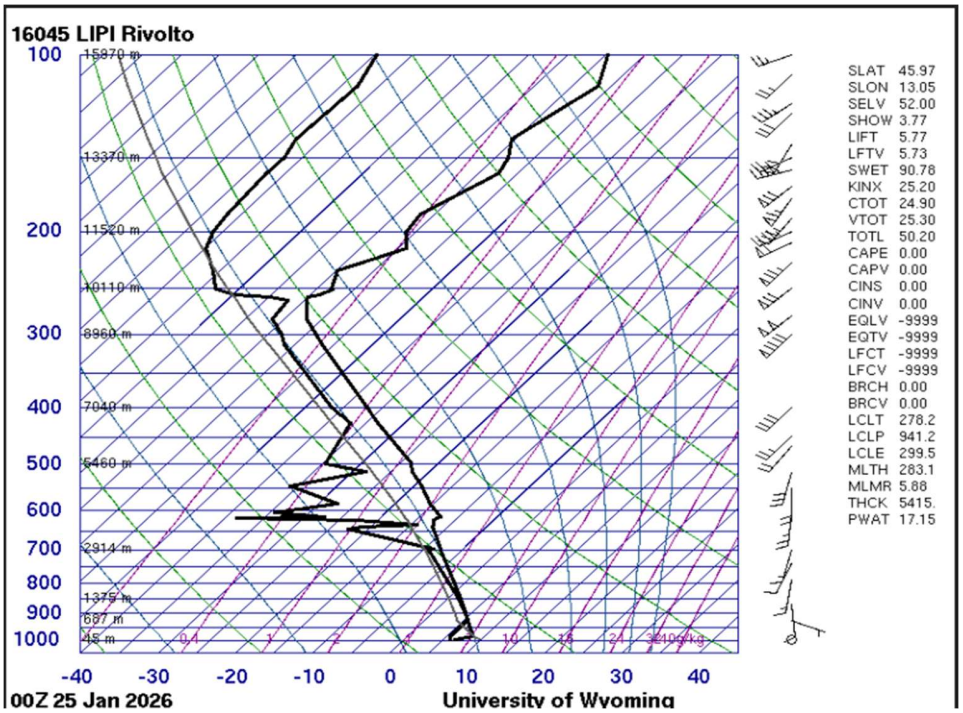
- Pic 1.2 – Map of grounds pressure (lines) and Geopotential 500 HPA (coloured)

- 

- Pic 1.3 – Map of grounds pressure (lines) and temperature 850 HPA (coloured)

- 

- Pic 1.4 – diagram of the flow at the isobaric level 300 hPa



- Pic. 1.5 - Radiosurvey relating to the launch station in Udine - Rivolto

Rainfall forecast

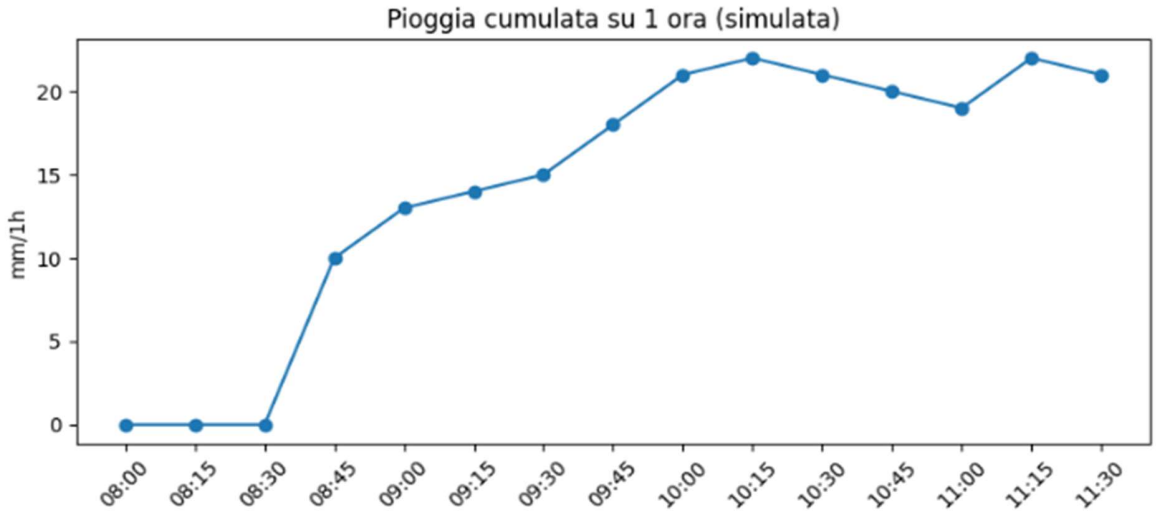
Simulated data for the rain sensor (rainfall accumulation every 15 minutes. To facilitate the exercise, it is assumed that rainfall is uniform across the study areas and has the same accumulated values (table 1.1):

Time	Rainfall accumulation (mm)
08:00 a.m	0
08:15 a.m	3
08:30 a.m	6
08:45 a.m	10
09:00 a.m	13
09:15 a.m	17
09:30 a.m	21
09:45 a.m	28
10:00 a.m	34
10:15 a.m	39
10:30 a.m	42
10:45 a.m	48
11:00 a.m	53
11:15 a.m	61

11:30 a.m	63

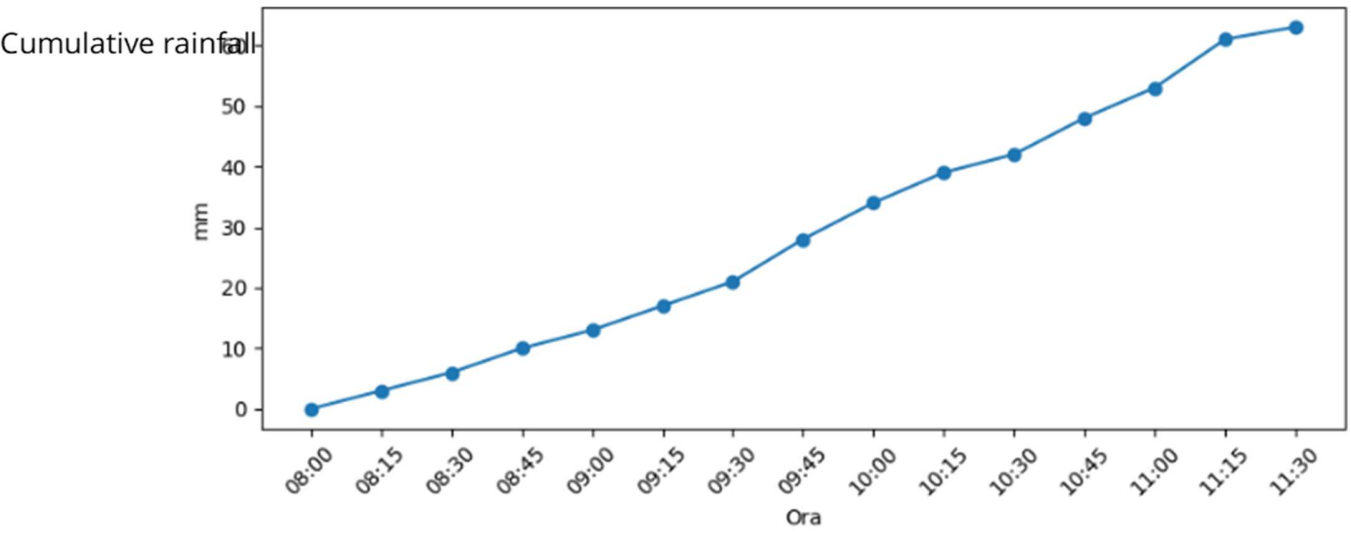
Table 1.1 - simulated rainfall every 15 minutes

Following the data included in the aforementioned table, here the diagram with the r



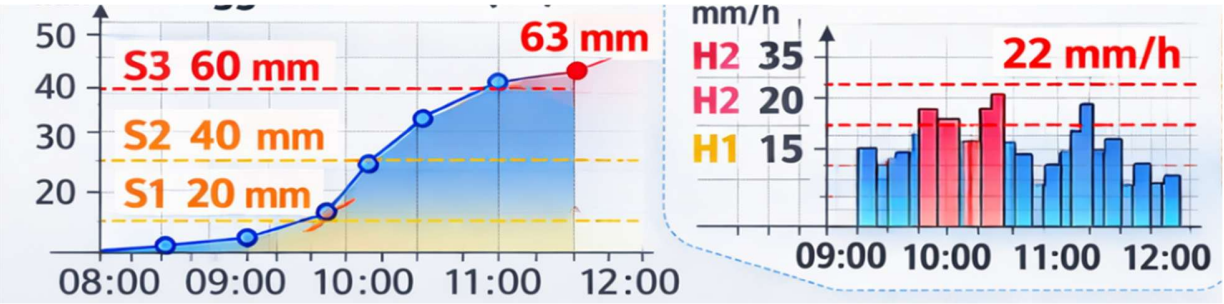
Rainfall test results with the amount of rainfall accumulation in one hour:

Rainfall summarized in 3 hours:



Alarm system

The system monitors every data and new entry data, and compares the rainfalls accumulations with the thresholds (table 1.2).



Time	Thresholds	Transcription
9.30 a.m.	S1	Pluviometer xx – threshold exceeded S1(20 mm) – 21 mm 2026.xx.xx – 9.30h LT
10.30 a.m.	S2	Pluviometer xx – threshold exceeded S2(40 mm) – 41 mm 2026.xx.xx – 10.30h LT
11.15 a.m.	S3	Pluviometer xx – threshold exceeded S1(60 mm) – 61 mm 2026.xx.xx - 11.15h LT

Table 1.2 - indication of the time at which precipitation exceeds the set thresholds

1.Findings per pilot sites

The following sections present in detail the individual outcomes and findings of the simulation tests conducted across the various territories of the Digital Plan project partners. These pilot simulations were carried out within the framework of the project's broader objective to validate and operationally assess the effectiveness of the developed technological solutions in real-world conditions.

Each local test involved the installation, configuration, and activation of IoT-based sensors specifically designed for alert monitoring and early warning purposes. These devices were strategically deployed according to the environmental features s.l., risk profiles, and operational requirements of the respective pilot areas. The simulations aimed to verify not only the technical performance of the sensors themselves, but also their capacity to transmit accurate and timely data to the central platform, ensuring seamless communication and interoperability with existing monitoring systems. The results outlined in the subsequent sections provide a comprehensive overview of how the installed sensor networks responded under simulated emergency conditions, including their reliability, responsiveness, and data quality. Particular attention was given to evaluating the effectiveness of alert generation mechanisms, real-time data visualization, and the integration of collected information into the decision-support processes of local authorities and civil protection stakeholders.



1.1 LP1 – GAL Molise

Time 6.00	**Starting of synoptic forecast**						
Time 7.00	**Activation Operational centre**						
Time 8.30	**Start of the precipitation**						
Time 9.00	**Sensor**	**Thresholds**	**Data**	**Alarm**	**Action**	**Attuator**	**Civil Protection Action**
	Pluviometer	0-20 mm	18mm	Yellow	Platform notification/Actuator API call/Email	None	Early warning for field monitoring personnel
Time 9.30	**Sensor**	**Thresholds**	**Data**	**Alarm**	**Action**	**Attuator**	**Civil Protection Action**
	Pluviometer	20mm	21mm	Yellow	Platform notification/Actuator API call/Email	None	Early warning for field monitoring - Monitor the evolution of phenomena
	Sensor	**Thresholds**	**Data**	**Alarm**	**Action**	**Attuator**	**Civil Protection Action**

Time 10.30	Pluviometer	40 mm	42mm	Orange	Platform notification/Actuator API call/Email	None	Monitoring critical points in the territory
Time 11.15	**Sensor**	**Thresholds**	**Data**	**Alarm**	**Action**	**Attuator**	**Civil Protection Action**
	Pluviometer	60mm	61mm	Red	Platform notification/Actuator API call/Email	None	Road closures - Monitoring critical points in the area
Time 12.00	**Sensor**	**Thresholds**	**Data**	**Alarm**	**Action**	**Attuator**	**Civil Protection Action**
	Pluviometer	60mm	61mm	Red	Platform notification/Actuator API call/Email	None	Monitoring critical points in the area
12.30	**End of the simulations (EXE)**						
12.30-13.30	**DEBRIEFING EXE**						

1.1.1 Description of the participants in the planned pilot in region/country and overview of participant statistics

As part of the DIGITAL PLAN project, which has enabled the creation of a digital decision-support platform integrated with a network of weather sensors, territorial monitoring systems and modules for the automatic analysis of alert thresholds, GAL Molise organised, with technical support from the Molise Region's Civil Protection Service, a Command Post Exercise (Command Post Exercise - CPX) for the municipalities of Busso and Montagano, which served as pilot municipalities.

The exercise was aimed at the mayors, in their capacity as local civil protection authorities, the heads of the municipal civil protection offices, members of the Municipal Operations Centres (COCs) and staff involved in forecasting, monitoring and emergency management activities.

The aim of the exercise was to test decision-making procedures and operational coordination in the context of two different emergency scenarios:

- severe weather events characterised by extreme rainfall, with consequent hydraulic and hydrogeological risks;
- and forest and wildland fires, with the potential for human-settled areas to be affected.

The exercise was conducted exclusively as a tabletop exercise, without the deployment of vehicles or personnel in the field, through the step-by-step simulation of events and the use of the DIGITAL PLAN platform as the main decision-support tool.

During the exercise, the following were simulated: the collection of data from the monitoring network, the automatic processing of risk indicators, the triggering of alert thresholds and the generation of operational notifications. Participants were required to interpret the available information, assess how the scenario was developing and take the decisions falling within their remit in accordance with their respective municipal civil protection plans.

The specific objectives of the exercise were:

- to assess the municipalities' ability to use the DIGITAL PLAN platform as a decision-support tool;
- to train mayors and Municipal Operations Centres (COCs) in the use of information derived from real-time monitoring;
- to test the procedures for activating and managing the Municipal Operations Centre;
- to verify the correct flow of communications between the local authority, the regional authority and the components of the Civil Protection System;
- to assess the timeliness of decisions following the triggering of alert thresholds;
- to consolidate the procedures for managing extreme rainfall events and forest fires as set out in municipal planning;

- to identify any organisational, procedural or technological issues, proposing corrective actions aimed at the continuous improvement of the system.

The exercise also provided an important opportunity for the operational validation of the DIGITAL PLAN platform, enabling the effectiveness of the integration between environmental monitoring, automatic threshold analysis, alert systems and decision-making processes to be verified, with the aim of strengthening the response capacity of local authorities and increasing the resilience of local areas to major natural hazards.

1.1.2 Outcomes and achieved results

a) Table for analysis of the outcomes

No.	Objectives and elements of the exercise	Strengths	Recommendations for improvements	Further notes
Exercises and actions in the pilot				
1	*Coordination of participants*	Good cooperation between the Mayor, Municipal Civil Protection Office and COC members. Clear assignment of roles and responsibilities.	Increase the involvement of external emergency agencies in future exercises.	Coordination improved throughout the exercise.

2	*The work of the HQ (Headquarters)*	Effective management of information and decision-making processes within the COC.	Further standardize operational procedures and documentation.	Good adherence to the Municipal Civil Protection Plan.
3	*Leading interventions*	Timely evaluation of simulated scenarios and activation of response measures.	Improve prioritization tools for simultaneous emergencies.	Decisions supported by DIGITAL PLAN data.
4	*Mobilizing operational strength*	Rapid activation of available municipal resources and volunteers.	Test mobilization procedures with additional external resources.	Resource availability was adequate for simulated events.
5	*Use of connections / communications*	Reliable communications among participants and Regional Operations Centre.	Introduce redundant communication channels for contingency situations.	Communication flow remained continuous.
6	*Managing information*	Efficient collection, sharing and validation of operational information.	Improve standardized reporting formats.	Situation awareness increased through the platform.
7	*Usage of GIS*	GIS layers effectively supported risk	Expand GIS datasets with additional local	GIS proved valuable for

		assessment and territorial analysis.	infrastructure and critical assets.	operational planning.
8	*Communications with media*	Public communication strategy correctly identified and discussed during simulation.	Develop pre-defined communication templates for emergency messaging.	No real media activation occurred.
9	*Use of specialized equipment*	Weather sensors and monitoring dashboards provided useful real-time information.	Increase operator training on advanced platform functions.	Equipment functioned correctly during simulation.
10	*Respecting protective measures*	Safety procedures and emergency protocols were correctly applied.	Include additional scenarios involving responder safety.	Fully compliant with exercise objectives.
Management				
1	*Preparing the exercise locations*	Facilities adequately prepared and equipped.	Improve signage and participant reception procedures.	Logistics supported smooth execution.
2	*Security during the exercise*	Exercise conducted safely without incidents.	Introduce a formal safety briefing before each session.	Safety officer role should be formalized.

3	*Dynamics of the exercises*	Progressive scenario development maintained participant engagement.	Include more unexpected injects to test adaptability.	Appropriate exercise pace.
4	*Implementation of detailed scenarios*	Scenarios realistically reproduced heavy rainfall and wildfire events.	Increase complexity by combining multiple simultaneous hazards.	Scenarios reflected local territorial risks.
5	*Exercise elaboration*	Exercise objectives were achieved and evaluation criteria clearly defined.	Expand evaluation indicators for decision-making performance.	Suitable for municipal-level training.
6	*Logistics of support*	Technical and organizational support was adequate.	Improve equipment availability for larger exercises.	No significant logistical issues identified.
7	*Preparing the groups for exercises*	Participants demonstrated good understanding of exercise objectives.	Provide preliminary refresher training on COC procedures.	Good level of engagement.
8	*Organizing the work*	Activities followed the planned schedule with effective coordination.	Allocate additional time for post-exercise debriefing.	Overall organization was satisfactory.
9	*Using the DIGITAL PLAN platform*	Platform successfully supported monitoring,	Continue improving dashboard usability and customization features.	Participants quickly became

		alerts and operational decision-making.		familiar with the system.
10	*Usefulness of the DIGITAL PLAN platform for stakeholders in the pilot project*	Platform significantly improved situational awareness and shared operational picture.	Extend platform access to additional institutional stakeholders.	High perceived operational value.
11	*The usefulness of the DIGITAL PLAN platform in stakeholder communication*	Facilitated timely exchange of information among all participants.	Integrate automated reporting and notification functions.	Improved coordination among institutions.
12	*Evaluate the overall usefulness of the DIGITAL PLAN platform*	The platform proved to be an effective Decision Support System (DSS), integrating sensor data, GIS information and alert thresholds to support municipal emergency management.	Continue development through integration with additional monitoring systems, Civil Protection databases and predictive models, while providing periodic user training.	Overall assessment: Excellent. The platform substantially enhances preparedness, decision-making and coordination during hydro-meteorological and wildfire emergencies.

b. Conclusions regarding the outcomes of the pilot deployment

The pilot project, which took place in the municipalities of Busso and Montagano, made it possible to test, in a realistic operational context, the effectiveness of the DIGITAL PLAN platform as a decision-support system for the management of civil protection emergencies linked to extreme weather events and wildfires. The exercise demonstrated how the integration of environmental monitoring, distributed sensors, automated analysis of alert thresholds and the cartographic representation of information provides valuable support for the decision-making processes of mayors and municipal operations centres.

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scenarios evolved, improving the timeliness of assessments and the quality of decisions taken by the municipal officials present during the simulation. The availability of up-to-date information in real time made it possible to reduce the time required to analyse the situation and to activate the procedures set out in the Municipal Civil Protection Plans.

The pilot also confirmed the importance of having a shared information framework amongst all stakeholders involved in the operational management of the emergency. The platform created served as a single point of access to operational information, facilitating coordination between local authorities, the Region and civil protection agencies, and improving the flow of information throughout all phases of the simulated event. The pilot achieved its set objectives, demonstrating that the use of advanced digital tools can contribute significantly to increasing the resilience of local authorities and strengthening the response capacity of the civil protection system.

1.1.3. Lessons-learnt and critical issues addressed

a. Use of the DIGITAL PLAN Platform during the pilot and lessons learnt

The exercise demonstrated that the DIGITAL PLAN platform is an effective Decision Support System for emergency management at municipal level. The integration of



meteorological data, monitoring sensors, analysis of the trigger thresholds for the phenomena under consideration, and the application of GIS systems enabled decision-makers to have a comprehensive and continuously updated view of the operational scenario.

One of the most highly appreciated aspects was the use of intuitive dashboards, which enabled even staff with limited experience in using geographic information systems to quickly interpret risk indicators and their developments. This reduced the time needed to understand the situation and identify the most appropriate operational measures

The pilot also demonstrated that the availability of automatic alerts triggered when warning thresholds are exceeded is a key element in supporting decision-making processes, enabling local authorities to proactively initiate the operational procedures set out in civil protection plans. Among the key lessons learnt is the need to complement technological innovation with in-depth training for operators, including regular thematic updates and relevant exercises that enable them to consolidate their skills and make full use of the platform's potential.

b. Critical issues encountered during the pilot deployment

The minor issues that arose during the pilot – which, incidentally, stemmed from a wholly experimental exercise – did not compromise the smooth running of the exercise, but provided useful insights for the system's further development. In particular, the main observations concerned the need to simplify certain features of the user interface and to make it even easier to access the most relevant information during decision-making phases.

It was also highlighted that the number of information levels available within the GIS should be expanded to include further data on critical infrastructure, sensitive locations, staging areas and municipal resources, thereby further improving support for operational planning. From an organisational perspective, the pilot confirmed the importance of establishing standardised procedures for sharing information across different institutional levels, thereby avoiding duplication and ensuring greater standardisation of information flows. Finally, the need to schedule regular updates to spatial data and the platform's configuration was confirmed, to ensure that the information available always remains consistent with changes in the local area and with municipal planning.

i.Technical and functional performance of the DIGITAL PLAN PLATFORM during the pilots

Throughout all the exercise activities, the platform delivered high levels of reliability, ensuring service continuity and the availability of information without any significant interruptions. Data from the sensor network was acquired and displayed correctly, enabling constant monitoring of developments in the simulated scenario.

The GIS functionalities, the cartographic representation of events and the alert threshold visualisation systems satisfactorily supported territorial analysis activities, improving participants' situational awareness.

The notification and automatic alarm generation system also demonstrated a good level of reliability, enabling the rapid identification of changes in risk conditions and facilitating the timely activation of operational procedures. The overall performance confirms that the platform possesses an adequate level of technological maturity to be used as an operational tool to support emergency management, whilst leaving scope for future functional developments.

ii. Adjustments to operational modes



The exercise highlighted the need to integrate the use of the platform more fully into the day-to-day procedures of the Municipal Operations Centres, so that it becomes a tool used not only during emergencies but also in prevention and monitoring activities. It was also proposed to define standard operating procedures that clearly set out responsibilities relating to data consultation, information validation and the activation of the various operational phases triggered when risk thresholds are exceeded. Further progress relates to the provision of automated reports and customised dashboards for the various decision-making levels, enabling mayors, municipal technicians and regional bodies to quickly access the information falling within their respective remit. Finally, the need to increase the frequency of drills and training activities was highlighted, with a view to consolidating the integration between digital tools, municipal planning and decision-making processes.

Other interventions made to optimize the overall effectiveness of the system

During the pilot, numerous suggestions were gathered aimed at improving the platform, primarily concerning the optimization of the user interface, the simplification of navigation, and the introduction of new analytical features. Of particular interest was the possibility of integrating additional information sources, such as satellite data, high-resolution weather forecasts, drone imagery, and other environmental monitoring networks, thereby expanding the system's predictive capabilities.



The importance of strengthening interoperability with platforms already used by regional and national civil protection agencies was also highlighted, as this would facilitate the automatic exchange of information and reduce duplication of efforts. Overall, the proposed measures will further enhance the platform's operational effectiveness, making it an increasingly comprehensive tool to support emergency prevention, monitoring, and management.

1.1.4. Conclusions

The pilot project confirmed the effectiveness of the approach adopted by the DIGITAL PLAN project in promoting the digital transformation of civil protection activities through advanced monitoring, analysis, and decision-support tools.

The integration of data from sensors, automated analysis, GIS, and alert systems has been shown to significantly improve risk assessment capabilities and the quality of operational decisions. The experience gained in the municipalities of Busso and Montagano serves as a model that can be replicated in other local contexts characterized by similar risks, promoting greater consistency in procedures and a higher level of preparedness among local governments. The results obtained highlight how technology, when properly integrated with planning, training, and the organization of the civil protection system, is a key factor in increasing community resilience and reducing the impact of disasters. The DIGITAL PLAN project thus lays an excellent and innovative

foundation for the evolution of emergency management practices, moving toward decision-making processes that are increasingly timely, collaborative, and based on objective data, thereby contributing to the overall strengthening of public administrations' operational capabilities.

1.2 PP2 – AGRRA, Zadar County - Croatia

1.2.1. Description of the participants in the planned pilot in region/country and overview of participant statistics

The AGRRA pilot deployment was carried out on 25 August 2026 as a tabletop simulation aimed at testing the practical use of selected functionalities of the DIGITAL PLAN IoT and DSS platform for wildfire risk monitoring.

The Gračac pilot area was selected as the reference area for the exercise due to its relevance to wildfire risk and the availability of environmental monitoring data. The simulation focused on the use of sensor information, predefined threshold values and automated alerts to demonstrate how the platform can support the monitoring of potentially critical wildfire conditions.

The exercise brought together representatives with different roles relevant to the implementation and potential operational use of the DIGITAL PLAN platform. Participants included three AGRRA project staff members, two representatives of firefighters, civil protection expert, AGRRA external technical expert responsible for the selection and positioning of sensors and related technical aspects, and five mayors representing municipalities in the pilot area.

A total of 12 participants took part in the pilot deployment.

The composition of the group enabled the exercise to be assessed from technical, civil protection, local-government and operational firefighting perspectives. In addition to testing the platform itself, the exercise provided an opportunity to discuss the practical relevance of sensor-based information and automated alerts for local authorities and emergency-response stakeholders.

The main objectives of the pilot were:

- to test the functionality of the DIGITAL PLAN platform for wildfire risk monitoring;
- to verify the display and interpretation of sensor information from the Gračac pilot area;
- to test the platform response to predefined wildfire-risk thresholds;
- to verify the generation and distribution of automated alert notifications;
- to demonstrate the practical use of the platform to representatives of local authorities and firefighting services;



- to assess the usefulness of combining sensor data, GIS-based location information and automated alerts in a single digital environment; and
- to identify possible improvements for future operational use and further development of the platform.

Participant statistics

Category	Institution / role	No.
Project partner staff	AGRRA – project staff	3
Operational emergency-response sector	Firefighters	2
Civil Protection	Civil protection expert	1
Technical support	AGRRA external technical expert responsible for sensors and their positioning	1
Local authorities	Mayors of municipalities in the pilot area	5
Total		**12**

1.2.2. Outcomes and achieved results

Pilot Scenario – Wildfire Risk Monitoring

a. Analysis of outcomes

Table for the analysis of the outcomes

No.	Objectives and elements of the exercise	Strengths	Recommendations for improvements	Further notes
Exercises and actions in the pilot				



1	*Coordination of participants*	The exercise brought together AGRRA staff, civil protection expertise, firefighters, a technical sensor expert and representatives of local authorities.	Future exercises could involve additional operational and civil protection stakeholders.	The multidisciplinary composition enabled the pilot to be discussed from technical, administrative and operational perspectives.
2	*The work of the HQ (Headquarters)*	The exercise provided a common environment in which participants could monitor the platform and discuss the simulated situation.	Future exercises could introduce a more detailed simulated coordination and decision-making process following the activation of an alert.	No physical emergency headquarters was activated because the activity was conducted as a tabletop simulation.
3	*Leading interventions*	The exercise demonstrated how a critical sensor value can lead to automatic activation of a predefined alert level.	Further develop the connection between alert levels and specific civil protection or firefighting response procedures.	The test focused on the monitoring and alert-generation stage rather than physical intervention.
4	*Mobilizing operational strength*	Firefighters participating in the exercise provided	Future exercises could include a more detailed	No physical mobilisation of

		an operational perspective on the usefulness of sensor-based wildfire information.	simulation of the mobilisation and coordination of emergency resources.	firefighting resources was required during the tabletop exercise.
5	*Use of connections / communications*	The automated e-mail notification successfully distributed the generated alert to the designated participants.	Continue testing notification workflows and consider additional communication channels for future operational scenarios.	The successful receipt of the e-mail alert confirmed the functionality of the tested notification mechanism.
6	*Managing information*	Sensor information, geographical location and alert status were available through the same digital environment.	Further improve the presentation of historical sensor values and alert information to support more detailed analysis.	Centralised information management facilitated discussion between participants from different institutions.
7	*Usage of GIS*	The platform linked the sensor information to its geographical position in the Gračac pilot area, making it easier to	Continue expanding the GIS database with additional relevant risk, infrastructure and civil protection information.	GIS visualisation provided a direct spatial context for the alert.

		identify the location of the simulated critical condition.		
8	*Communications with media*	Media communication was not required as part of the tabletop pilot exercise.	Future exercises could consider a simulated public-information component where appropriate.	Not applicable to the operational scope of the present exercise.
9	*Use of specialized equipment*	Weather sensors and monitoring dashboards provided useful real-time information and displayed data.	Provide operator training on advanced platform functions and sections.	Equipment have functioned properly during simulation.
10	*Respecting protective measures*	Safety procedures and protocols were applied.	Include additional scenarios involving responder safety.	Fully compliant with simulation objectives.
Management				
1	*Preparing the exercise locations*	The exercise environment provided suitable conditions for participant coordination and practical testing of the platform.	Future exercises could be conducted in a dedicated operational environment where available.	The pilot was conducted on 25 August 2026 as a tabletop simulation.

2	*Security during the exercise*	No safety or security issues occurred during the exercise.	—	The activity was conducted indoors and did not involve physical emergency intervention.
3	*Dynamics of the exercises*	The simulated increase in wildfire risk provided a clear sequence for demonstrating the platform's response.	Future scenarios could include additional changes in conditions or unexpected events.	The exercise focused on a critical wildfire-risk situation in the Gračac area.
4	*Implementation of detailed scenarios*	The scenario incorporated predefined environmental thresholds and a critical temperature value to test the alert mechanism.	Future exercises could combine temperature, relative humidity, wind and other parameters in more complex scenarios.	The final simulated value was 39.0°C / 17% RH.
5	*Exercise elaboration*	The scenario and threshold values were prepared in advance, allowing the platform functionality to be tested in a controlled manner.	Thresholds should continue to be reviewed and refined using data collected from the pilot monitoring network.	The exercise combined technical testing with discussion of practical use by stakeholders.

6	*Logistics of support*	The required technical equipment, platform access and participant arrangements were available for the exercise.	—	The exercise was completed without logistical difficulties.
7	*Preparing the groups for exercises*	Participants were introduced to the purpose of the exercise, the wildfire-risk scenario and the relevant platform functions before the practical test.	Future exercises could assign more detailed individual operational roles in advance.	Different participant profiles enabled discussion from technical, operational and local-government perspectives.
8	*Organizing the work*	AGRRA coordinated the exercise and ensured the participation of technical, civil protection, firefighting and local-government representatives.	Future exercises could further formalise roles and responsibilities within the simulated response chain.	A total of 12 participants took part in the pilot deployment.
9	*Using the DIGITAL PLAN platform*	The platform successfully displayed the Gračac sensor, processed the simulated critical value	Continue testing the platform with additional sensor parameters and more complex	The 39.0°C value was clearly visible on the platform and the alert

		and generated the Red Alert.	combinations of threshold conditions.	was successfully activated.
10	*Usefulness of the DIGITAL PLAN platform for stakeholders in the pilot project*	The platform provided a common digital environment for viewing sensor information, identifying the location of the monitored condition and receiving alerts.	Further define how alerts should be interpreted and followed up by different stakeholder groups.	The participation of mayors, firefighters and civil protection expertise supported discussion of the platform's practical relevance.
11	*The usefulness of the DIGITAL PLAN platform in stakeholder communication*	Automated e-mail alerts enabled the generated warning to be distributed directly to the designated participants.	Further develop alert distribution procedures and define clear escalation and communication pathways.	All participants included in the alert workflow received the e-mail notification during the exercise.
12	*Evaluate the overall usefulness of the DIGITAL PLAN platform*	The exercise demonstrated the practical value of combining sensor monitoring, GIS information, threshold-based alerts and automated notifications.	Continue testing the system under different wildfire-risk conditions and with a broader set of environmental and operational data.	The pilot successfully demonstrated the tested workflow from sensor value to alert generation and notification.

b. Conclusions regarding the outcomes of the pilot deployment

The AGRRA pilot deployment, carried out on 25 August 2026, successfully demonstrated selected functionalities of the DIGITAL PLAN IoT and DSS platform in the context of simulated wildfire-risk monitoring in the Gračac pilot area.

The tabletop exercise brought together 12 participants, including AGRRA project staff, firefighters, a civil protection expert, an external technical expert responsible for sensor-related aspects and five mayors representing municipalities in the pilot area. This composition enabled the platform to be assessed from technical, operational and local-government perspectives.

During the practical test, synthetic environmental data were used to reproduce critical wildfire-risk conditions. The Gračac sensor was used as the reference monitoring point and a simulated temperature value of 39.0°C was introduced. The value exceeded the predefined threshold for the highest risk level and resulted in the activation and visualisation of a Red Alert on the DIGITAL PLAN platform. The exercise also successfully tested the notification mechanism. The generated alert was distributed by e-mail and all



participants included in the notification workflow received the alert, confirming the functioning of the tested communication mechanism.

The pilot demonstrated the complete tested workflow from sensor information and threshold comparison to alert generation, GIS-based visualisation and automated notification. It also provided an opportunity for local authorities, firefighters and civil protection stakeholders to discuss how such information could potentially support wildfire-risk monitoring, preparedness and coordination.

Overall, the exercise confirmed the practical potential of the DIGITAL PLAN platform to bring together environmental sensor information, geographical context, predefined risk thresholds and automated alerts within a single digital environment.

1.2.3. Lessons-learnt and critical issues addressed

a. Use of the DIGITAL PLAN PLATFORM during the pilot and lessons learnt

The DIGITAL PLAN platform was used as the main digital environment during the AGRRA pilot exercise. Participants followed the sensor information associated with the Gračac pilot area and observed the platform response when a critical simulated temperature value was introduced.

The practical test confirmed that the platform can connect sensor information with predefined thresholds and generate an appropriate alert when a critical value is reached.

Several key lessons were identified:

- Automated alerts provide an important link between monitoring and response. The successful generation of the Red Alert and distribution of the corresponding e-mail notification demonstrated how sensor information can be transformed into an actionable warning for designated stakeholders.
- GIS visualisation adds geographical context to sensor information. Displaying the Gračac sensor at its geographical location enabled participants to immediately associate the critical value with the relevant pilot area.

- Stakeholder involvement improves the practical assessment of the platform. The participation of firefighters, civil protection expertise, local authorities, AGRRA staff and technical support allowed the platform to be considered from different perspectives.
- Local thresholds require continued assessment. The predefined values used in the simulation provide a basis for testing, but continued collection and analysis of local environmental data will be important for further refining thresholds for operational use.
- Notification procedures should be clearly defined. The successful e-mail test confirmed the technical functionality of the notification mechanism, while the exercise also highlighted the need to define responsibilities for receiving, interpreting and escalating alerts.
- Further scenarios can increase the operational value of the platform. Future exercises should test combinations of temperature, relative humidity, wind and other relevant parameters, as well as different wildfire-risk situations

The exercise therefore demonstrated that the DIGITAL PLAN platform can provide a useful connection between IoT-based monitoring and civil protection activities, while further operational procedures and locally adapted thresholds can strengthen its future application.

b. Critical issues encountered during the pilot deployment

No major technical or functional problems affecting the implementation of the pilot exercise were identified. The sensor information was successfully displayed on the platform, the critical simulated temperature value of 39.0°C was processed, the Red Alert was activated and the corresponding automated e-mail

i. Technical and functional performance of the DIGITAL PLAN PLATFORM during the pilots

The DIGITAL PLAN platform successfully processed and displayed the simulated sensor information from the Gračac pilot area.

The critical value of 39.0°C exceeded the predefined threshold for the Red Alert level and resulted in the corresponding alert being displayed on the platform. The alert was also distributed through the configured e-mail notification mechanism, with the designated participants successfully receiving the notification.

The test therefore confirmed the functionality of the main elements assessed during the exercise: sensor data visualisation, threshold-based alert generation, geographical representation and automated notification.

ii. Adjustments to operational modes

The pilot did not require any major changes to the operational mode of the DIGITAL PLAN platform.

Further testing should examine how different combinations of environmental parameters can influence the operational status of the system.

Other interventions made to optimize the overall effectiveness of the system

No corrective technical interventions were required during the pilot deployment.

The exercise nevertheless provided useful input for future optimisation. In particular, continued collection of local sensor data, refinement of wildfire-risk thresholds, integration of additional environmental parameters and further development of GIS information could improve the usefulness of the system

1.2.4. Conclusions

The AGRRA pilot deployment carried out on 25 August 2026 successfully demonstrated the practical use of selected DIGITAL PLAN IoT and DSS platform functionalities for simulated wildfire-risk monitoring in the Gračac pilot area.

The tabletop simulation brought together 12 participants representing AGRRA, firefighting services, civil protection, technical expertise and local authorities. This combination provided an appropriate setting for testing the platform while also discussing its potential relevance for local risk monitoring and emergency preparedness.

During the exercise, a synthetic critical sensor value of 39.0°C was introduced for the Gračac monitoring point. The value exceeded the predefined threshold and triggered the Red Alert within the DIGITAL PLAN platform. The alert was visually displayed together with the geographical location of the sensor and the corresponding temperature value.

The notification mechanism was also successfully tested. The generated alert was distributed by e-mail and received by the designated participants, confirming the functioning of the tested alert communication workflow.

The pilot demonstrated how sensor information, predefined thresholds, GIS-based visualisation and automated notifications can be combined within one digital

environment. The participation of firefighters, civil protection expertise and mayors also provided an opportunity to discuss how such information could support local authorities and emergency-response stakeholders in monitoring potentially critical wildfire conditions.

Overall, the AGRRA pilot achieved its intended objectives and provided a practical demonstration of the DIGITAL PLAN platform's potential to support environmental monitoring, wildfire-risk assessment, information sharing and civil protection preparedness.

1.3 PP3 – Parco Nazionale della Maiella

The pilot deployment of Maiella National Park (PP3) was carried out on 30 July 2026 at the Abbazia di Santo Spirito al Morrone – Sala Ciampa, Sulmona (AQ), immediately following the capacity building session held under activity A2.4. Holding the two activities on the same day and at the same venue allowed the participants to move directly from platform training to the operational testing of the system.

1.3.1. Description of the participants in the planned pilot in region/country and overview of participant statistics

The pilot deployment involved 14 participants. The composition of the group was designed to bring together, in the same room, the technical body that operates the monitoring network (Maiella National Park), the external civil protection expertise that designed the exercise, and both the political and the technical level of the three pilot municipalities - that is, the authorities that in a real event would have to declare the operational phases of the municipal emergency plan and act upon them.

Category	Institution / role	No.

Project partner staff	Maiella National Park (PP3) – technical and scientific staff	6
External technical staff	Maiella National Park (PP3) – contracted technicians	2
External expert	Civil protection expert, coordinator of the exercise	1
Local authority – political level	Municipality of Caramanico Terme – Mayor	1
Local authority – political level	Municipality of Pratola Peligna – Deputy Mayor	1
Local authority – technical level	Municipality of Caramanico Terme – Technical Office, Sector IV	1
Local authority – technical level	Municipality of Pratola Peligna – Technical Office, Sector IV	1
Local authority – technical level	Municipality of Lama dei Peligni – Technical Office, Sector IV	1
Total		14

Participant statistics

- 14 participants in total, well above the minimum of 5 foreseen by the project for this type of activity.
- 9 participants (64%) from the project partner, including contracted technicians and the external civil protection expert; 5 participants (36%) from the pilot municipalities.
- All three pilot municipalities of the Maiella area - Lama dei Peligni, Caramanico Terme and Pratola Peligna - were represented, giving 100% coverage of the pilot territory.
- Both institutional levels were present on the municipal side: 2 elected representatives (a Mayor and a Deputy Mayor) and 3 technical officers of the municipal technical offices responsible for civil protection.
- The exercise was attended in full by the same participants who had taken part in the capacity building session held earlier the same day, ensuring continuity between training and operational testing.

The common project scenario - a widespread meteorological event with moderate to heavy rainfall and thresholds set at 20, 40 and 60 mm over three hours - was adapted to the risk profile of the Maiella pilot area. The analysis of the Civil Protection Plans of the three pilot municipalities (Lama dei Peligni, Caramanico Terme and Pratola Peligna) had already identified wildfire and avalanche as the two prevailing local risks. Two dedicated exercises were therefore designed and run in sequence on the same day, keeping the

methodological structure of the common scenario - forecast, threshold escalation, automatic alarm generation, civil protection response - but applying it to the hazards that are actually relevant for the pilot territory.

Lama dei Peligni was used as the reference pilot municipality for the civil protection framing of both exercises. The applicable alerting framework is summarised below.

Criticality	Alert zone / reference authority
Weather, hydrogeological, hydraulic, hydrogeological for thunderstorms	ABRU D1
Snow and ice, low-altitude snowfall, frost, heatwaves, fog, wind	ABRU D1
Wildfire and interface wildfire	Province of Chieti
Avalanche	Maiella sector (Meteomont)

The alert chain applied is the one foreseen by the national civil protection system: declaration of expected criticality levels by the Regions and Functional Centres, declaration of alert levels (yellow, orange, red) by the Region and the Regional Operations

Room, and consequent activation of the operational phases (attention, pre-alert, alert) set out in the municipal emergency plan.

Sensor network used

The exercises used the project monitoring stations installed in the three pilot municipalities. During extreme events the stations acquire data at a standard interval of five minutes. The parameters measured across the network are: rainfall, air temperature, relative humidity, atmospheric pressure, wind speed and direction, snow depth, soil moisture and water level.

Exercise 1 – Adverse weather event: wildfire

Synoptic situation. A levelled surface pressure field, associated with a subtropical–continental anticyclonic ridge at mid-tropospheric levels, produced conditions of high atmospheric stability with extremely hot and dry weather. The 12:00 radiosounding of Pratica di Mare showed a marked separation between the real temperature curve and the saturation curve, confirming decidedly low relative humidity values (31% at ground level). The regional wildfire (AIB) bulletin was used as the institutional forecast reference.

Alert thresholds applied

Parameter	Threshold	Unit	Level
Relative humidity	60	% previous night	Low
Relative humidity	50	% previous night	Medium
Relative humidity	30	% previous night	High
Wind	27–40	knots	Low
Wind	41–56	knots	Medium
Wind	> 56	knots	High
Temperature	25–30	°C	Low
Temperature	31–33	°C	Medium
Temperature	> 34	°C	High

Exercise timeline – test of 30 July 2026, start 10:00 LT

Time	Parameter	Injected value	Level	Civil protection action

Start	Relative humidity	30% previous night	High	Attention phase – field monitoring personnel alerted
+30'	Temperature	32 °C	Medium	Monitoring of critical points; verification of AIB readiness
+30'	Wind	41–56 knots	Medium	Monitoring of critical points
+45'	Temperature	36 °C	High	Pre-alert phase – activation of the municipal operational structure
+45'	Wind	> 56 knots	High	Pre-alert phase – interface areas placed under surveillance

Analysis of results – wildfire



Type	Sent	Received	Result
Messaging	Yes	Yes	Positive – immediate
Alarms	Yes	Yes	Positive – immediate
Actuators	Not envisaged	n/a	Not applicable – no actuators connected

Exercise 2 – Adverse weather event: avalanche

Synoptic situation. The situation over the Adriatic area was dominated by an intense outbreak of Siberian cold air associated with a cyclogenesis over the central-southern Mediterranean, producing glacial conditions and widespread snowfall down to lowland and coastal levels.

The exercise used the Abruzzo Region weather forecast bulletin for 2-3 April 2026, the avalanche criticality bulletin of 3 April 2026 and the avalanche criticality warning no. 65 of 5 April 2026 as institutional forecast references.

Predictive thresholds applied – hourly increments of snow depth (Hs)

12H	24H	48H	Unit	Level
< 9	< 12	< 30	cm/h	None
10–18	13–30	31–50	cm/h	Low
19–50	31–60	51–65	cm/h	Medium
> 51	> 61	> 71	cm/h	High

Exercise timeline – test of 30 July 2026, start 11:00 LT

12H	24H	Unit	Level	Civil protection action
5	7	cm/h	Low	Ordinary monitoring; no operational phase activated
20	25	cm/h	Medium	Attention phase – monitoring of access

				roads and exposed settlements
60	90	cm/h	High	Pre-alert phase – road closures and surveillance of avalanche paths

Analysis of results – avalanche

Type	Sent	Received	Result
Map update	Yes	Yes	Positive – immediate
Email notification	Not configured	n/a	Not applicable – channel not yet configured

Operational command structure

Role	Name	Organisation
Coordinator EXE	Antonio Cardillo	External civil protection expert contracted by Maiella National Park
Technical support EXE	Ludovico Frate	Maiella National Park (PP3)
Technical support EXE	Valter Di Cecco	Maiella National Park (PP3)
Technical support EXE	Luciano Di Martino	Maiella National Park (PP3) – Director
Remote technical support	SensorID technical staff	SensorID – sensor supplier, connected remotely for data injection
Observer EXE	Technical officer, Sector IV	Municipality of Caramanico Terme
Observer EXE	Technical officer, Sector IV	Municipality of Pratola Peligna
Observer EXE	Technical officer, Sector IV	Municipality of Lama dei Peligni

Evaluator EXE	Mayor	Municipality of Caramanico Terme
Evaluator EXE	Deputy Mayor	Municipality of Pratola Peligna
Evaluator EXE	Technical staff	Maiella National Park (PP3)

1.3.2. Outcomes and achieved results

a. Analysis of outcomes

No.	Objectives and elements of the exercise	Strengths	Recommendations for improvements	Further notes
Exercises and actions in the pilot				
1.	*Coordination of participants*	A single coordinator with a defined mandate; roles assigned before the start; all participants in one room with a	Extend the exercise to the regional civil protection service and to the provincial fire brigade.	The sequence of two scenarios kept the group engaged throughout.

		shared view of the platform.		
2.	*The work of the HQ (headquarters)*	The exercise room operated as a simulated municipal operations centre (COC); the DSS platform was projected in real time so that all participants shared the same operational picture.	Introduce a written COC event log to be filled in during the exercise.	The HQ function was simulated; no municipal COC was physically activated.
3.	*Leading interventions*	Decision points were explicitly tied to threshold crossings; the escalation from Medium to High level was declared and discussed.	Map each alert level onto the corresponding operational phase of each municipal emergency plan.	—

4.	*Mobilizing operational strength*	Participants identified the resources their plans foresee at each operational phase.	A field exercise with actual mobilisation of volunteer civil protection teams.	Not applicable in a table-top format.
5.	*Use of connections / comms*	The remote connection with the sensor supplier's technical staff worked without interruption for the whole duration of both exercises.	Configure and test the notification channels (email and, as a redundant option, SMS or instant messaging) before operational use.	—
6.	*Managing info*	All alarm data were available simultaneously on the platform, with history and timestamps.	Add an export function to generate a post-event report directly from the alarm history.	—
7.	*Usage of GIS*	The public map updated in real	Overlay the digitalised	The digitalised plans are already

		time, displaying coloured labels at the exact position of each sensor.	municipal civil protection plans (emergency areas, exposed elements, hazard layers) on the alarm map.	available from activities A1.1 and A1.2.
8.	*Communications with media*	Not included in the exercise design.	Add a press and public information module to future exercises.	—
9.	*Use of specialized equipment*	The project IoT stations were used, with a five-minute sampling interval: rain gauge, thermometer, hygrometer, barometer, anemometer, snow gauge, soil moisture and	Complete the installation of the remaining stations to obtain full coverage of the three slopes.	Four stations were operational at the time of the exercise; eight were under installation.



		water level sensors.		
10.	*Respecting protective measures*	No operational risk exposure; the exercise was conducted indoors.	—	Not applicable to a table-top exercise.
Management				
1.	*Preparing the exercise locations*	Abbazia di Santo Spirito al Morrone – Sala Ciampa: conference room equipped with projection and stable connectivity, suitable for a table-top exercise.	—	Same venue as the capacity building session, which allowed direct continuity between the two activities.
2.	*Security during the exercise*	No safety issues arose.	—	Not applicable to a table-top exercise.
3.	*Dynamics of the exercises*	Two scenarios run in sequence	Introduce an unannounced	—

		(wildfire at 10:00 LT, avalanche at 11:00 LT); threshold crossings at +30' and +45' produced a realistic escalation within a compact timeframe.	event to test the reaction of participants to unforeseen developments.	
4.	*Implementation of detailed scenarios*	Both scenarios were built on real synoptic situations and on official regional bulletins rather than on abstract data.	—	Wildfire scenario based on the Pratica di Mare radiosounding and the regional AIB bulletin; avalanche scenario based on Abruzzo Region and Meteomont bulletins.
5.	*Exercise elaboration*	Scenario, thresholds and injection timeline	Circulate the scenario documentation to	—

		were prepared in advance by the external civil protection expert and presented to participants at the start.	the municipalities a few days in advance.	
6.	*Logistics of support*	Adequate: room, equipment and remote technical support were all available for the whole duration.	—	—
7.	*Preparing the groups for exercises*	The exercise followed the A2.4 capacity building session held on the same day, so all participants had just been trained on the platform.	—	Sequencing training and exercise on the same day proved effective and is recommended for replication.
8.	*Organizing the work*	Clear command structure:	Distribute a written role	—

		coordinator, technical support, observers and evaluators.	assignment sheet at the start of the exercise.	
9.	*Using the Digital Plan platform*	The alarms injected remotely by the sensor supplier's technical staff were immediately reflected on the platform. Thresholds and map labels behaved exactly as configured.	—	The simulation was fully successful, with no discrepancy between injected data and platform response.
10.	*Usefulness of the Digital Plan platform for stakeholders in the pilot project*	Municipal technical officers could see the direct link between sensor readings and the operational phases of their	Extend platform accounts to all municipal civil protection officers of the pilot municipalities.	—

		own emergency plans.		
11.	*The usefulness of the Digital Plan platform in stakeholder communication*	The platform provided a shared, real-time operational picture between the Park and the municipalities, removing the need for verbal relay of sensor data.	Define a formal escalation protocol specifying who is notified at each alert level.	—
12.	*Evaluate the overall usefulness of the Digital Plan platform*	Overall usefulness confirmed by all participants: the system delivered the expected alerting chain from sensor to municipal decision-maker.	Complete the monitoring network and consolidate the thresholds on the basis of local historical series.	—

b. Conclusions regarding the outcomes of the pilot deployment

The pilot deployment achieved all the objectives set for the exercise. The IoT sensors responded correctly, the temporal escalation of the monitored parameters was reproduced as designed, the pre-set thresholds were exceeded at the expected times, the alarms were generated automatically and without delay, and the graphical outputs and event records were produced on the platform as foreseen.

The alarms injected by the sensor supplier's technical staff, connected remotely, found immediate correspondence on the Digital Plan platform: no latency, loss of data or inconsistency between the injected values and those displayed was observed. The map labels appeared at the correct sensor positions with the correct colour coding. On this basis the simulation can be considered fully successful.

Beyond the technical outcome, the exercise produced a second and equally relevant result: it placed the elected and technical representatives of the three pilot municipalities in the position of reading sensor data as civil protection decisions. Each threshold crossing was discussed in terms of which operational phase of the municipal emergency

plan it would trigger, which is precisely the transition that the Digital Plan project aims to enable.

1.3.3. Lessons-learnt and critical issues addressed

a. Use of the DIGITAL PLAN PLATFORM during the pilot and lessons learnt

The platform was used throughout the exercise as the single operational environment: thresholds had been configured in advance for each monitored parameter, the public map was projected in the room, and the alarm history was consulted after each escalation step. The participants followed the full chain - sensor reading, threshold evaluation, alarm generation and map label - in real time. The main lessons learnt are the following:

- Configuring thresholds on parameters that municipalities already use in their own planning (relative humidity and wind for wildfire, snow depth increments for avalanche) makes the alarm immediately intelligible to the end user, and considerably shortens the interpretation time.
- Running the exercise immediately after the training session is highly effective: participants applied on the same day what they had just learnt, and the questions

raised during the exercise were markedly more operational than those raised during the training.

- The value of the platform for the municipalities lies less in the raw measurement than in the explicit link between the alert level and the operational phase of their emergency plan. This link should be made explicit within the platform itself.
- The presence of both the political and the technical level of the municipalities in the same room proved essential: the declaration of an operational phase is a political act, while its implementation is a technical one, and the exercise made this division of responsibility visible.
- Remote support from the sensor supplier proved to be a viable and economical operating model, which can be replicated for routine verification of the network without requiring on-site presence.

b. Critical issues encountered during the pilot deployment

i. Technical and functional performance of the DIGITAL PLAN PLATFORM during the pilots

No malfunction of the platform was recorded during either exercise. Alarm generation and map visualisation performed as configured, with response times perceived as immediate by the participants. The only limitation identified is structural rather than functional: at the time of the exercise the monitoring network was not yet complete, with



four stations operational and eight still under installation. The exercise therefore tested the alerting chain on a partial network, and a further verification will be required once the full network of twelve stations is in operation.

- The alarm map does not yet display the layers of the digitalised municipal civil protection plans, so the operator must consult two separate environments to relate an alarm to the emergency areas and exposed elements.
- The platform does not offer an export function capable of generating a post-event report directly from the alarm history, which would be useful both for internal debriefing and for reporting to the regional civil protection service.
- The email notification channel had not yet been configured at the time of the exercise. The alerting chain was therefore verified up to threshold evaluation, alarm generation and map visualisation; the delivery of notifications to external recipients will have to be tested in a dedicated verification once the mailing lists are set up.

ii. Adjustments to operational modes

- The common project scenario, based on cumulative rainfall thresholds, was replaced by two locally relevant scenarios - wildfire and avalanche - while retaining the methodological structure of the common exercise. This adjustment was made in order



to test the system against the risks actually addressed by the civil protection plans of the pilot municipalities.

- The exercise was conducted as a table-top exercise with remote data injection rather than as a field exercise. This allowed both scenarios to be run within a single session and made it possible to control precisely the timing of the threshold crossings.

- Thresholds were expressed in the same units and reference intervals used by the regional bulletins (percentage relative humidity of the previous night, knots, degrees Celsius, hourly increments of snow depth over 12 and 24 hours), so that the platform output can be compared directly with the institutional alerting products.

Other interventions made to optimize the overall effectiveness of the system

b) The civil protection framework of the reference pilot municipality was reconstructed and shared with all participants at the start of the exercise, including the alert zones, the competent authorities for each criticality type and the reading key of the regional bulletins.
c) The alarm notifications were verified and updated before the exercise, so that they were displayed directly.
d) The exercise was designed with a progressive escalation (Medium level at +30 minutes, High level at +45 minutes) in order to test not only the single threshold crossing but also



the behaviour of the system when several thresholds on the same sensor are exceeded in sequence.

1.3.4. Conclusions

The pilot deployment carried out by Maiella National Park on 30 July 2026 successfully validated the Digital Plan IoT and DSS system under simulated emergency conditions. Both exercises - wildfire and avalanche - produced the expected results: the thresholds were correctly evaluated, the alarms were automatically generated and displayed, and the map was updated in real time without any perceptible delay. No functional defect of the platform emerged.

The pilot deployment also confirmed the methodological choice made by the Park at the start of the project, namely to select the risk types on the basis of the civil protection plans of the pilot municipalities rather than on a generic hazard model. Testing the system on wildfire and avalanche - the two risks that actually characterise the Maiella territory - produced an exercise that the municipalities recognised as their own, and generated recommendations that are directly usable in the revision of their emergency plans.

Three actions are recommended in order to consolidate the results achieved. First, the completion of the monitoring network (currently under installation), so that the alerting chain can be verified over the full set of twelve stations and over all three slopes of the massif. Second, the integration of the digitalised civil protection plans into the alarm map, so that an alarm can be read directly against emergency areas and exposed elements. Third, the formalisation of an escalation protocol that associates each alert level with a defined operational phase and a defined set of recipients, to be adopted by the three pilot municipalities and proposed for replication to the other municipalities of the Maiella national Park.

On this basis, the pilot deployment of Maiella National Park is considered concluded with a fully positive outcome, and the tested configuration is regarded as ready for transfer to the Action Plan for Civil Protection Plans Digitization under activity A3.2.

1.4 PP5 City of Dubrovnik

PP5-CoD pilot deployment took place on 25 August 2026 at the Dubrovnik Development Agency - DURA, Branitelja Dubrovnika 15, Dubrovnik. The pilot deployment was conducted prior to the CP Seminar organized under Activity A3.4, which was held later the same day at the same venue. During the pilot deployment, participants had the opportunity to practically test the DIGITAL PLAN IoT platform and its functionalities. The subsequent CP Seminar then provided an opportunity to further present and discuss the DIGITAL PLAN Action Plan, IoT platform and pilot activities, linking the practical testing with the broader civil protection framework of the project.

1.4.1 Description of the participants in the planned pilot in region/country and overview of participant statistics

The pilot deployment in Dubrovnik involved 16 participants. The group was composed to bring together representatives of the City of Dubrovnik, responsible for the implementation of the pilot activities and the monitoring network, together with civil protection representatives, technical experts and relevant local stakeholders. This composition ensured the participation of actors who, in the event of a real wildfire emergency, would be involved in monitoring conditions, assessing the level of risk, coordinating response measures and implementing the operational procedures defined within the local civil protection framework.

Category	Institution / role	No.
Project partner staff	City of Dubrovnik (PP5) – technical staff	7
Project partner staff - Internal expert	Civil protection expert, coordinator of the exercise	1

Regional authority	Dubrovnik-neretva County – Head of the department	1
Local authority	Dubrovnik development agency	5
Regional coordinator	Regional development agency – DUNEA, Head of the department	1
Local authority	Public Fire Department Dubrovnik, Deputy	1
Total		16

Participants statistics

- 16 participants in total,
- 8 participants (50%) represented the City of Dubrovnik (PP5), including 7 technical staff members and 1 internal civil protection expert who coordinated the exercise.
- 5 participants (31%) represented the Dubrovnik Development Agency – DURA, ensuring the involvement of the local development and implementation level.
- The regional level was represented by Dubrovnik-Neretva County and the Regional Development Agency DUNEA, with one representative from each institution, providing a link between the pilot activities and the wider regional institutional framework.



- The Public Fire Department Dubrovnik was represented by its Deputy, ensuring the direct involvement of the operational emergency-response sector particularly relevant to the wildfire scenario tested during the pilot.
- Overall, the composition of the participant group ensured a multi-level and cross-sectoral approach, bringing together municipal technical staff, civil protection expertise, regional and local development institutions, and operational firefighting services. This provided an appropriate setting for testing the DIGITAL PLAN platform from both technical and operational perspectives.
- The participation of stakeholders with different institutional and operational responsibilities enabled the pilot exercise to assess not only the technical functioning of the platform, but also its potential role in information sharing, risk monitoring, alert interpretation and coordination between relevant authorities during wildfire-related events.

Scenario design and civil protection framework

The common project scenario was adapted to reflect the specific risk profile and environmental conditions of the Dubrovnik pilot area. Based on the analysis of the local Civil Protection Plan, wildfire was identified as one of the main risks relevant to the pilot territory. Therefore, a dedicated wildfire simulation was developed, while maintaining the methodological approach of the common project scenario: monitoring of

meteorological conditions, progressive threshold escalation, automatic alarm generation through the DIGITAL PLAN platform. This approach enabled the pilot to test the system under conditions directly relevant to the local context and the protected area of Velika and Mala Petka Forest Park.

Criticality	Alert zone / reference authority
Wildfire and interface wildfire	City of Dubrovnik, Velika and Mala Petka Forest Park.

The alert chain applied is the one foreseen by the national civil protection system: declaration of expected criticality levels by the Regions and Functional Centres, declaration of alert levels (yellow, orange, red) by the Region and the Regional Operations Room, and consequent activation of the operational phases (attention, pre-alert, alert) set out in the municipal emergency plan.

Sensor network used



The exercises used the project two monitoring stations installed in the pilot area. During extreme events the stations acquire data at a standard interval of five seconds. The parameters measured across the network are: rainfall, air temperature, relative humidity, atmospheric pressure, wind speed and direction.

Exercise 1 – adverse weather event: wildfire

The pilot scenario focused on high-temperature conditions in the Velika and Mala Petka Forest Park area. Elevated air temperatures were simulated to represent hot summer conditions associated with an increased wildfire risk. Temperature data from the meteorological stations installed within the pilot area were used to test the predefined thresholds and the corresponding alert generation within the DIGITAL PLAN platform. The pilot scenario focused on instantaneous temperature values recorded by the meteorological stations installed in the Velika and Mala Petka Forest Park. Each current temperature reading was compared directly with the predefined threshold values in the DIGITAL PLAN platform. When an instantaneous value exceeded the defined threshold, the system automatically generated the corresponding alert, allowing participants to verify the complete chain from sensor measurement and threshold comparison to alarm generation and visualization on the platform.



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Alert threshold applied

Temperature	25–30	°C	Low
Temperature	31–33	°C	Medium
Temperature	34 –1000	°C	High

Exercise timeline – test of 25 August 2026, start 06:00 – 14:00 – local time

Time	Sensor	Thresholds	Data	Alarm	Action	Actuator	Civil Protection Action
6.00	Starting of synoptic forecast						Forecast indicates increased fire danger due to heatwave and dry conditions
7.00	Activation Operational Centre						Increased monitoring readiness
8.00	Sensor activation	Temperature + Relative Air Humidity	28°C / 45% RH	Normal	Data monitoring	None	Regular monitoring of fire risk indicators
9.00	Sensor	Temperature: >30°C / RH: <40%	31°C / 38% RH	Yellow	Platform notification / Actuator API call / Email	None	Early warning for field monitoring personnel; increased awareness in vulnerable areas
10.00	Sensor	Temperature: >33°C / RH: <30%	34°C / 28% RH	Orange	Platform notification / Actuator API call / Email	None	Activation of enhanced monitoring; inspection of critical points and high-risk areas
11.00	Sensor	Temperature: >35°C / RH: <25%	36°C / 23% RH	Orange	Platform notification / Actuator API call / Email	None	Deployment readiness of Civil Protection units; monitoring of vegetation and fire-prone locations
12.00	Sensor	Temperature: >37°C / RH: <20%	38°C / 18% RH	Red	Platform notification / Actuator API call / Email	None	High fire danger alert; activation of emergency procedures; continuous monitoring of territory
13.30	Sensor	Temperature: >38°C / RH: <20%	39°C / 17% RH	Red	Platform notification / Actuator API call / Email	None	Possible restriction of activities in vulnerable areas; preparation for rapid intervention
14.00	End of simulation (EXE)						
14.00–15.00	DEBRIEFING EXE						Evaluation of platform response and

Analysis of the result – wildifire

Type	Sent	Received	Result
Messaging	Yes	Yes	Positive – immediate
Alarms	Yes	Yes	Positive – immediate
Actuators	Not envisaged	n/a	Not applicable – no actuators connected

Operational command structure

Role	Name	Organization
Coordinator EXE	Marko Miljanić	Civil protection expert in City of Dubrovnik
Technical support EXE	Mario Galić	City of Dubrovnik (PP5)
Technical support EXE	Kristina Bilić	City of Dubrovnik (PP5)
Technical support EXE	Tera Cvjetković	City of Dubrovnik (PP5) – Head of the department
Observer EXE	Technical officer	City of Dubrovnik (PP5)
Observer EXE	Technical officer	City of Dubrovnik (PP5)
Observer EXE	Technical officer	Dubrovnik development agency - DURA
Evaluator EXE	Head of department	Dubrovnik-neretva County

Evaluator EXE	Head of department	Regional development agency - DUNEA
Evaluator EXE	Deputy	Public Fire Department Dubrovnik

1.3.2 Outcomes and achieved results

a) analysis of the outcomes

No.	Objectives and elements of the exercise	Strengths	Recommendations for improvements	Further notes
Exercises and actions in the pilot				
1.	*Coordination of*	The exercise	In future exercises,	The multidisciplinary
2.	*The work of the HQ (headquarters)*	The exercise room functioned as a simulated coordination environment. The DIGITAL PLAN platform was presented and monitored during the exercise, providing participants with a common operational picture.	Future exercises could simulate a more detailed operational decision-making process based on generated alerts.	No operational headquarters was physically activated, as the activity was conducted as a simulation exercise.
3.	*Leading interventions*	The exercise demonstrated how changes in monitored temperature values can trigger predefined thresholds and generate corresponding alerts within the platform.	Further develop the link between individual alert levels and specific civil protection response procedures.	/

4.	*Mobilizing operational strength*	The participation of the Public Fire Department Dubrovnik provided an operational perspective on the usefulness of meteorological information in wildfire-risk situations.	Future pilots could include a field component involving operational emergency-response services.	Actual mobilisation of operational resources was not foreseen within this pilot exercise.
5.	*Use of connections / comms*	Participants were able to follow the information generated through the DIGITAL PLAN platform during the simulation.	Further test and develop automatic notification channels for communicating alerts to responsible stakeholders.	The pilot primarily focused on platform-based monitoring and alert generation.
6.	*Managing info*	Sensor information and corresponding alert levels were available through a single digital environment, facilitating the interpretation of monitored conditions.	Continue improving the presentation and accessibility of historical sensor and alarm information.	The exercise demonstrated the potential of centralised information management during wildfire-risk conditions.
7.	*Usage of GIS*	The platform provided a geographical representation of the		Geographical visualisation is particularly useful

		monitoring stations, allowing sensor information to be associated directly with the Velika and Mala Petka pilot area.		due to the specific location and characteristics of the Velika and Mala Petka Forest Park.
8.	*Communications with media*	Public and media communication was not part of the pilot exercise	Future exercises could include procedures for communicating warnings and relevant information to the public.	Not applicable to the scope of the current pilot deployment.
9.	*Use of specialized equipment*	The exercise used data associated with the two meteorological stations installed in the Velika and Mala Petka Forest Park. Temperature monitoring enabled the testing of predefined thresholds through instantaneous value comparison.	Continue collecting meteorological data to support future refinement of locally relevant thresholds and risk assessment.	The stations constitute the main physical monitoring component of the Dubrovnik pilot deployment.
10.	*Respecting protective measures*	The exercise was conducted indoors and	—	No field intervention was



		did not expose participants to operational or wildfire-related risks.		performed during the exercise.
Management				
1.	*Preparing the exercise locations*	Dubrovnik Development Agency - DURA provided an appropriate environment with the technical conditions required for the presentation and testing of the DIGITAL PLAN platform.	—	The pilot deployment was held on 25 August 2026 at DURA, Branitelja Dubrovnika 15, Dubrovnik. Same venue as the CP seminar session, which allowed direct continuity between the two activities.
2.	*Security during the exercise*	No safety or security issues occurred during the exercise	—	The activity was conducted indoors as a simulation exercise.
4.	*Implementation of detailed scenarios*	The scenario focused on conditions relevant to wildfire risk in the Velika and Mala Petka Forest Park and used predefined	Future scenarios could combine temperature with other relevant meteorological	Instantaneous temperature values were compared with

		temperature thresholds for testing the system response.	parameters such as relative humidity and wind conditions.	predefined thresholds.
5.	*Exercise elaboration*	The scenario and temperature thresholds were defined in advance, enabling a structured demonstration of threshold comparison and automatic alert generation.	Further refine thresholds using longer-term data collected from the pilot meteorological stations	The exercise retained the methodological structure of the common DIGITAL PLAN scenario while adapting it to local wildfire risk.
6.	*Logistics of support*	The venue, equipment and technical conditions were adequate for the entire exercise.	—	—
7.	*Preparing the groups for exercises*	Participants received an introduction to the purpose of the pilot, the wildfire scenario and the relevant DIGITAL PLAN platform functionalities before operational testing began.	—	The pilot deployment was followed by the CP Seminar later the same day, allowing the practical experience to be further discussed in the broader project context.

8.	*Organizing the work*	The participation of technical, civil protection, firefighting, local and regional representatives provided different perspectives during the exercise.	Assign more detailed operational roles to participants in future simulation exercises.	A total of 16 participants took part in the pilot deployment.
9.	*Using the Digital Plan platform*	The platform successfully demonstrated the comparison of instantaneous temperature readings with predefined thresholds and the corresponding generation and visualisation of alerts.	Continue testing the platform using different parameters and more complex combinations of threshold conditions.	The simulation was fully successful, with no discrepancy between injected data and platform response.
10.	*Usefulness of the Digital Plan platform for stakeholders in the pilot project*	The platform provides a common digital environment in which relevant stakeholders can access and interpret monitoring information and alerts.	Define clear procedures for the distribution and escalation of alerts among responsible institutions.	—
11.	*The usefulness of the Digital Plan platform in stakeholder communication*	The platform provides a common digital environment in which relevant stakeholders can	Define clear procedures for the distribution and escalation of alerts	—

		access and interpret monitoring information and alerts.	among responsible institutions.	
12.	*Evaluate the overall usefulness of the Digital Plan platform*	The pilot confirmed the usefulness of combining IoT meteorological monitoring, predefined thresholds and digital alert visualisation for monitoring wildfire-related conditions in the Dubrovnik pilot area.	Continue data collection, refine locally relevant thresholds and expand future exercises to include additional parameters and operational response procedures.	The pilot provided a successful practical demonstration of the DIGITAL PLAN approach in the Velika and Mala Petka Forest Park

b. Conclusion regarding the outcomes of the Pilot deployments

The pilot deployment successfully achieved its main objectives and demonstrated the practical application of the DIGITAL PLAN IoT and DSS platform in the Dubrovnik pilot area. The exercise confirmed that meteorological data from the monitoring system can be used to support the identification and assessment of conditions associated with increased wildfire risk in the Velika and Mala Petka Forest Park.

During the exercise, instantaneous temperature values were compared with predefined thresholds, allowing participants to follow the process from sensor measurement and threshold evaluation to the generation and visualisation of the corresponding alert within the DIGITAL PLAN platform. This demonstrated the potential of the system to transform real-time meteorological observations into information that can support civil protection monitoring and decision-making.

The pilot also confirmed the importance of bringing together different stakeholders involved in risk prevention and emergency response. The participation of representatives of the City of Dubrovnik, Dubrovnik-Neretva County, DURA, DUNEA and the Public Fire Department Dubrovnik provided technical, institutional and operational perspectives on the use of the platform.

Overall, the pilot deployment demonstrated the usefulness of combining IoT-based meteorological monitoring, predefined alert thresholds and GIS-based visualisation within a

single digital environment. The results provide a sound basis for further refinement of locally relevant thresholds, continued collection of meteorological data and future testing of additional parameters and more complex wildfire scenarios.

1.4.3 Lessons learnt and critical issues addressed

a. Use of the Digital Plan Platform during the pilot and lesson learnt

The DIGITAL PLAN platform was used during the pilot exercise as the main digital environment for monitoring sensor data, comparing measured values with predefined thresholds and visualising the corresponding alerts. The participants were able to follow the complete information flow from the meteorological stations installed in the Velika and Mala Petka Forest Park to the presentation of monitoring information within the platform.

The pilot provided several important lessons:

- Locally adapted thresholds are essential. Using temperature thresholds directly related to the wildfire scenario made the platform outputs easier for participants to understand and interpret in the context of the Dubrovnik pilot area.
- Real-time monitoring provides added value for wildfire risk management. The use of



instantaneous value comparison demonstrated how changes in meteorological conditions can be identified and communicated through the platform as soon as predefined thresholds are reached.

- GIS-based visualisation improves situational awareness. Displaying monitoring

  information in relation to the geographical location of the meteorological stations makes it easier to understand where potentially critical conditions are occurring.

- The involvement of different stakeholders is important for effective platform use.

  Bringing together municipal technical staff, civil protection expertise, firefighting representatives and regional and local institutions enabled the system to be assessed from different operational and institutional perspectives.

- Meteorological monitoring can support civil protection decision-making. The pilot

  demonstrated how raw sensor measurements can be transformed into structured alerts that are easier to interpret and can provide additional information to responsible authorities during periods of increased wildfire risk.

- Further testing and data collection will improve the system. Continued monitoring through the two meteorological stations will provide additional local data that can be used to refine thresholds and develop more advanced scenarios combining temperature with other meteorological parameters relevant to wildfire risk.



Overall, the pilot confirmed that the DIGITAL PLAN platform can provide a useful connection between IoT-based environmental monitoring and civil protection risk management, while also highlighting the importance of locally adapted thresholds, clear alert procedures and continued cooperation between technical and operational stakeholders.

b. Critical issue encountered during the pilot deployment

No major technical or functional issues affecting the implementation of the pilot exercise were identified. The platform enabled participants to follow the monitoring process and observe the comparison of instantaneous temperature values with predefined thresholds and the corresponding alert visualization. Nevertheless, the pilot identified several aspects that could be further improved:

- The temperature thresholds should be further refined based on a longer series of local meteorological data collected by the two stations installed in the Velika and Mala Petka Forest Park.
- Future testing should include a combination of several meteorological parameters, particularly temperature, relative humidity and wind, to provide a more comprehensive assessment of conditions associated with wildfire risk.

Alert and notification procedures could be further developed to ensure that relevant information is efficiently communicated to the responsible civil protection and emergency-response stakeholders.



1.4.4 Conclusions

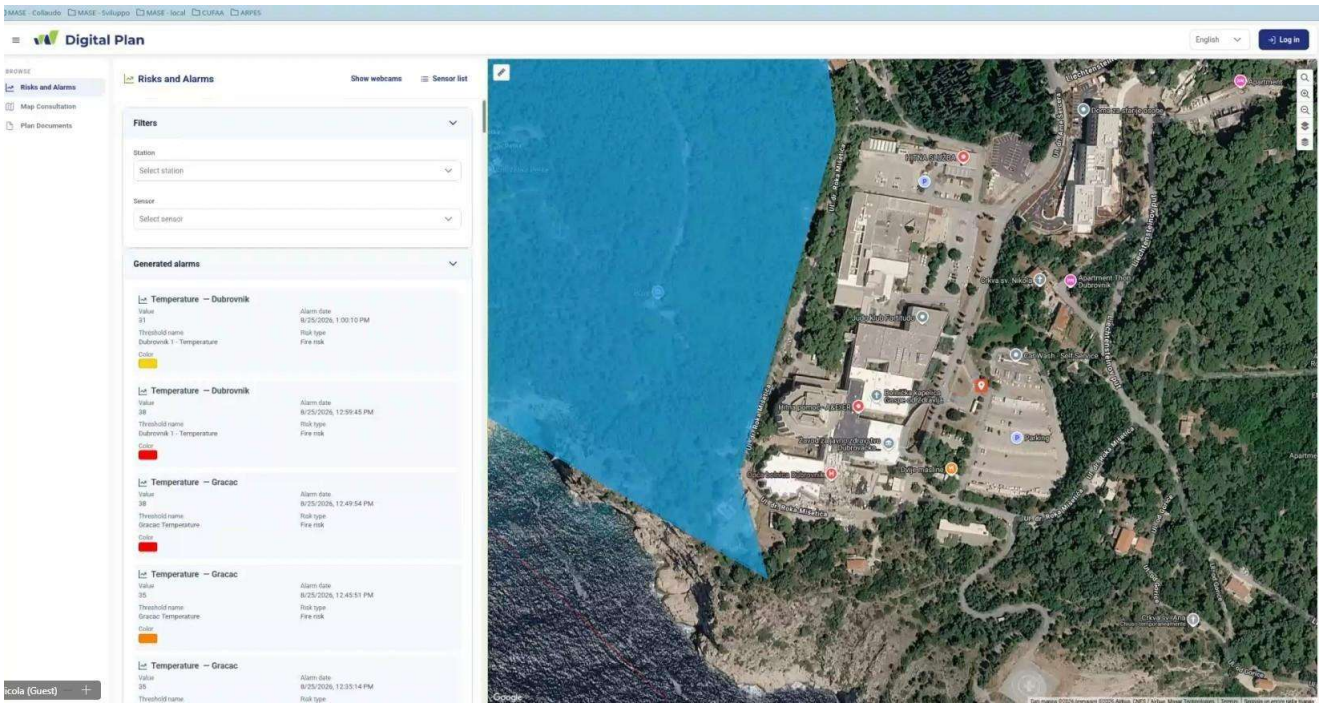
The pilot deployment carried out by the City of Dubrovnik (PP5) on 25 August 2026 successfully demonstrated the application of the DIGITAL PLAN IoT and DSS platform in the context of wildfire risk monitoring. The exercise focused on the Velika and Mala Petka Forest Park, where two meteorological stations were installed as part of the pilot activities. The exercise demonstrated the process of monitoring meteorological conditions and comparing instantaneous temperature values with predefined thresholds. Participants were able to follow the information flow from sensor measurements and threshold evaluation to alert generation and visualization within the DIGITAL PLAN platform. The pilot also confirmed the importance of adapting the DIGITAL PLAN approach to the specific characteristics of the local territory. Focusing on wildfire risk provided a practical scenario directly relevant to the environmental characteristics and civil protection needs of Dubrovnik.

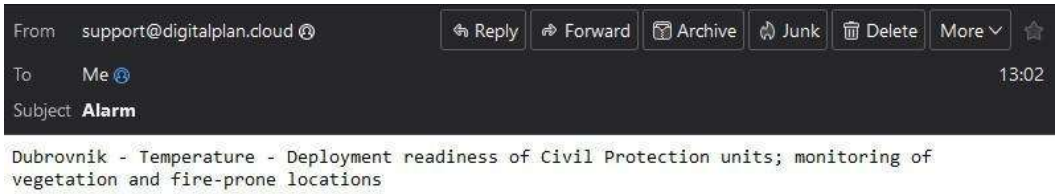
The involvement of municipal technical staff, civil protection expertise, firefighting services and local and regional institutions further demonstrated the potential of the platform to support information sharing and coordination between relevant stakeholders. The pilot identified several areas for further development, particularly the refinement of alert thresholds based on longer-term local monitoring data, the combined use of additional meteorological parameters such as relative humidity and wind, and further development of GIS information and alert communication procedures. Overall, the Dubrovnik pilot deployment achieved its intended objectives and confirmed the potential of the DIGITAL PLAN platform to support real-time environmental monitoring, wildfire risk assessment and



civil protection decision-making. The experience and results obtained provide a solid basis for the continued use and further development of the monitoring system and for integrating the DIGITAL PLAN approach into future civil protection and wildfire risk management activities in Dubrovnik.

Attachments:





1.5 PP6 – RERA

The pilot deployment of RERA S.D. (PP6) was carried out on 25 August 2026 as an in-person working session held at the RERA S.D. premises (Domovinskog rata 2, Split), testing the wildfire-risk monitoring functionalities of the DIGITAL PLAN platform for the Žrnovnica pilot area, using the Mosor 2 sensor station. The exercise was conducted as a tabletop simulation, with the in-person participation of RERA project staff and representatives of local self-government units (cities and municipalities) of the Split-Dalmatia County, with remote support from the technical team responsible for the platform and the online participation of the Lead Partner for part of the session, and focused on the configuration of risk thresholds, the simulation of a wildfire scenario and the verification of the automatic generation and visualisation of alarms.

The main objectives of the pilot were:

• to test the functionality of the DIGITAL PLAN platform for wildfire-risk monitoring in the Žrnovnica pilot area;

• to verify the integration and display of sensor data from the Mosor 2 station;

to test the activation of predefined wildfire-risk thresholds for the air-temperature parameter;

• to verify the automatic generation of alarms and their visualisation on the public Risks and Alarms map;

• to identify potential improvements for the future operational use of the platform.

1.5.1 Description of the participants in the planned pilot in region/country and overview of participant statistics

The pilot deployment of RERA S.D. (PP6) was carried out on 25 August 2026 as an in-person working session held at the RERA S.D. premises (Domovinskog rata 2, Split), testing the wildfire-risk monitoring functionalities of the DIGITAL PLAN platform for the Žrnovnica pilot area, using the Mosor 2 sensor station. The exercise was conducted as a tabletop simulation, with the in-person participation of RERA project staff and representatives of local self-government units (cities and municipalities) of the Split-Dalmatia County, with remote support from the technical team responsible for the platform and the online participation of



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The main objectives of the pilot were:

• to test the functionality of the DIGITAL PLAN platform for wildfire-risk monitoring in the Žrnovnica pilot area;

• to verify the integration and display of sensor data from the Mosor 2 station;

to test the activation of predefined wildfire-risk thresholds for the air-temperature parameter;

• to verify the automatic generation of alarms and their visualisation on the public Risks and Alarms map;

• to identify potential improvements for the future operational use of the platform.

Participant statistics:

No.	Category/Istitution	Notes
1	RERA S.D. (PP6) – project staff	Host / organiser (RERA
2	Representatives of local self-government units (cities and	Civil-protection target group



	municipalities) of the Split-Dalmatia County	
3	Technical team responsible for the platform	Remote technical support
	Total participants	24

Participation was recorded through a signed attendance list, which is annexed to this report. In total, 24 participants took part in the session - RERA S.D. project staff together with representatives of local self-government units (cities and municipalities) of the Split-Dalmatia County - with remote technical support from the platform team and the online participation of the Lead Partner for part of the session.

1.5.2 Outcomes and achieved results

Pilot scenario – Wildfire risk monitoring

The RERA pilot consisted of an in-person tabletop simulation, held at the RERA S.D. premises, of a wildfire-risk scenario using air-temperature data from the Mosor 2 sensor station in the Žrnovnica pilot area. On the DIGITAL PLAN platform, a temperature threshold with escalating intervals was configured for the station, using the “instantaneous value comparison”

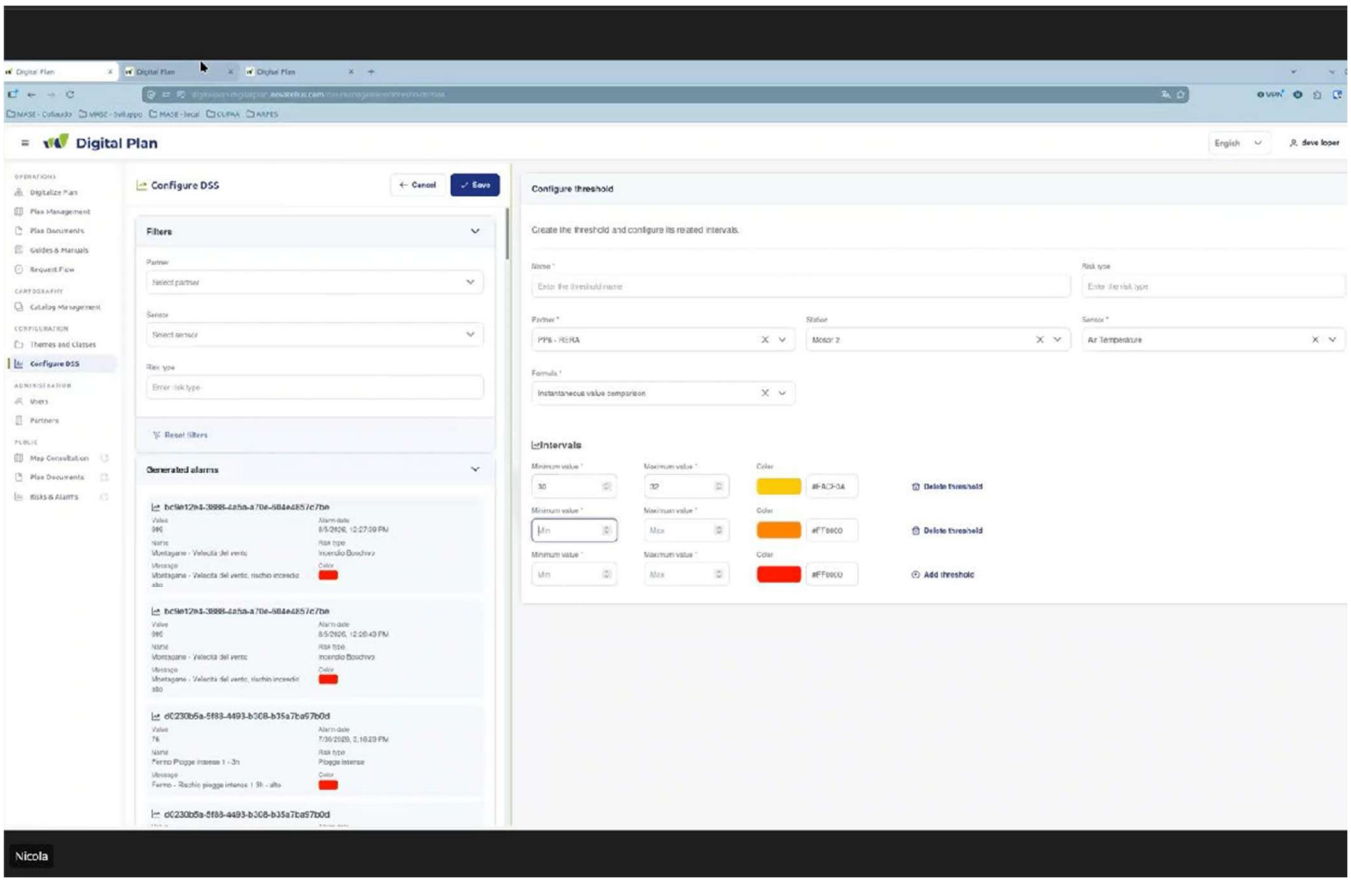
formula, so that increasing temperature values would progressively trigger higher wildfire-risk alarm levels.

Configured threshold intervals (Mosor 2 – Air Temperature):

Interval	Colour	Alarm level
30 – 32 °C	Yellow (#FACF0A)	Warning
above 32 °C	Orange (#FF8000)	Pre-alert
higher values	Red (#FF0000)	Alert

Test timeline (25 August 2026):

Time	Value	Activity / result
13:06:07	31	Air-temperature reading for Mosor 2 crossed the first (Yellow) threshold interval; a fire-risk alarm was generated and displayed, and an automatic e-mail notification was sent (early warning for field monitoring personnel).
13:06:37	35	Temperature reached 35 °C, crossing into the higher (Orange/Red) intervals; the alarm was updated on the



		platform and on the public Risks and Alarms map, and automatic e-mail notifications were sent for the Orange (deployment readiness) and Red (possible restriction of activities; rapid intervention) levels.
Onwards	–	The generated alarms were reviewed on the DSS interface and on the public map as part of the tabletop simulation.
End	–	Debriefing and evaluation of the platform response with the participants.

Figure 1 – DSS threshold configuration for the Mosor 2 station (air temperature, wildfire-risk intervals).



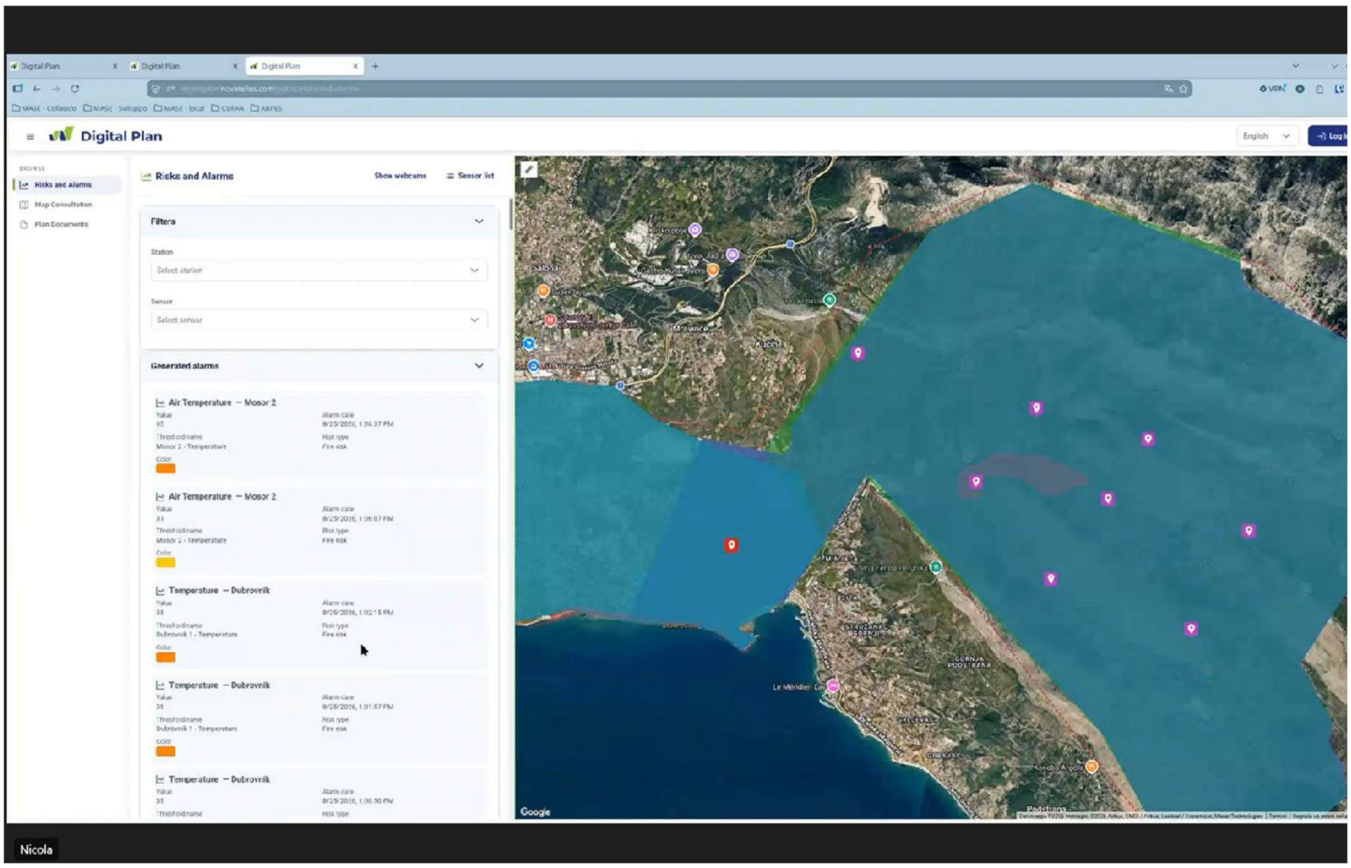


Figure 2 – Public Risks and Alarms map showing the fire-risk alarm generated for Mosor 2 (25 August 2026).

During the simulation, the DIGITAL PLAN platform issued automatic e-mail notifications for each configured wildfire-risk level of the Mosor 2 station (air temperature). Three notifications were generated between 13:06 and 13:07 on 25 August 2026, for the Yellow, Orange and Red levels, each carrying the operational message associated with that level (Figures 3–5).

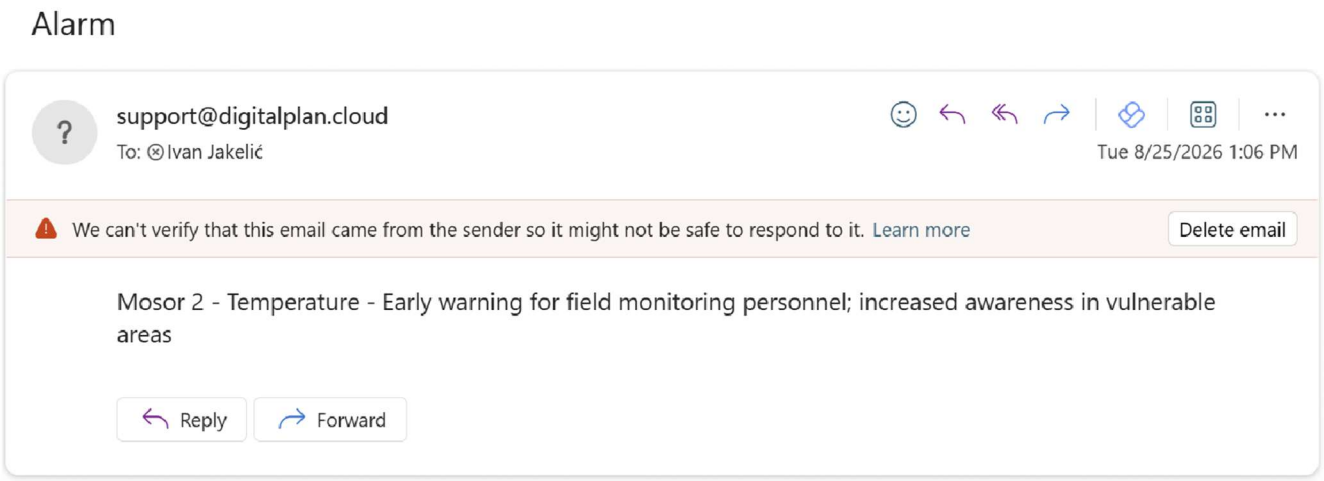


Figure 3 – Automatic DSS e-mail notification – Yellow (Warning) level, Mosor 2 (Temperature): early warning for field monitoring personnel and increased awareness in vulnerable areas (25 August 2026).

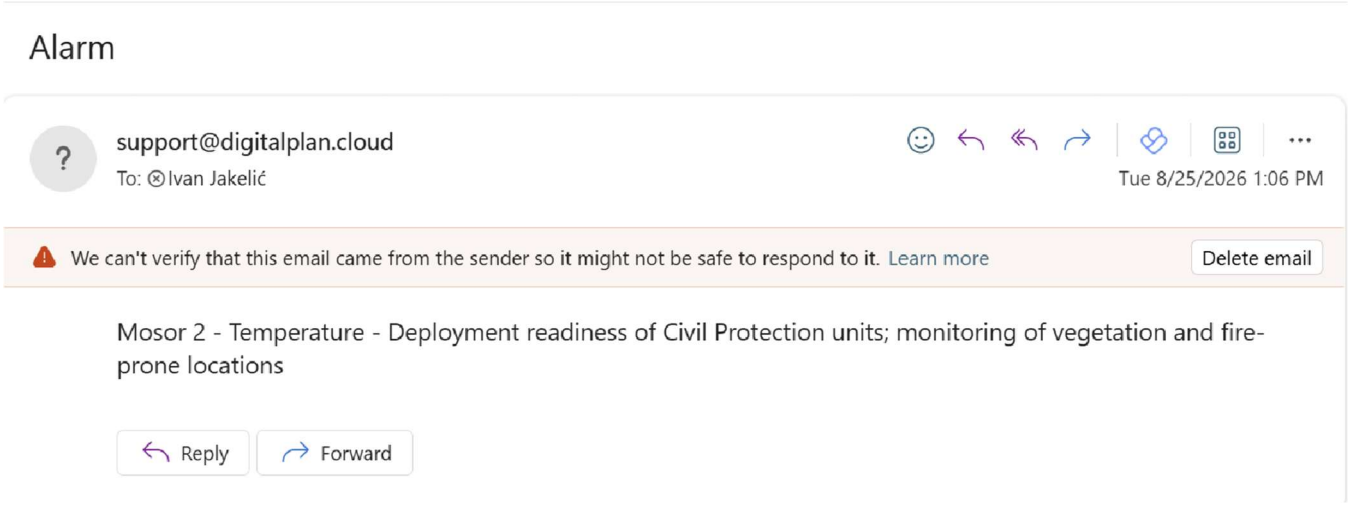


Figure 4 – Automatic DSS e-mail notification – Orange (Pre-alert) level, Mosor 2 (Temperature): deployment readiness of Civil Protection units and monitoring of vegetation and fire-prone locations (25 August 2026).

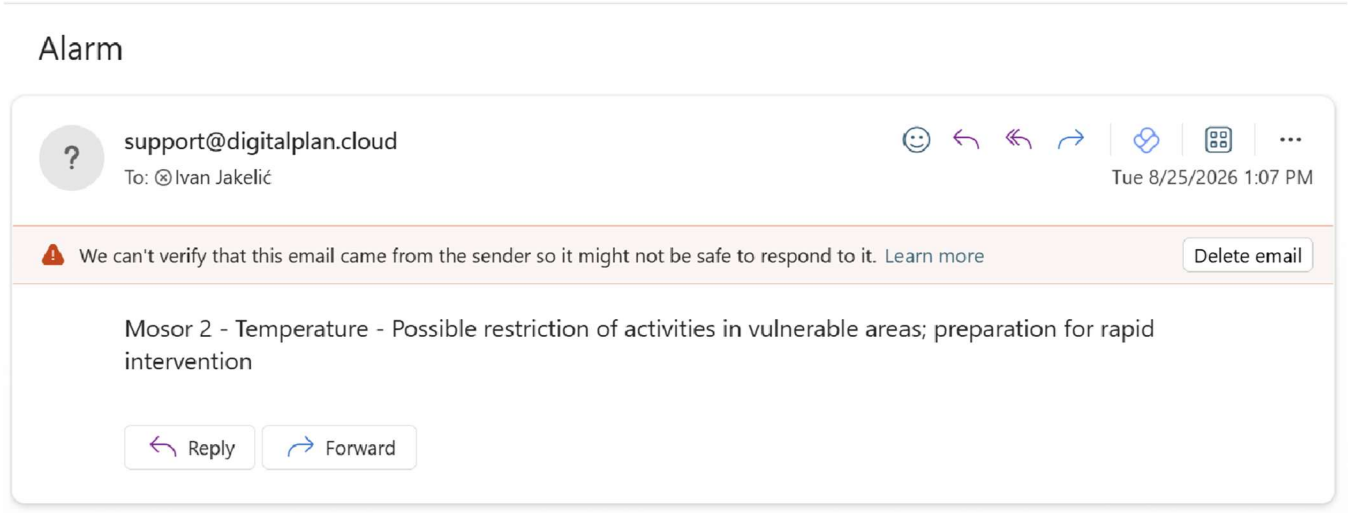


Figure 5 – Automatic DSS e-mail notification – Red (Alert) level, Mosor 2 (Temperature): possible restriction of activities in vulnerable areas and preparation for rapid intervention (25 August 2026).

Analysis of the outcomes

No.	*Objectives and elements of the exercise*	Strengths	Recommendations for improvements	Further notes
Exercises and actions in the pilot				

1	*Coordination of participants*	Roles clearly assigned before the session; all participants followed the same shared platform view on the venue screen.	Involve local civil-protection and firefighting stakeholders in future sessions.	In-person session.
2	*The work of the HQ (headquarters)*	The session acted as a simulated operations room, with the DSS projected on the venue screen in real time.	Introduce a written event log to be filled in during the exercise.	HQ simulated in a working-room setting; no operational COC activated.
3	*Leading interventions*	Decision points were explicitly tied to threshold crossings (yellow → orange/red).	Map each alert level onto the corresponding operational phase of the municipal emergency plan.	—
4	*Mobilizing operational strength*	—	Combine with a field-level exercise in future iterations.	Not applicable – tabletop test.
5	*Use of connections / comms*	The connection with the technical team (joining remotely) worked without interruption, and	Register operational distribution lists so notifications reach all responsible services.	—

		automatic e-mail notifications were generated for each alert level.		
6	*Managing info*	All alarm data were available simultaneously on the platform, with history and timestamps.	Add an export function to generate a post-event report from the alarm history.	—
7	*Usage of GIS*	The public Risks and Alarms map updated in real time, displaying the alarm at the Mosor 2 position.	Overlay the digitalised civil - protection plans on the alarm map.	—
8	*Communications with media*	—	Add a public-information module to future exercises.	Not applicable – tabletop test.
9	*Use of specialized equipment*	The Mosor 2 IoT station and the air-temperature sensor were used and displayed correctly on the platform.	Extend testing to additional sensors and parameters of the station.	—



10	*Respecting protective measures*	—	—	Not applicable – tabletop
Management				
1	*Preparing the exercise locations*	The venue was prepared and the platform shared with all participants.	—	In-person session.
2	*Security during the exercise*	No safety issues.	—	Not applicable – tabletop test.
3	*Dynamics of the exercises*	Progressive escalation of temperature values (31 35)→ produced a realistic threshold escalation within a compact timeframe.	Introduce an unannounced event to test participants' adaptability.	—
4	*Implementation of detailed scenarios*	The wildfire scenario was applied to the risk actually relevant for the Žrnovnica pilot area.	Combine multiple parameters (e.g. add relative humidity and wind).	Air temperature used for the scenario.
5	*Exercise elaboration*	Thresholds, intervals and the escalation sequence were prepared in advance and presented at the start.	Circulate the scenario documentation to participants in advance.	—



6	*Logistics of support*	Adequate: platform, screen-sharing and technical support were available for the whole session.	—	—
7	*Preparing the groups for exercises*	Participants were familiar with the platform and quickly followed the alarm chain.	Provide a short refresher before each exercise.	—
8	*Organizing the work*	Clear structure: coordination, technical support and review of results.	Distribute a written role-assignment sheet at the start.	—
9	*Using the DIGITAL PLAN platform*	The configured thresholds behaved exactly as set: the alarms were generated and displayed without delay.	—	Simulation fully successful; no discrepancy between data and platform response.
10	*Usefulness of the platform for stakeholders in the pilot project*	Participants could see the direct link between sensor readings and wildfire-risk alarm levels.	Extend platform access to local civil-protection stakeholders.	—

11	*Usefulness of the platform in stakeholder communication*	The platform provided a shared, real-time operational picture between RERA and the technical team.	Define a formal escalation protocol specifying who is notified at each alert leve	—
12	*Evaluate the overall usefulness of the platform*	Overall usefulness confirmed: the system delivered the expected alerting chain from sensor to alarm and map.	Complete the sensor configuration and consolidate thresholds on the basis of local historical data.	High perceived operational value.

b. Conclusions regarding the outcomes of the pilot deployment

The RERA pilot demonstrated the functionality of the DIGITAL PLAN platform for monitoring a simulated wildfire-risk scenario in the Žrnovnica pilot area using the Mosor 2 sensor station. During the test, the air-temperature reading rose from 31 to 35, crossing the predefined thresholds and triggering fire-risk alarms that were automatically generated and displayed both in the DSS interface and on the public Risks and Alarms map. The test confirmed that the sensor data, the threshold logic and the alarm visualisation worked as

configured, with no perceptible delay or inconsistency between the injected values and the platform response. On this basis, the simulation can be considered fully successful.

1.5.3 Lessons-learnt and critical issues addressed

a. Use of the DIGITAL PLAN Platform during the pilot and lessons learnt

The platform was used throughout the session as the single operational environment: the threshold had been configured in advance for the Mosor 2 air-temperature parameter, the public map was shared with the participants, and the alarm history was consulted as the values escalated. The participants followed the full chain – sensor reading, threshold evaluation, alarm generation and map label – in real time. The main lessons learnt are the following:

- Configuring thresholds on a parameter that is directly relevant to wildfire risk (air temperature) makes the alarm immediately intelligible to the end user and shortens interpretation time.
- The instantaneous-comparison formula is well suited to real-time wildfire-risk monitoring, as it reacts to each new reading without waiting for an aggregation window.
- The value of the platform lies in the explicit link between the alert level and the operational response; this link should be reflected in the municipal civil-protection procedures.
- Running the test together with the technical team (connected remotely) is an efficient model for verifying the configuration of the station.

b. Critical issues encountered during the pilot deployment

i. Technical and functional performance of the DIGITAL PLAN platform during the pilot

No malfunction of the platform was recorded during the session. Alarm generation and map visualisation performed as configured, with response times perceived as immediate by the participants. The alarm was displayed at the correct sensor position on the public map with the correct value.

ii. Adjustments to operational modes

The exercise was conducted as an in-person tabletop test with a controlled escalation of the air-temperature values, which made it possible to test the behaviour of the system when several thresholds on the same sensor are crossed in sequence, without requiring field deployment.

iii. Other interventions made to optimize the overall effectiveness of the system

The automatic e-mail notification channel was tested successfully during the pilot; extending the distribution to all responsible services and overlaying the digitalised civil-protection plans on the alarm map were identified as the next configuration steps, to complete the alerting



chain from sensor to external recipients and to allow an alarm to be read directly against emergency areas and exposed elements.

1.5.4 Conclusions

The pilot deployment carried out by RERA S.D. (PP6) on 25 August 2026, in an in-person session held at the RERA S.D. premises with broad participation of local self-government units of the Split-Dalmatia County, successfully validated the DIGITAL PLAN IoT and DSS system for the Žrnovnica pilot area under a simulated wildfire-risk scenario. The Mosor 2 station, the configured temperature thresholds and the alarm visualisation behaved as designed: the alarms were generated automatically and displayed on the platform and on the public Risks and Alarms map without delay. The pilot confirms that the tested configuration is ready to be consolidated and transferred to the Action Plan for Civil Protection Plans Digitalization under Activity 3.2. The automatic e-mail notification was validated during the pilot; extending the notification distribution to all responsible services and integrating the digitalised civil-protection plans into the alarm map are recommended as the next steps.



1.6. PP8 – Municipality of Fermo

The pilot implementation in the Municipality of Fermo (PP8) took place on 30 July 2026 at the town hall, immediately following the capacity-building session held as part of activity A3.4. Holding the two activities on the same day and at the same venue enabled participants to move directly from training on the platform to testing the system in practice.

Scenario design and civil protection framework

As part of the DIGITAL PLAN project- which enabled the creation of a digital decision-support platform integrated with a network of weather sensors, territorial monitoring systems, and modules for the automatic analysis of alert thresholds- the municipality of Fermo organized, with technical support from the Civil Protection Service of the Marche Region and the Prefecture of Fermo, a command post exercise (Command Post Exercise – CPX) for the local municipality, which served as the pilot municipality. The exercise was aimed at the Mayor, the Councilor for Civil Protection, the Deputy Prefect, Civil Protection volunteers, and several representatives of the Municipal Police, as well as members of the Municipal Operations Centers (COC) and personnel involved in emergency forecasting, monitoring, and management.

The project's baseline scenario- a large-scale weather event with moderate to heavy rainfall and thresholds set at 20, 40, and 60 mm over a three-hour period—was adapted to the risk profile of the pilot area in the Fermo region. An analysis of the municipal Civil Protection Plans had already identified intense rainfall as one of the predominant local risks during the

drafting of the climate change adaptation plan prepared by Prof. Fazzini from 2016 to 2018. Two dedicated exercises were therefore designed and conducted sequentially on the same day, maintaining the methodological structure of the common scenario - forecasting, escalation of thresholds, automatic generation of alerts, and Civil Protection response- but applying it to the hazards that are actually relevant to the pilot area.

Fermo was used as the pilot municipality for the Civil Protection framework of both exercises. The applicable alert framework is summarized below.

The objective of the exercise was to test decision-making procedures and operational coordination in the context of an emergency scenario involving severe weather events:

- of short duration (maximum 2 hours - which have frequently caused flooding in areas near the coast and at elevations close to sea level-primarily flooding of coastal neighborhoods and the underpasses of the Adriatic Railway

- lasting up to 6 hours but characterized by at least moderate hourly intensity (up to 10 mm/hour) , with consequent hydraulic risks primarily related to the Ete stream in the town of Salvano, and secondarily to the secondary water network-minor streams with very short runoff timeswhich have, in the recent past, caused significant damage to buildings and casualties not far from the municipal territory of Fermo The exercise was conducted exclusively in a theoretical format, without the use of vehicles or personnel in the field, through a step-by-step simulation of the events and the use of the DIGITAL PLAN platform as the primary decision-support tool. During the exercise, the following were simulated: the collection of data from the monitoring network, the automatic processing of risk indicators,



the triggering of alert thresholds and the generation of operational notifications. Participants were required to interpret the available information, assess how the scenario was developing and take the decisions falling within their remit in accordance with their respective municipal civil protection plans.

The specific objectives of the initiative were:

- to assess the ability of municipal technical staff to use the DIGITAL PLAN platform as a decision-support tool;
- to train the mayor and members of the Municipal Operations Center (COC) in the use of information derived from real-time monitoring;
- to test the procedures for activating and managing the Municipal Operations Center;
- verify the proper flow of communication between the municipal administration, the regional administration, and the components of the Civil Protection System; assess the timeliness of decisions following the activation of alert thresholds;
- consolidate procedures for managing extreme rainfall events as provided for in the local civil protection emergency plan;
- identify any organizational, procedural, or technological issues and propose corrective actions aimed at the continuous improvement of the system.



The exercise also provided an important opportunity to confirm the technical and operational validity of the DIGITAL PLAN platform, allowing for verification of the effectiveness of the integration between environmental monitoring, automatic threshold analysis, alert systems, and decision-making processes, with the aim of strengthening the response capacity of local authorities and increasing resilience or, more precisely, mitigating the specific risks faced by these areas in the face of major natural hazards.

Criticality	**Alert zone / reference authority**
Weather, hydrogeological, hydraulic, hydrogeological for thunderstorms	MARCHE 6 southern hilly and coastal area
Snow and ice, low-altitude snowfall, frost, heatwaves, fog, wind	MARCHE 6 southern hilly and coastal area

The alert chain applied is that provided for by the national civil protection system: declaration of the expected criticality levels by the Regions and the operational centres; declaration of the alert levels (yellow, orange, red) by the Marche Region and its regional operations centre; and the subsequent activation of the operational phases (caution, pre-alert, alert) provided for in the municipal emergency plan.



1.6.1. Description of the participants in the planned pilot in region/country and overview of participant statistics

The pilot deployment in Dubrovnik involved 16 participants. The group was composed to bring together representatives of the City of Dubrovnik, responsible for the implementation of the pilot activities and the monitoring network, together with civil protection representatives, technical experts and relevant local stakeholders. This composition ensured the participation of actors who, in the event of a real wildfire emergency, would be involved in monitoring conditions, assessing the level of risk, coordinating response measures and implementing the operational procedures defined within the local civil protection framework.

Category	Institution / role	No.
Project partner PP(	Political staff	2
Project partner staff	Fermo municipality (PP8) – technical and scientific staff	6
External technical staff	Fermo municipality (PP8) – contracted technicians	2
External expert	Scientific local coordinator of activity	1

State authority – territorial level	Prefecture of Fermo – Territorial Government Office / Deputy Prefect	2
Local authority – CP Technical staff	Municipality of Fermo –	3
Local authority – CP Technical Staff	Municipality of Porto Sant'Elpidio	1
Local authority – CP technical level	Municipality of Montegiorgio	1
Regional authority – CP technical level	Marche region -	5
National authority – emergency services	National Fire Brigade – Provincial Command of Fermo	1
Local authority – operational services	Municipality of Fermo – Local Police	1
Total		25

Participant statistics

- 25 participants in total, above the minimum of 5 foreseen by the project for this type of activity.

- 13 participants (52%) from the project partner, including contracted technicians and the external civil protection expert; 12 participants (48%) from the national, regional and local authority level.

- Four institutional levels were present: The National level (Prefecture and Fire Brigades); the regional level, the county level and the Municipal level; 2 elected representatives (a Deputy Mayor) from the PP8.

- The exercise was attended in full by the same participants who had taken part in the capacity building session held earlier the same day, ensuring continuity between training and operational testing.

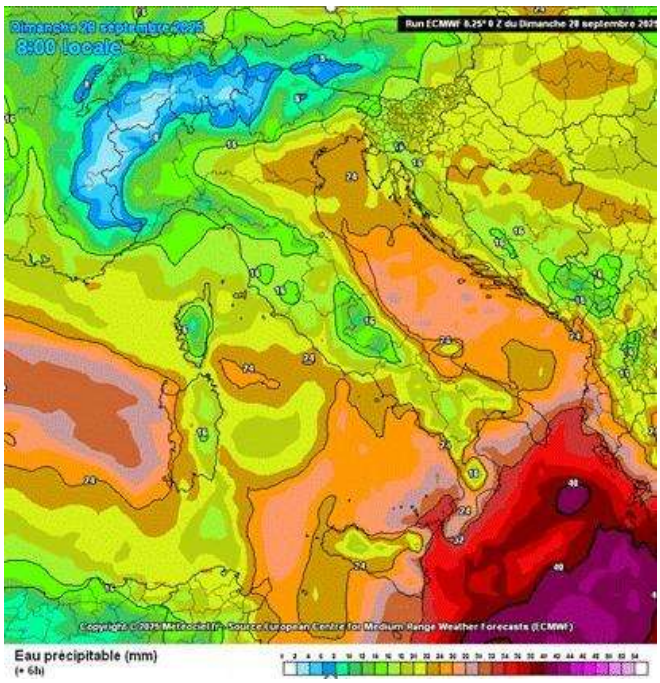
Sensor network used

The exercises made use of the project's monitoring stations installed within the municipal administrative area, specifically in the valley-floor hamlet of Ete-Caldarette and the coastal area of Lido di Fermo-Casabianca. During extreme weather events, the stations record data at standard five-minute intervals. The parameters measured by the network are: precipitation, air temperature, relative humidity, atmospheric pressure, wind speed and direction, and water level (stat. Fermo 1).

Exercise 1 – Adverse weather event: short and heavy precipitation (Rainy storm)



Synoptic situation - An area of instability – characterized by low geopotential at medium tropospheric levels and the presence of instability lines at ground level – is present across the entire Italian peninsula, leading to likely episodes of severe weather, with rain showers, some of which may be thunderstorms, strong winds and a rise in mean sea level due to waves, some of which may be significant



The 3-hour precipitation forecast for the morning, derived from the LAM (limited area model) model with a spatial resolution of 2.2 × 2.2 km, shows areas of heavy rainfall within the area covered by the simulation, although the cumulative totals are slightly underestimated compared with the actual cumulative totals recorded. The modelling relating to the forecast of potential precipitation shows figures more in line with what actually occurred, with cumulative totals of up to 30 mm.

Finally, The RADIO SOUNDING carried out in Bologna at 12:00 CET shows a considerable relative humidity in the air column, from the ground up to an altitude of approximately 3,000 m, but without any convergence (the black lines never touch!!) The bora wind, characterized by cold, dry air, contrasts sharply with the pre-existing warm, humid air, resulting in heavy rain showers accompanied by intense thunderstorm activity.

Alert thresholds – HEAVY RAIN 1h

Regionalisation study covering the Marche region (CIMA Foundation – May 2016) – Reg Int: 2015/28 – No. 670, revised with data from the Paludi di Fermo weather station

	1H	3H	6H	12H	24H	48H	72H	UM	LEVEL
Rain	<24	<31	<37	<44	<52	<70	<100	mm	No
	24	31	37	44	52	70	100	mm	low
	37	49	55	62	69	90	110	mm	medium
	46	61	68	74	81	100	130	mm	high

Exercise timeline – test of 30 July 2026, start 11:30 LT

Interreg Co-funded by the European Union

Italy – Croatia

Digital Plan

Analysis of results - heavy - short rainfall - flooding in coastal areas and underpasses

Starting of synoptic forecast						
Activation Operational centre						
Start of the precipitation 1h						
Sensor	**Thresholds**	**Data**	**Alarm**	**Action**	**Attuator**	**Civil Protection Action**
Pluviometer	0-24 mm	18mm	green	Platform notification/Actuator API call/Email	None	Early warning for field monitoring personnel
Sensor	**Thresholds**	**Data**	**Alarm**	**Action**	**Attuator**	**Civil Protection Action**
Pluviometer	24mm	30 mm	Yellow	Platform notification/Actuator API call/Email	None	Early warning for field monitoring - Monitor the evolution of phenomena
Sensor	**Thresholds**	**Data**	**Alarm**	**Action**	**Attuator**	**Civil Protection Action**
Pluviometer	37 mm	40 mm	Orange	Platform notification/Actuator API call/Email	None	Monitoring critical points in the territory
Sensor	**Thresholds**	**Data**	**Alarm**	**Action**	**Attuator**	**Civil Protection Action**

Pluviometer	46mm	50 mm	Red	Platform notification/Actuator API call/Email	None	Road closures - Monitoring critical points in the area
Sensor	**Thresholds**	**Data**	**Alarm**	**Action**	**Attuator**	**Civil Protection Action**
Pluviometer	46mm	61mm	Red	Platform notification/Actuator API call/Email	None	Monitoring critical points in the area
End of the simulations (EXE)						
DEBRIEFING EXE						

Exercise timeline – test of 30 July 2026, start 11:30 LT

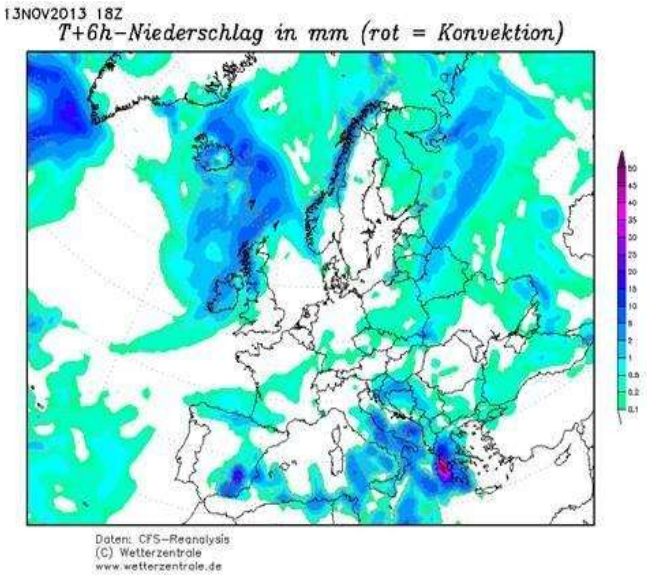
Analysis of results – heavy - short rainfall - flooding in coastal areas and underpasses

Type	Sent	Received	Result
Messaging	Yes	Yes	Positive – immediate
Alarms	Yes	Yes	Positive – immediate
Actuators	Not envisaged	n/a	Not applicable – no actuators connected

Exercise 2 – Adverse weather event: prolonged and heavy precipitation (cold katafront)

SYNOPTIC SITUATION AND WEATHER FORECAST –

A dynamic low-pressure system, characterized by a “cold drop” at high altitude of troposhere and centred over western Sicily, is causing conditions of marked atmospheric instability, including along the central Adriatic coast, where frequent weather phenomena – some of which may be of high intensity – are likely.



The rainfall forecast for the next 6 hours, as produced by a regional-scale model (with a resolution of approximately 16 km), shows rainfall spreading across the whole of central and southern Italy, though on a smaller scale than what actually occurred.

Alert thresholds – ABUNDANT RAIN 3h

Regionalisation study covering the Marche region (CIMA Foundation – May 2016) – Reg Int: 2015/28 – No. 670, revised with data from the Paludi di Fermo weather station by Fazzini (2026)

Exercise timeline – test of 30 July 2026, start 12:30 LT

	1H	3H	6H	12H	24H	48H	72H	UM	LEVEL
Rain	<24	<31	<37	<44	<52	<70	<100	mm	No
	24	31	37	44	52	70	100	mm	low
	37	49	55	62	69	90	110	mm	medium
	48	61	68	74	81	100	130	mm	high

Analysis of results – heavy - prolonged rainfall - flooding in the bottom valley

Starting of synoptic forecast						
Activation Operational centre						
Start of the precipitation 3h						
Sensor	**Thresholds**	**Data**	**Alarm**	**Action**	**Attuator**	**Civil Protection Action**
Pluviometer	0-31 mm	20mm	green	Platform notification/Actuator API call/Email	None	Early warning for field monitoring personnel
Sensor	**Thresholds**	**Data**	**Alarm**	**Action**	**Attuator**	**Civil Protection Action**
Pluviometer	37mm	45 mm	Yellow	Platform notification/Actuator API call/Email	None	Early warning for field monitoring - Monitor the evolution of phenomena

Sensor	Thresholds	Data	Alarm	Action	Attuator	Civil Protection Action
Pluviometer	49 mm	60 mm	Orange	Platform notification/Actuator API call/Email	None	Monitoring critical points in the territory
Sensor	**Thresholds**	**Data**	**Alarm**	**Action**	**Attuator**	**Civil Protection Action**
Pluviometer	61 mm	70 mm	Red	Platform notification/Actuator API call/Email	None	Road closures - Monitoring critical points in the area
Sensor	**Thresholds**	**Data**	**Alarm**	**Action**	**Attuator**	**Civil Protection Action**
Pluviometer	61mm	75 mm	Red	Platform notification/Actuator API call/Email	None	Monitoring critical points in the area
End of the simulations (EXE)						
DEBRIEFING EXE						

Exercise timeline – test of 30 July 2026, start 12:30 LT

Analysis of results – heavy and prolonged rainfall

Type	Sent	Received	Result
Map update	Yes	Yes	Positive – immediate
Email notification	Not configured	n/a	Not applicable – channel not yet configured

Operational command structure

Role	Name	Organisation
Coordinator EXE	Massimiliano Fazzini	External civil protection expert contracted by Fermo municipality
Technical support EXE	Lorenzo Paniccià	CP local coordinator - Fermo municipality PP8
Technical support EXE	Kelly Forti	CP volunteer - Fermo municipality PP8
Remote technical support	SensorID technical staff	SensorID – sensor supplier, connected remotely for data injection
Observer EXE	Administrative officer, Sector III	Municipality of Fermo
Observer EXE	Director, Sector IV (Civil Protection)	Municipality of Fermo

Observer EXE	Director, Sector III (Europe Desk)	Municipality of Fermo
Evaluator EXE	Deputy Mayor EU funds	Municipality of Fermo
Evaluator EXE	Deputy Mayor Civil Protection	Municipality of Fermo

1.6.2. Outcomes and achieved results

a. Analysis of outcomes

No.	**Objectives and elements of the exercise**	**Strengths**	**Recommendations for improvements**	**Further notes**
Exercises and actions in the pilot				
1.	*Coordination of participants*	A single coordinator with a defined mandate; roles assigned before the start; all participants in one room with a shared view of the platform.	Extend the exercise to the regional civil protection service and to the provincial fire brigade.	The sequence of two scenarios kept the group engaged throughout.

2.	*The work of the HQ (headquarters)*	The exercise room operated as a simulated municipal operations centre (COC); the DSS platform was projected in real time so that all participants shared the same operational picture.	Introduce a written COC event log to be filled in during the exercise.	The HQ function was simulated; no municipal COC was physically activated.
3.	*Leading interventions*	Decision points were explicitly tied to threshold crossings; the escalation from Medium to High level was declared and discussed.	Map each alert level onto the corresponding operational phase of each municipal emergency plan.	—
4.	*Mobilizing operational strength*	Participants identified the resources their plans foresee at each operationa phase	A field exercise with actual mobilisation of volunteer civil protection teams	Not applicable in a table-top format.
5.	*Use of connections / comms*	The remote connection with the sensor supplier's	Define the recipients for each alert level and test a	—

		technical staff worked without interruption for the whole duration of both exercises.	redundant multi-channel notification scheme (e-mail plus SMS, instant messaging or an equivalent channel), since Fire Brigade and Civil Protection representatives considered e-mail alone insufficient for time-critical warnings.	
6.	*Managing info*	All alarm data were available simultaneously on the platform, with history and timestamps.	Add a post-event export function and introduce a data-validation mechanism, agreed with the Marche Region, so that sensor-derived information can be checked and alerts indicating a	—



			clear and imminent risk can be reliably escalated to decision-makers.	
7.	*Usage of GIS*	The public map updated in real time, displaying coloured labels at the exact position of each sensor.	Integrate the digitised municipal civil protection plan into the alarm map and, where feasible, automatically link the relevant action plan or procedure when an alert is issued; add concise guidance on appropriate behaviour during an emergency.	The digitalised plans are already available from activities A1.1 and A1.2.
8.	*Communications with media*	Not included in the exercise design.	Add a press and public information module to future exercises.	—



9.	*Use of specialized equipment*	The project IoT stations were used, with a five-minute sampling interval: rain gauge, thermometer, hygrometer, barometer, anemometer, snow gauge, soil moisture and water level sensors.	Complete the installation of the remaining stations to obtain full coverage of the three slopes.	Four stations were operational at the time of the exercise; eight were under installation.
10.	*Respecting protective measures*	No operational risk exposure; the exercise was conducted indoors.	—	Not applicable to a table-top exercise.
Management				
1.	*Preparing the exercise locations*	Venues outside the town hall: a conference room equipped with a projector and a reliable internet connection, suitable for holding a theory session.	—	Same venue as the capacity building session, which allowed direct continuity between the two activities.
2.	*Security during the exercise*	No safety issues arose.	—	Not applicable to a table-top exercise.
3.	*Dynamics of the exercises*	Two scenarios run in sequence (heavy and short rainfall at 11:00 LT, prolonged rainfall at 12.30 LT);	Introduce an unannounced event to test the reaction of participants to	—

		threshold crossings at +30' and +45' produced a realistic escalation within a compact timeframe.	unforeseen developments.	
4.	*Implementation of detailed scenarios*	Both scenarios were built on real synoptic situations and on official regional bulletins rather than on abstract data.	—	The scenarios relating to short, intense (burst) and heavy but prolonged (frontal) rainfall have been supplemented by synoptic maps (probability of rainfall, cumulative totals and precipitable water), maps at altitude (500 hPa) and at ground level showing fronts, and radiosonde in Bologna data available online. Geohydrological



				hazard warnings produced by the regional Civil Protection operational centre were also attached.
5.	*Exercise elaboration*	Scenario, thresholds and injection timeline were prepared in advance by the external civil protection expert and presented to participants at the start.	Circulate the scenario documentation to the municipalities a few days in advance.	—
6.	*Logistics of support*	Adequate: room, equipment and remote technical support were all available for the whole duration.	—	—
7.	*Preparing the groups for exercises*	The exercise followed the A3.4 capacity building session held on the same day, so all participants had just been trained on the platform.	—	Sequencing training and exercise on the same day proved effective and is recommended for replication.



8.	*Organizing the work*	Clear command structure: coordinator, technical support, observers and evaluators.	Distribute a written role assignment sheet at the start of the exercise.	—
9.	*Using the Digital Plan platform*	The alarms injected remotely by the sensor supplier's technical staff were immediately reflected on the platform. Thresholds and map labels behaved exactly as configured.	—	The simulation was fully successful, with no discrepancy between injected data and platform response.
10.	*Usefulness of the* *Digital Plan platform for stakeholders in the pilot project*	Municipal technical officers could see the direct link between sensor readings and the operational phases of their own emergency plans.	Extend platform accounts to all municipal civil protection officers of the pilot municipalities.	—
11.	*The usefulness of the Digital Plan platform in stakeholder communication*	The platform provided a shared, real-time operational picture	Formalise an escalation and notification protocol	—



			specifying recipients, channels and message types at each alert level, including coordination with the Marche Region, assessment of interoperability with the single European emergency number 112, and an 'all-clear' / end-of-emergency notification.	
12.	*Evaluate the overall usefulness of the* *Digital Plan platform*	Overall usefulness confirmed by all participants: the system delivered the expected alerting chain from sensor to municipal decision-maker.	Complete the monitoring network and consolidate thresholds using local historical series; assess future extension	—



			of the platform to additional hydraulic monitoring contexts, including river systems and, where relevant, dams.	

b. Conclusions regarding the outcomes of the pilot deployment

- The pilot deployment achieved all the objectives set for the exercise. The IoT sensors responded correctly, the temporal escalation of the monitored parameters was reproduced as designed, the pre-set thresholds were exceeded at the expected times, the alarms were generated automatically and without delay, and the graphical outputs and event records were produced on the platform as foreseen.

- The alarms injected by the sensor supplier's technical staff, connected remotely, found immediate correspondence on the Digital Plan platform: no latency, loss of data or inconsistency between the injected values and those displayed was observed. The map

labels appeared at the correct sensor positions with the correct colour coding. On this basis the simulation can be considered fully successful.

- Beyond the technical outcome, the exercise produced a second and equally relevant result: it placed the elected and technical representatives of the Fermo municipality in the position of reading sensor data as civil protection decisions. Each threshold crossing was discussed in terms of which operational phase of the municipal emergency plan it would trigger, which is precisely the transition that the Digital Plan project aims to enable.

- The debriefing was equally valuable as a co-design exercise: institutional stakeholders translated the successful technical test into concrete requirements for operational use, particularly concerning notification governance, data validation, interoperability with existing emergency structures and tighter integration with civil protection procedures.

1.6.2. Lessons-learnt and critical issues addressed

a. Use of the DIGITAL PLAN PLATFORM during the pilot and lessons learnt

The platform was used throughout the exercise as the single operational environment: thresholds had been configured in advance for each monitored parameter, the public map was projected in the room, and the alarm history was consulted after each escalation step. The participants followed the full chain - sensor reading, threshold evaluation, alarm generation and map label - in real time.

The main lessons learnt are the following:

● Setting thresholds for parameters that local authorities already use in their planning (short or prolonged periods of heavy rainfall) makes the alert immediately understandable to the end user and significantly reduces interpretation time. Participants nevertheless stressed that operational usefulness also depends on validated data and on clear, imminent warnings reaching the appropriate decision-makers without ambiguity.

● Conducting the exercise immediately after the training session proved highly effective: participants could apply the platform immediately and discuss operational questions with the Deputy Prefect, Marche Region and Civil Protection representatives. The discussion confirmed that the platform's value lies not only in the raw measurement, but in translating an alert into an explicit operational phase and, ideally, automatically presenting the relevant action plan and emergency guidance.

● The presence of both the political and technical levels in the same room proved essential: declaration of an operational phase is a decision-making responsibility, while implementation is operational and technical. The pilot also showed that the platform should be positioned within the wider institutional alert chain, with defined cooperation with the Marche Region and an assessment of interoperability with the single European emergency number 112.



● Alert delivery must be designed as a resilient, multi-channel process. Fire Brigade and Civil Protection representatives questioned reliance on e-mail alone and recommended alternative or redundant channels, with recipients defined by alert level and with a specific 'all-clear' message to close the emergency lifecycle.

● Remote support from the sensor supplier proved to be a viable and economical operating model, which can be replicated for routine verification of the network without requiring on-site presence.

b. Critical issues encountered during the pilot deployment

Technical and functional performance of the DIGITAL PLAN PLATFORM during the pilot exercises

- No malfunctions of the platform were detected in either of the two exercises. Alarm generation and map display functioned as intended, with response times perceived as immediate by the participants.

- The only limitation identified is structural rather than functional: at present, there is no piezometric sensor in place for monitoring the underpasses that are frequently affected by flooding. The exercise therefore tested the alert chain on a network that was not yet complete; consequently, a further verification will clearly be necessary once the full network is operational.



- The alarm map does not yet display the layers of the digitised municipal civil protection plan; consequently, the operator must consult two separate interfaces to link an alarm to emergency areas and exposed elements. A future integration should allow the relevant emergency plan or action procedure to be opened automatically when an alert is issued and should make concise emergency-behaviour guidance available where appropriate.

- The platform does not offer an export function capable of generating a post-event report directly from the alarm history, which would be useful both for internal debriefing and for reporting to the regional civil protection service.

- At the time of the exercise, the e-mail notification channel had not yet been configured. The pilot therefore validated the chain only up to threshold assessment, alarm generation and map display. During the debriefing, Fire Brigade and Civil Protection representatives also questioned whether e-mail should be the primary channel for urgent alerts. A dedicated operational test should verify recipient lists and a redundant multi-channel scheme, including messages for escalation and for the end of the emergency.

- The platform does not yet include a formal data-validation workflow or a defined interface with the Marche Region's operational processes and the single European emergency number 112. These aspects should be assessed before full operational adoption, especially for alerts indicating a clear and imminent risk that must reach decision-makers promptly.

i. Adjustments to operational modes



● The common project scenario, based on cumulative rainfall thresholds, was adapted into two locally relevant rainfall scenarios - short and intense precipitation and prolonged heavy precipitation - while retaining the methodological structure of the common exercise. This adjustment allowed the system to be tested against the urban/coastal flooding and hydraulic risks actually addressed by the Fermo civil protection framework.

● The exercise was conducted as a table-top exercise with remote data injection rather than as a field exercise. This allowed both scenarios to be run within a single session and made it possible to control precisely the timing of the threshold crossings.

● Thresholds were expressed as cumulative rainfall over the reference intervals used for the exercises (1 hour and 3 hours), based on the regionalisation study for the Marche Region and revised with local data from the Paludi di Fermo weather station, so that platform outputs could be read consistently alongside institutional warning products.

ii. Other interventions made to optimize the overall effectiveness of the system

● The civil protection framework of the reference pilot municipality was reconstructed and shared with all participants at the start of the exercise, including the alert zones, the competent authorities for each criticality type and the reading key of the regional bulletins.



● The alarm display parameters and threshold notifications within the platform were verified and updated before the exercise so that they were shown directly on the map; external e-mail delivery remained outside the tested configuration.

● The exercise was designed with a progressive escalation (Medium level at +30 minutes, High level at +45 minutes) in order to test not only the single threshold crossing but also the behaviour of the system when several thresholds on the same sensor are exceeded in sequence.

1.6.2. Conclusions

No functional defects were found in the platform dedicated to the project.

The pilot implementation also confirmed the methodological approach adopted by the Municipality of Fermo at the start of the project, namely to select risk categories based on the old civil protection plan and the climate adaptation plan produced in 2018, rather than on a generic hazard model. The testing of the system in relation to urban and river flooding - the two risks that most characterise the local area - resulted in an exercise that the Municipality embraced as its own and generated recommendations that can be directly applied to the revision of its emergency plans.

Three actions are now recommended in order to consolidate the results achieved. Firstly, the monitoring network should be completed so that the warning chain can be tested across the full set of stations in the Ete Morto and Tenna river valleys and along the coastal road,



including the underpasses exposed to urban flooding. In parallel, as suggested during the debriefing by the representative of the Prefecture of Fermo, the scalability of the platform should be assessed for additional hydraulic monitoring contexts, including river systems and, where relevant, dams.

Secondly, the digitised civil protection plan should be integrated into the warning map so that an alert can be linked directly to emergency areas, exposed elements and the relevant action plan or procedure. Where appropriate, the same interface should also provide concise guidance on how to behave during the emergency.

Thirdly, a validated escalation protocol should link each alert level to a defined operational phase, recipients, communication channels and message types. The protocol should define cooperation with the Marche Region, assess interoperability with the single European emergency number 112, ensure that alerts indicating a clear and imminent risk reach the appropriate decision-makers through redundant channels rather than e-mail alone, and include a specific end-of-emergency / all-clear notification.

On this basis, the pilot implementation is considered successfully completed. It confirmed the platform's capacity to support early warning, shared situational awareness and coordinated emergency response, while identifying the governance, validation and interoperability refinements required for operational deployment. The tested configuration is therefore ready to feed into the Civil Protection Action Plan Digitization under activity A3.2 and to strengthen Fermo's resilience to climate-related hazards.

2. Key Findings and Conclusions from the Pilot Simulation Test

All partners involved in the pilot activities, namely LP1, PP2, PP3, PP4, PP5, PP6 and PP8, successfully carried out the simulation testing of the platform and the sensors installed in the selected pilot areas within their respective territories. The testing activities were conducted with the aim of assessing the overall functionality of the system under simulated emergency conditions and verifying the effective interaction between the installed sensors and the platform.

During the simulation exercises, each partner focused on the main climate-related risks identified at the beginning of the project, namely heavy rainfall, wildfires and avalanches. All three risk scenarios were simulated through the platform and the corresponding sensor systems in order to assess the system's ability to detect and communicate potentially hazardous conditions.

In particular, the simulations enabled the partners to verify the activation and management of alert levels, the procedural steps to be followed in response to the detected risk, and the correct visualisation and display of risk signals and alerts on the platform. This allowed the partners to assess not only the technical performance of the sensors and the platform, but also the coherence and effectiveness of the procedures associated with the management of emergency scenarios.



Overall, the pilot testing activities were successfully completed across all participating territories. No significant technical or operational issues were reported by the partners during the execution of the simulations. The technical experts and relevant stakeholders who participated in the testing activities also confirmed the smooth implementation of the simulated scenarios and did not identify any major criticalities affecting the performance or usability of the system.

The results of the simulations therefore indicate that the platform and the installed sensor systems are capable of supporting the identification, communication and visualisation of the selected climate-related risks, while enabling users and relevant stakeholders to follow the appropriate procedures in response to simulated emergency situations. The absence of significant problems during the pilot tests provides a positive indication of the system's overall functionality and readiness for application in the selected pilot areas.

