MOUNTADAPT

ELEVATING HEALTHCARE CLIMATE ADAPTATION

Monitoring, Early Warning and Response System Development and Adaptation Report

Co-funded by the European Union

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

D2.2 – Monitoring and Early Warning and Response System Development and Adaptation Report	
Deliverable type	R
From	Encarnacao, J. (IRIDEON), Wei, W. (CSTB) Bonnet, P. (CSTB), Mansouri, A. (CSTB), Thangarajah, S. (CSTB), Rousselle, D. (CSTB), Pfeifer, B. (UMIT), Launay, E. (ARIA), Karozis, S. (NCSRD), Murgue, E. (CRISISOFT)
Reviewed by	Karozis, S. (NCSRD)
Dissemination level	Public
Due date	31/08/2025
Actual delivery date	26/09/2025
Version no.	2
Work Package no.	2

Document history		
13/08/2025	Version 1 sent for review	Launay, E. (ARIA)
29/08/2025	Version 2 sent for review	Launay, E. (ARIA)
18/09/2025	Version 3 sent for final review	Launay, E. (ARIA)
26/09/2025	Final version submitted	Karozis, S. (NCSRD), François, C. (EQY)

Contacts	
Emilie Launay (ARIA)	emilie.launay@suez.com
Wenjuan Wei (CSTB)	wenjuan.wei@cstb.fr
Bernhard Pfeifer (UMIT)	bernhard.pfeifer@umit-tirol.at
Stelios Karozis (NCSRD)	skarozis@ipta.demokritos.gr
João Encarnacao (IRIDEON)	j.encarnacao@irideon.es
Eric Murgue (CRISISOFT)	eric.murgue@crisisoft.com

Table of Contents

Project partners

Acronym	Full Name of Organisation
ARIA	Aria Technologies Sas
CSTB	Centre Scientifique Et Technique Du Batiment
CRISISOFT	Crisisoft
IRIDEON	Irideon Sl
NCSRD	National Center For Scientific Research "Demokritos"
UMIT	Umit Tirol - Private Universitat Fur Gesundheitswissenschaften Und Technologie Gmbh

Acronyms

AI - Artificial Intelligence

API - Application Programming Interface

EC – European Commission

ECDC - European Centre for Disease Prevention and Control

EU – European Union

IEQ – Indoor Environment Quality

GPS – Global Positioning System

IPCC - Intergovernmental Panel on Climate Change

IPM – Interface Program Management

ISO - International Organization for Standardization

MEWRS - Monitoring, Early Warning and Response System

MRL - Maximum Residue Levels

OQEI - Observatory for Indoor Environmental Quality

PM – Particulate Matter

PR – Project Result

RCP - Representative Concentration Pathway

SoA – State of the Art

TRL – Technology Readiness Level

TVOC - Total volatile organic compounds

WP – Work Package

Introduction

Project Description

MOUNTADAPT is a Horizon Europe project funded by the European Commission. The project consortium is made up of 27 partners across Europe. As part of the EU Mission Adaptation to Climate Change, MOUNTADAPT will enhance health system resilience to the adverse effects of climate change, focusing on European Alpine biogeographical regions.

The project will leverage past initiatives – such as the LIFE RESYSTAL, MountResilience, and BRACE projects – to boost the community-driven resilient transformation of the health system in mountain areas and therefore limit the impact on health and wellbeing of direct or indirect effects of climate change.

This will be achieved by improving climate change health effect predictions, and strengthening health professionals' capacities to prevent, prepare, detect, and respond to climate change threats to health.

Pioneering solutions will be tested in identified healthcare facilities in Austria, Slovenia, Romania, and France. Replication studies will be conducted in Hamburg (Germany), Timis (Romania), and Andorra to prepare the replication of some solutions on replicator health systems at the end of the project.

Project objectives and results

The project's goal is to improve the resilience of the health systems to the adverse effects of climate change European Alpine biogeographical regions. These areas are particularly directly or indirectly impacted by the effects of climate change, including decreased air quality, temperature rise larger than European average, and increasing risk from rock falls and landslides caused by floods.

This transformation to adapt to climate change will be achieved through five specific objectives:

1. Improve the prediction of short- and long-term health effects of climate change
2. Boost the responsiveness of the health system in the context of climate change
3. Improve health professionals' capacity to prevent, prepare, detect, and respond to climate change threats to health and increase the awareness and preparedness of the general public
4. Design, test, and evaluate innovative win-win adaptation solutions to feed health system planning

5. Largely upscale adaptation measures and best practices from demonstration sites to other institutions inside and outside the mountain biogeographical area.

MOUNTADAPT will produce key resources to support the achievement of these objectives:

- climate and health models
- monitoring and emergency management tools
- integrated systems
- adaptation guidance and recommendations
- trainings
- impact assessment applications.

A Full Guide for Adaptation Solutions will be disseminated widely post-project, providing comprehensive guidance for replicating MOUNTADAPT solutions.

Key Target Audiences

- **Healthcare Actors**
  Including healthcare staff, sustainability managers, and students and focussing on scientific knowledge, training, and awareness campaigns to foster a community of practice.
- **Scientific Community and Initiatives**
  Targeting climate and health researchers, promoting open science through publications and joint activities.
- **Public Authorities and Decision-Makers**
  Engaging with EU, national, regional, and local authorities to share lessons learned and promote transformative solutions.
- **Local Citizens**
  Involving individuals and vulnerable groups, promoting engagement and co-creation for local climate resilience.
- **Innovators and Investors**
  Attracting research entities, private solution providers, and investors to advance innovative solutions tested in MOUNTADAPT.

The MEWRS Framework

The MEWRS framework aims to deliver an all-encompassing, end-to-end multi-hazard Monitoring, Early Warning, and Response System to build resilience against health risks caused by climate change. The project architecture integrates independent tools that interoperate seamlessly, ensuring continuous environmental surveillance, risk modeling, warning communication, and efficient crisis management.

This report presents the process and outcomes related to the development and adaptation of the key components within MEWRS:

PR2: MONITORING TOOLS

Within MOUNTADAPT, advanced monitoring tools enable the continuous collection of environmental and health-related data to support local environmental and epidemiological surveillance, providing a robust foundation for analysis and modelling activities essential for climate adaptation in mountain regions.

PR2.1 VECTRACK system (IRIDEON)

IRIDEON's VECTRACK system: IoT end to end solution focused on a digital early warning of vectors of arboviral infectious zoonotic diseases (virus transmitted by mosquitoes). The VECTRACK sensors deployed in the field automatically collect and analyse information about airborne vectors of arboviruses, wirelessly transmitted to a machine-learning cloud server. The information is made available in near-real-time (updated every 30minutes), and each recorded event is tagged with a time stamp with a resolution of 1 second.

This solution is entirely focused on a Climate Change related hazard, as invasive mosquitoes are spreading exactly due to Climate Change. Furthermore, extreme events like heatwaves, floods, heavy precipitation and storms, are hazards that generate the conditions for outbreaks of vector borne diseases, The presence, abundance and dynamics of vectors is powerful and novel bio-indicator to build resilience towards health risks caused by the effects of climate change, that can be combined with other data sources (e.g. air quality, extreme weather forecasts) to generate novel and improved monitoring and forecast models for climate and health.

The World Health Organization estimates that vector-borne diseases (Zika virus, dengue, yellow fever, etc.) account for more than 17% of all infectious diseases (WHO, 2020), with more than half of the world's population at risk. Climate change can enhance the transmission dynamics, geographic spread and re-emergence of vector-borne diseases, and alter entire ecosystem habitats (including urban habitats), making vectors thrive (Rocklöv et al, 2020).

Outbreaks of arboviruses in Europe are a very concrete case of high-impact climate-related stressors of concern to the EU. Any society to be truly resilient to other events like flooding, storms, heat-waves and fires, must also be ready to what happens after these events, and vector-borne disease outbreaks are one of the most impactful and dangerous disaster events that happen as a consequence of climate change related hazards. Moreover, mosquito vectors are successfully colonizing mountain areas, where arboviral diseases outbreaks are happening and spreading due to climate factors.

The VECTRACK prototype has been demonstrated in the Mediterranean area. In this CLIMATE-01-03 project, the VECTRACK system will for the first time be demonstrated at Alpine sites under the perspective of climate change related hazards, and have its data integrated with other technologies related to different hazards, generating a multi-hazard early warning system. Another particular contribution of VECTRACK in this project, is to use the demo sites to actually screen for the presence of possible dangerous species in Alpine areas where SoA disease vector surveillance is not yet fully mature as in other Biogeographical Regions, like Mediterranean, Atlantic, Continental, etc. During the 3 years of project, VECTRACK could be used to make an early detection of the potential beginning of entry and colonization of invasive vector species at Alpine sites, as this Biogeographical Region has become suitable for the dangerous Aedes arboviral vectors (ECDC 2023). This action would be a real breakthrough, of the utmost importance and impact for EU public health authorities, the ECDC (European Centre for Disease Prevention and Control), and the EC.

PR2.2 Indoor environmental quality (IEQ) monitoring method (CSTB)

The IEQ monitoring solution, which will be implemented by CSTB at three demonstration sites, will measure a dozen indoor physical parameters continuously or semi-continuously during the periods of interest, e.g., the summer period focusing on the occurrence of heat waves and the winter period focusing on the occurrence of wood heating related pollution. These parameters, such as air temperature and concentrations of chemical and particulate pollutants, will allow the calculation of indoor air resilience during the target periods.

PR3: Integrated Systems

The project integrates models and real-time data streams into comprehensive platforms, equipping health authorities and systems with timely, actionable information for the communication of early warnings and adapted response in the face of climate-induced hazards.

PR3.1 SURVIRAL (UMIT)

The system implemented in this project enables the simulation of population dynamics and the spread of disease-transmitting mosquito species (in particular Aedes aegypti and Aedes albopictus) in a defined area (country, city, continent, etc.). In this demonstration case, the federal state of Tyrol in Austria was selected. The basis is an agent-based model that was implemented in the existing SURVIRAL framework and maps the biological development stages of mosquitoes (egg, larva, pupa, adult) with species-specific parameters. Temperature and precipitation data from both historical measurements by GeoSphere Austria and regional climate models (EURO-CORDEX, REMO2009, RCP scenarios) are integrated as key influencing factors. In addition, biological parameters such as development and mortality rates, overwintering strategies, and reproductive cycles were extracted from the scientific literature. The system can be used to simulate various climate scenarios and assess their impact on the establishment and spread of vector populations. This forms the basis for risk analyses of diseases such as dengue, Zika, and chikungunya.

PR3.2 Air Advanced Sentinel, ex Vision360 (ARIA)

AirAdvanced® Sentinel (hereafter "Sentinel", ex Vision 360) is a digital solution developed by SUEZ Air & Climate/ARIA Technologies to centralise environmental observations and atmospheric modelling outputs into an intuitive platform for decision support. Within MountAdapt, Sentinel is deployed to make air quality, pollen and related environmental information accessible, understandable and actionable for healthcare providers, municipalities and citizens. It integrates physical sensors with advanced dispersion and forecast modelling, including the use of virtual stations to cover areas without monitors.

The solution supports the project's aim to anticipate and mitigate environmental-health risks in mountainous/urban contexts, enabling data-driven operational responses and public communication. The modular architecture allows tailoring to each demonstrator's context and constraints. Primary users include hospital and elderly-care operators, municipal environmental and public-health teams, and regional air-quality agencies.

The expected outcomes include enhanced situational awareness, early warning capabilities through configurable alerts, and robust evidence to support the organisation of services and interventions during critical environmental episodes.

PR3.3 LIFE RESYSTAL ecosystem (NCSRD)

LIFE RESYSTAL project provided a holistic approach, from climate risk to adaptation solutions and cost-benefit, alongside guidelines and best practises. Parts of the outcomes of the project has been bundled as LIFE RESYSTAL ecosystem and is further being developed in MOUNTADAPT project. In the current context, LIFE RESYSTAL ecosystem comprise of climate hazard analysis, vulnerability and climate risk analyses, applied in demonstrators' sites of the project. Different hazards, levels of analysis, future time periods and climate scenarios are being offered. LIFE RESYSTAL ecosystem can be applied:

- Regularly with the release of new IPCC climate scenarios
- When a new adaptation measure(s) has been taken in order to assess the new status of the infrastructure
- Changes in the facilities (e.g. new building) need to be assessed
- New hazards, more time periods or climate scenarios needs to be assessed

In general, LIFE RESYSTAL ecosystem provides a long-term timescale aspect of the communication of early warnings and adapted response concept, enabling an evidence-informed decision-making process.

PR4: Emergency Management Tool

The emergency management tool (PR4) efficiently mobilises healthcare staff in crisis time, supporting healthcare facilities in preparing for and responding to climate-related emergencies by ensuring optimal organisation of staff and resources.

PR4 MenKorn CALL (CRISISOFT)

MenKorn CALL is a collaborative web-based solution for mobilising and engaging staff. MenKorn CALL is aimed at organisations wishing to launch multi-service staff recall campaigns by controlling the flow and allocation of mobilised staff.

MenKorn CALL enables the distribution of staff mobilisation tasks at different hierarchical levels between directorates, departments and services.
Flow management makes it possible to mobilise only the necessary resources and to direct people to geographical areas, missions, teams and intervention vehicles.
Communication and supervision functionalities complete the solution.

Functional scope	MenKorn CALL
ALERT (mail, SMS, voice calls).	✓
SITUATION REPORTS with access to the event monitoring observatory.	✓
MOBILISATION OF STAFF (recall of personnel, automatic engagement/disengagement, orientation, assignment of missions…).	✓

REPORT available to all actors connected to the event.	✓
DEVICE MANAGEMENT Operational areas & mapping to size the device and distribute the teams and vectors.	✓
SUPERVISION (logs, communication, reports, statistics)	✓
SIMULATOR (training & exercises)	✓

1. Development and Adaptation of MEWRS Components

The development and adaptation process, carried out between Months 4 and 15 (M4–M15) under Task 2.2, was led by ARIA with active contributions from IRIDEON, CSTB, NCSRD, and CRISISOFT. This collaborative effort involved the co-design and development of key components covering monitoring, integration, and emergency management. A strong emphasis was placed on ensuring interoperability between tools through RESTful APIs and standardised data exchange protocols. Solutions were tailored to address the specific requirements of mountain environments and healthcare facilities within demonstration sites such as Grenoble and Alba Iulia. Validation was achieved through pilot deployments and iterative feedback loops, ensuring robustness and relevance of the MEWRS components.

PR2: Monitoring Tools Development and Adaptation

Key Objectives: *IRIDEON and CSTB focus on continuous environmental and epidemiological surveillance through the use of standardised in-situ monitoring methods, compliant with ISO/EN standards and utilising low-cost sensors. Existing monitoring tools are adapted to the specific conditions of mountain environments, while a co-developed indoor air resilience metric and tailored occupant questionnaires address the unique needs of healthcare facilities. Furthermore, the indoor environmental quality (IEQ) monitoring tools, originally developed by the French Observatory for Indoor Environmental Quality (OQEI), are specifically adapted for application within healthcare contexts.*

PR2.1 VECTRACK system (IRIDEON)

a. Pre-implementation preparation

The preparatory steps taken prior to deployment at each DEMO site, required acquiring site specific information on assets and capacities. This was done through interviews with people with managerial responsibilities at each site.

1- Determine the existence of an on-going vector surveillance programme.
2- In the absence 1), identify human resources with previous experience in vector surveillance.
3- In the absence of 2), identify human resources with training in biology, ecology, and environmental sciences or similar.
4- Assess the existing logistic capacities and assets to install, maintain and manage smart-trap stations, and define a supplying plan to provide non-existent assets (e.g. commercial professional mosquito traps, accessories and consumables).
5- Identify monitoring sites adequate to deploy the solution for mosquito surveillance
6- Train the local technicians in the use of the Vectrack system

b. Solution's architecture and design

<u>Description of the technical and functional architecture of the solution:</u>

VECTRACK is capable of accurately differentiating mosquitoes from other insects, and is also capable of classifying the species, the sex and the approximate age of the mosquitoes. To the best of our knowledge, VECTRACK is the only field-tested technology capable of doing this, making a disruptive contribution to the digitization of surveillance of vector based zoonotic infectious diseases.

- Data is collected automatically from each trap and the data sent wirelessly to a server, reducing to zero the working hours dedicated to trap inspection of a colonized area and insect spread as well.
- Insects are counted automatically in the optical module of the trap. All traps report their data flawlessly and accurately.
- Species, sex and age identification done automatically at the optoelectronic module. In the event that the trap attracts non-target insects these will not be accounted for.
- The system acquires vector information in real-time, so Health Agencies have a daily report, thus preventing that an infestation breaks out unnoticed and impeding any disease outbreaks in local populations.
- Since the system acquires daily and accurate information on pest population density in the field, the Vector Control Technicians will timely implement with precision and cost-effectiveness all necessary control measures.
- Full traceability and record of pest data, building historical records easily shared and compared with other regional or national authorities, and trans-nationally between EU member states.

- Simultaneous acquisition of pest and microenvironmental data, and the end-user may request the information in near real-time.

Details of the hardware architecture:

The optoelectronic sensor prototype called VECTRACK that has been created by IRIDEON, is already capable of distinguishing between genus and sex in field conditions, and species, sex and age of mosquitoes in laboratory conditions. The mosquito sensor is an optoelectronic device comprising an emitter, an array of LEDs, and an array of phototransistors acting as photoreceptors connected in parallel. This optical setup generates a light field. The sensor constantly captures the input from the sensor but only processes the samples when a triggering event occurs, i.e., when there is a perturbation of the light field. Optical sensor, microprocessor, and wireless communications are integrated into the electronics module.
Smart trap stations can be deployed as a wireless sensor network (WSN) with bidirectional management of data between sensors and a cloud application framework. When an insect is drawn into the trap equipped with a sensor, its characteristic wing flapping modulates the light field.
Captured signals are sampled at a rate sufficient to resolve the fundamental frequency of the wing-flap as well as several overtones. The light field is also perturbed by other physical elements associated to the flying insect: the kinetics of flight (speed, direction, and trajectory) and morphology (body/wing size and shape). Each of these physical elements of flying insects that cause a perturbation of the light field leads to a species-specific signature. The signal of this signature is filtered, amplified, acquired and processed using a combination of AI methods.
The sensor contains an optical emitter panel and an optical receiver panel which face each other through a transparent flight tube with a diameter of 105 mm. The optical emitter comprises a two-dimensional (2D) array of 940 nm wavelength infrared light emitting diodes (LEDs); and the optical receiver comprises a 2D array of 940 nm photodiodes.
The optical sensor has an active length of 70 mm in the downward direction. The output of the optical sensor is amplified and acquired by an analogue to digital converter (ADC) with a sampling frequency of 9603 samples per second. When a mosquito enters the sensing volume, it automatically triggers a recording of up to 1024 samples, i.e., of up to 107 milliseconds duration. The duration of a typical mosquito flight is around 50 milliseconds. The sensor automatically adds a timestamp to each recording, along with the measured ambient temperature.

Figure 1: VECTRACK sensor manufactured in MOUNTADAPT

c. Interface overview

The software powering the VECTRACK solution, denominated Senscape Hub, is very simple and intuitive.

Invitations to Senscape Hub
A person can be registered as a user by receiving an invitation via email to join an account. The new user simply follows the instruction of the email, and creates the login details: Email and Password.

To access the software:
1. Go to: https://senscape.eu/login
2. Write your email address, and the password that you created when you accepted the invitation the first time.
3. If the user does not know the password, then just needs to write the email address, click on “Forgot password?”, and follow the instructions. The user will create a new password and can gain access to the software.

Home page
The Senscape Hub Home page shows the results of ALL the sensor units associated to the account. The results are shown in different type of charts: i) Timeline of number of samples per day, ii) Histogram, iii) Timeline of individual samples.
At the end of the Home page, there’s a map showing the location of each sensor.

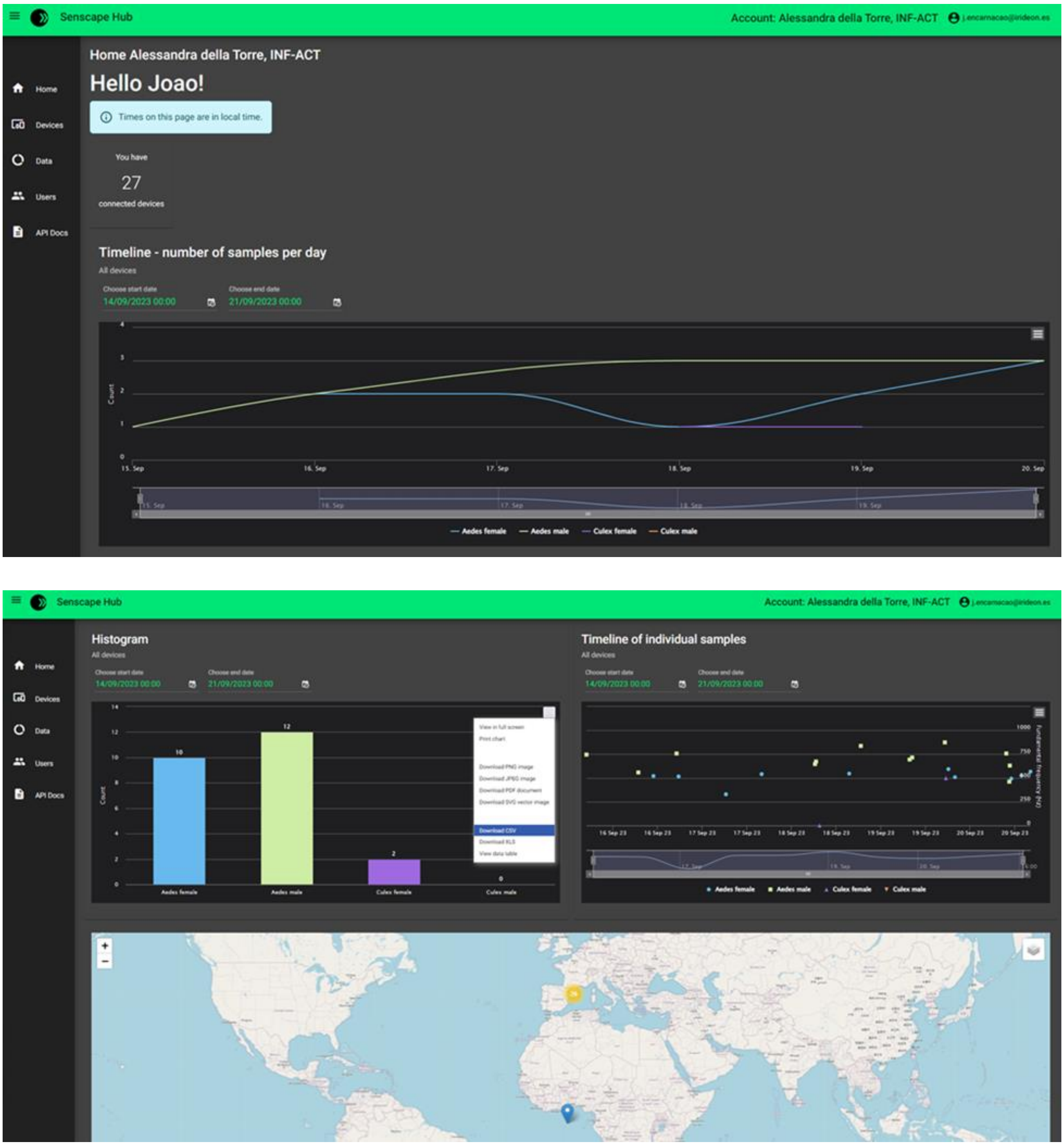


Figure 2: Senscape Hub home page

Clicking on box in the superior right corner of each chart, the user can see drop-down menu. Among other things, this menu allows the user to download the data between two dates and hours, as a CSV or XLS file. Each chart exports data in different ways.

The Home menu on the left has the following options

- <u>Devices-</u> Shows the list of all sensors associated to the account. To consult the results of only one sensor, click on "Details", which will take you the Home page of only that specific sensor.

- Data- Shows the data generated by all the sensors associated to the account. To filter the data, you can use the upper menu. You can for instance choose only one sensor, choose the classifications of interest, and choose start and end dates. You can download the data by clicking on “Download selection” and then “Download”.
- Users- Shows the list of users registered in the account. This page can also be used for a user with the profile of “Admin” to invite new users. The new users can be invited with the role of “Admin” or simply as “Guest”
- API docs- Shows the instructions in shell and python on how to use the API, so that the user can use his/her own server and software to collect, store and visualize the data of the sensors, i.e. retrieve a list of possible classifications of the data records based on the devices in the user account.

Edit device location before deploying sensors in the field

The sensors have a GPS module. However sometimes the traps are placed in a spot where the satellite signal may be blocked by vegetation, buildings, etc. Therefore the best procedure is to always write the coordinates or the address of the place where you want to install the sensors. This is done by clicking on “Devices”, then “Details” and then “Device info & config”. The figure below shows that the sensor has been attributed an address in Rome.

When the sensor in installed in the field, if it gets the GPS coordinates automatically, these replace the address. If not, then the typed address ensures the location of the sensor.

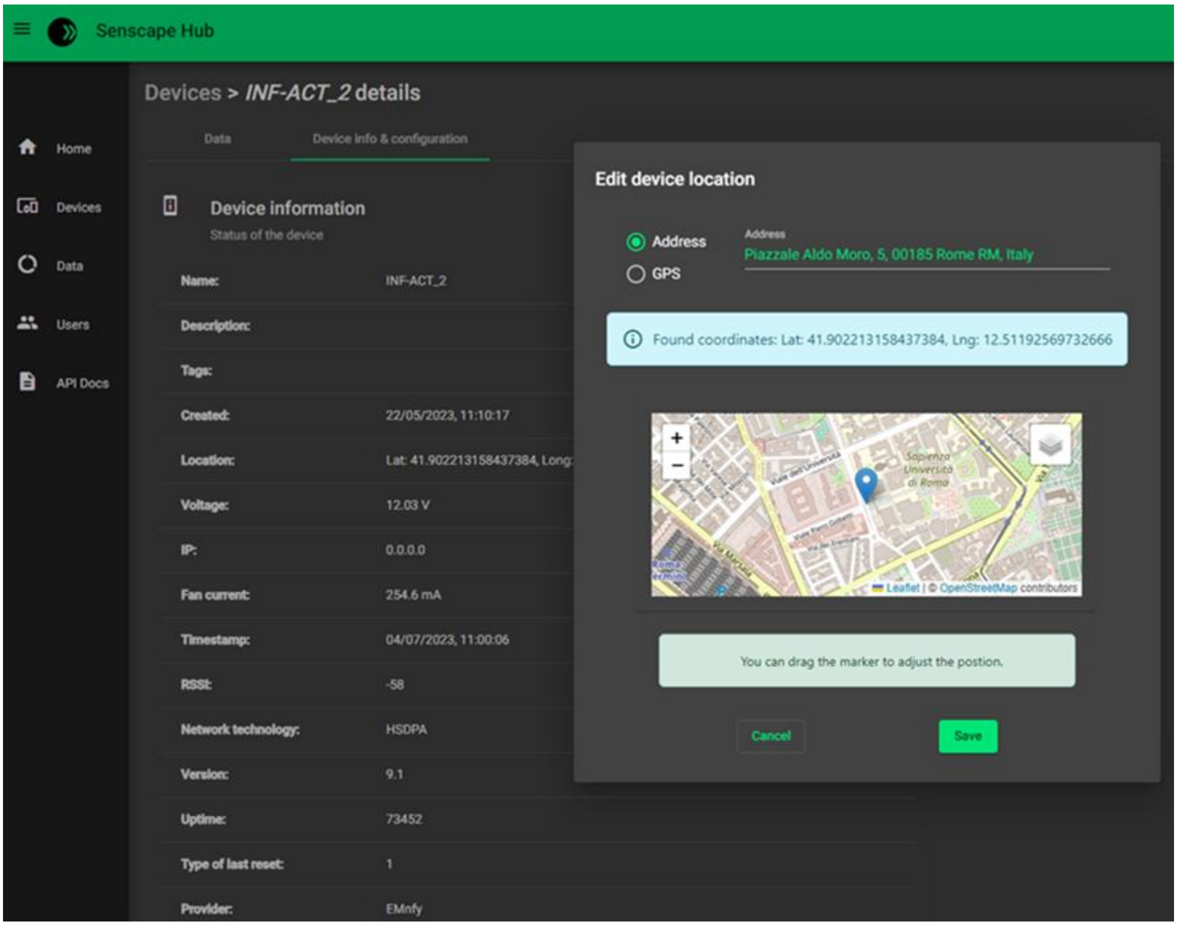


Figure 3:Senscape Hub Device & Configuration

d. Environmental or health challenge identified

Public Health Agencies need to detect and count insect vectors to determine where control measures are needed and assess their effectiveness. However, the efficiency of such process depends on knowing the time and location of pest dynamics and density, as early as possible. Vector detection and counting is typically performed by means of traps, which are regularly collected and manually analysed. Even using the most efficient traps available in the market, the main problem is that the manual inspection is very laborious and expensive. Also, a lag is created between the time the trap is placed and inspected. This lag may only be a week, but in the case of mosquitoes this can be more than half their adult life span. Therefore, the dynamics of vector population cannot be accurately and timely monitored to prevent outbreaks, which explains why still today up to 700 million people are infected and more than a million die each year from mosquito-borne diseases.

IRIDEON began working on a smart trap in 2016 (TRL1). The sensor prototype installed in commercial traps has been tested in relevant environment, and benchmarked by experts. The prototype now differentiates mosquitoes from other insects, and classifies genus and sex of Aedes and Culex species with an accuracy of >80%. These units are the ones deployed at the MOUNTADAPT demo sites.

Description of the intended users:

- Municipalities
- Health and environmental protection agencies
- Civil defence organisations.
- Public and private IPM professionals.
- Vector control technicians.
- Hospitality industry.

Description of the expected outcomes:

- Eliminate costs for manual inspection of traps with solution 3 times cheaper than reference SoA;
- Support the work of Health Protection Agencies with less resources and public costs;
- Reduction of costs of medical assistance to populations infected by vector-borne diseases. Prevent the increasing number of cases of diseases like Dengue, West Nile and Chikungunya;
- Contribution to improve sustainable control of disease-carrying mosquitoes, and to efficiently fight dangerous invasive pest spread all over Europe;
- Reduction of pesticide use and related costs. Sustainable use of insecticides ensuring a high level of environmental and human health protection, complying with new EU regulations REACH and MRLs;
- Protect EU populations in urban and rural areas. Reduce the burden of the diseases carried by mosquitoes, by reducing probability of outbreaks;
- Creation of new IPM services for municipalities, extending surveillance networks and job creation to all urban and rural areas at risk.
- Help fill a knowledge gap in ECDC policies: improved implementation of ECDC guidelines and EU Network for the epidemiological surveillance and control of communicable diseases (2119/98/EC);
- Better understand mosquito dynamics/ infestations, eradication and surveillance practices;
- Consolidate transnational knowledge on European regions affected by mosquitoes;

PR2.2 Indoor environmental quality (IEQ) monitoring method (CSTB)

a. Indoor air resilience metric

The Performance-based Assessment of Indoor Air Resilience (PAIR) method was developed to guide the building's adaptation to climate change and assess its indoor performance and resilience. The PAIR method includes:

1) Define the indoor air resilience metric depending on the extreme weather event (e.g., heat waves, cold waves, and extreme outdoor pollution);
2) Predict the theoretical resilience using indoor thermal, aeraulic, and chemical numerical models for specific weather conditions;
3) Evaluate practical resilience based on in-situ measurements in occupied buildings over a period of time;
4) Assess the overall resilience of indoor air to climate change.

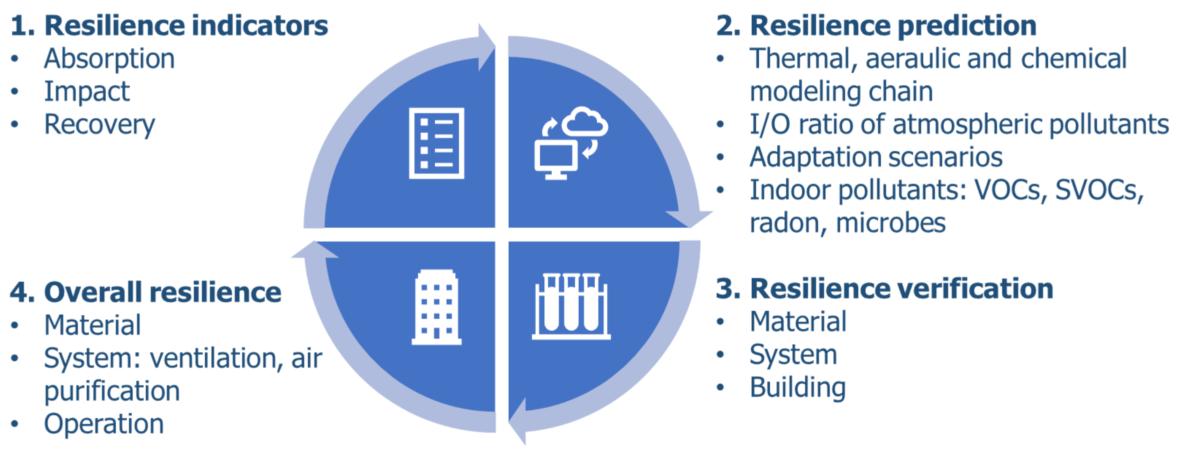


Figure 4. Performance-based Assessment of Indoor Air Resilience (PAIR) method

For the demonstration sites in Grenoble, Selnica, and Alba Iulia, the extreme weather events were defined as heat waves and extreme outdoor pollution. Therefore, the indoor air resilience metric was defined based on 10 indicators:

1) Air temperature
2) Air relative humidity
3) CO_2

4) Airborne particles PM_1
5) Airborne particles $PM_{2.5}$
6) Airborne particles PM_{10}
7) Ozone
8) NO_2
9) Formaldehyde
10) Total volatile organic compounds (TVOC)

IEQ monitoring will be conducted in the selected rooms at the three demonstration sites during the summer of 2025 and the winter of 2025 – 2026. The temperature, relative humidity, and the concentrations of CO_2, PM_1, $PM_{2.5}$, PM_{10}, ozone, NO_2, and formaldehyde will be measured continuously every 10 minutes, while the weekly-average TVOC concentration will be sampled using passive samplers followed by a laboratory analysis.
The resilience index will be calculated for the summer and winter seasons, respectively, based on the probability and amplitude of each indicator exceeding its threshold value.

$$Exceeding\ probability = \frac{\sum t|_{Ratio>1}}{Total\ time}$$

$$Exceeding\ amplitude = \left.\frac{\int (Ratio-1)dt}{\sum t}\right|_{Ratio>1}$$

$$Resilience\ index = \frac{\sum_{Parameter} Exceeding\ probability \times Exceeding\ amplitude}{Number\ of\ parameters}$$

Parameter	Threshold value	Reference
Temperature	28 °C	RE2020
Relative humidity	65%	WHO
CO_2	800 ppm	French regulation
PM_1	15 µg/m^3	WHO for $PM_{2.5}$
$PM_{2.5}$	15 µg/m^3	WHO
PM_{10}	45 µg/m^3	WHO
Ozone	100 µg/m^3	WHO
NO_2	25 µg/m^3	WHO

Formaldehyde	100 µg/m^3	WHO
TVOC	300 µg/m^3	UBA

Table 1. Threshold values for the indoor air resilience indicators

b. Indoor environmental quality (IEQ) monitoring tools

The IEQ monitoring will be conducted over 13 weeks in summer and winter, respectively, using NEMO loggers for temperature, relative humidity, CO_2, PM_1, $PM_{2.5}$, PM_{10}, ozone, NO_2, and formaldehyde, and passive samplers for TVOC. Once turned on, the NEMO loggers automatically take measurements at 10-minute intervals, while VOCs must be sampled every seven days.

The NEMO measurement kit contains:

1) A NEMO logger,
2) A magnet,
3) A tube containing the formaldehyde calibration badge (black photo film) and CO_2 calibration badge (white plastic monolithic),
4) A micro-USB cable and a power adapter.

Figure 5. NEMO measurement kit

The sampling of VOCs requires the following materials:

1) A Radiello diffusion cartridge contained in a glass tube. The cartridge is cylindrical with an external diameter of 4.8 mm and containing 300 mg of graphitized charcoal
2) A yellow diffusive body. Each diffusive body should not be used more than 10 times
3) A modified adapter.

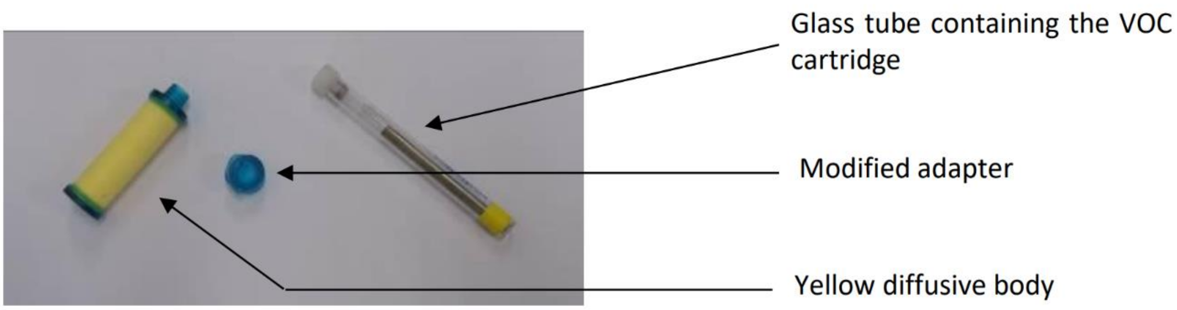


Figure 6. VOC sampler

To perform monitoring in healthcare facilities, the equipment and materials used must meet local hygiene requirements and the materials must be protected from occupants/patients to prevent damage. Therefore, all monitoring materials will be placed in a stainless-steel support to ensure hygiene and prevent risk.

Figure 7. Monitoring materials in a stainless-steel support

Table 2. Sampling locations

Demonstration site	Building
Grenoble	2 hospital rooms and 1 outdoor sampling location
Selnica	2 healthcare facility rooms and 1 outdoor sampling location
Alba Iulia	1 room in a day centre for elderly and 1 outdoor sampling location

c. Occupant questionnaires

A questionnaire is provided to the building manager/user to collect information on building characteristics, usage, and occupant perceptions of thermal comfort and indoor air quality. The questions include the following aspects:

1. Building characteristics
2. Building occupancy
3. Heating, ventilation, and air conditioning
4. Moisture and odour
5. Location of the monitored room in the building
6. Room description
7. Description of floor, ceiling and wall coverings in the room
8. Description of room openings
9. Room maintenance and cleaning
10. Thermal comfort
11. Indoor air quality

PR3: Integrated Systems Development and Adaptation

Key Objectives: *NCSRD, Aria, and UMIT contribute to MOUNTADAPT by integrating early warning systems and facilitating their communication to relevant stakeholders. Their work supports climate adaptation decision-making within healthcare settings, ensuring that timely alerts and actionable insights are available to guide responses to climate-induced health risks.*

PR3.1 SURVIRAL Agent-Based Epidemiological Model (UMIT)

a. Pre-implementation preparation

The preparatory phase prior to implementation played a key role in establishing a sound basis for subsequent modelling and adaptation within the MOUNTADAPT project. At the outset, a needs analysis was conducted in close consultation with relevant stakeholders, including experts from the fields of health, environment, and climate adaptation. The aim was to clearly outline the key issues: Which mosquito species are the focus? Which geographical regions are considered a priority? Which climate scenarios and time horizons should be taken into account, and which indicators are relevant for assessing vector distribution?

At the same time, a systematic survey and review of available data sources was carried out. Historical climate data was compiled from national weather archives (e.g., GeoSphere Austria) and checked for completeness and quality. Regional climate models from the EURO-CORDEX consortium were used for the future scenarios. These data had to be processed and harmonized in terms of temporal resolution, spatial granularity, and relevant variables (daily mean, minimum, and maximum temperatures, as well as precipitation) in order to be used in the simulation.

In addition, the scientific basis for the modelling was established. It was decided to use an agent-based simulation model that replicates the life cycle of the vectors – consisting of the egg, larva, pupa, and adult stages – in daily steps. Species-specific parameters such as development times, survival rates, and egg-laying behavior were to be taken into account in order to map biologically realistic dynamics. In addition, initial technical preparations were made: the provision of a server-based runtime environment, the setup of a database for simulation results, and the definition of interfaces for data exchange with other MOUNTADAPT modules.

Another important part of the preparation was the development of a validation plan. In addition to plausibility checks, this plan also provides for comparison with known biological patterns, for example with regard to the seasonal activity of species or their sensitivity to extreme climatic events. Sensitivity analyses were planned to test the robustness of the model against changes in individual parameters. Overall, this created a methodologically and technically sound foundation on which the actual implementation could be based.

b. Solution’s architecture and design

The architecture of the solution was designed to meet scientific requirements for accuracy and transparency while also offering the flexibility needed for practical application. At its core is a multi-layered design consisting of data storage, a simulation core (SURVIRAL), a service layer, and a user interface.

Data storage forms the bottom layer and is responsible for storing, processing, and managing both the input data and the simulation results. Here, the historical and projected climate data, which have been harmonized beforehand, are stored in a uniform structure. At the same time, all simulation results – from individual development stages to aggregated indicators – are stored in versions so that they can be reproduced and traced at any time.

Above this is the simulation core, which is the heart of the architecture. It is based on an agent-based approach implemented in Java and some pieces in Python in which each vector acts as an actor within a defined grid. Biological reality is modeled by state machines that control the transition between the egg, larva, pupa, and adult stages. Crucial environmental factors such as temperature and precipitation directly influence these transitions and determine development rates, mortality, and reproductive capacity. Implementation in Java enables a clear separation between species-independent basic functions and species-specific extensions, so that new species can be added modularly as needed.

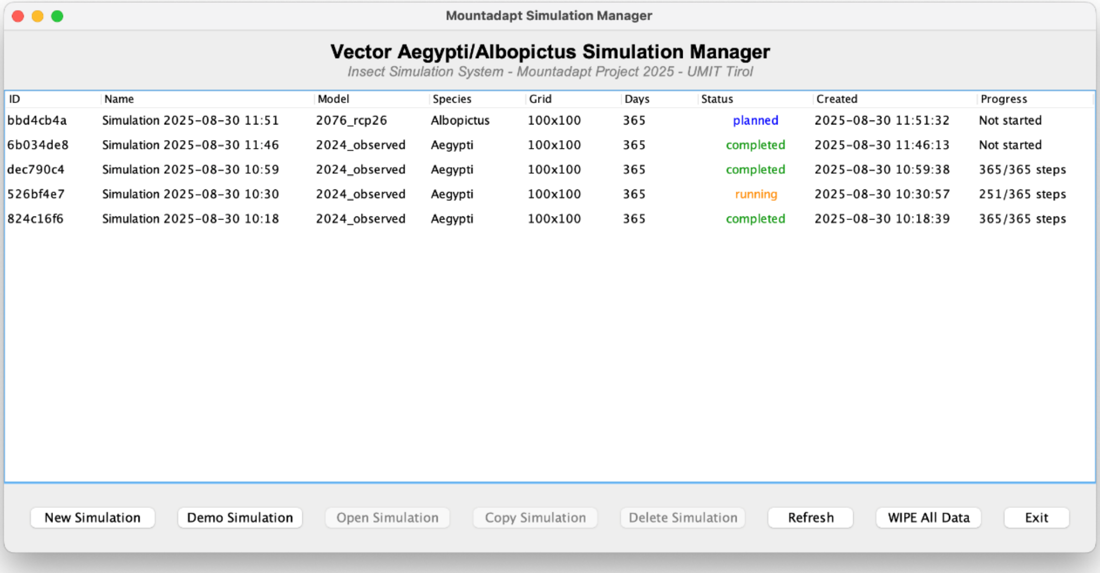
The simulation core is followed by the service layer, which serves as an interface between the core and applications. An API provides central functions, including starting, stopping, and configuring simulations, querying results, and exporting data in common formats such as CSV or GeoJSON. This layer ensures that the simulation results can not only be used within the system, but can also be integrated into other MOUNTADAPT modules. Furthermore all simulated results can be stored in PostgreSQL relational database system.

The top level is the user interface, which translates the complexity of the model into an understandable and practical form. It visualizes results in interactive maps, time series, and comparison views, and allows different scenarios to be weighed against each other. Particular emphasis was placed on designing the architecture in such a way that it remains expandable, high-performing, and transparent. Each simulation can be traced via unique identifiers and complete logging of the input parameters. This makes the solution not only a research tool, but also a practical tool for decision support.

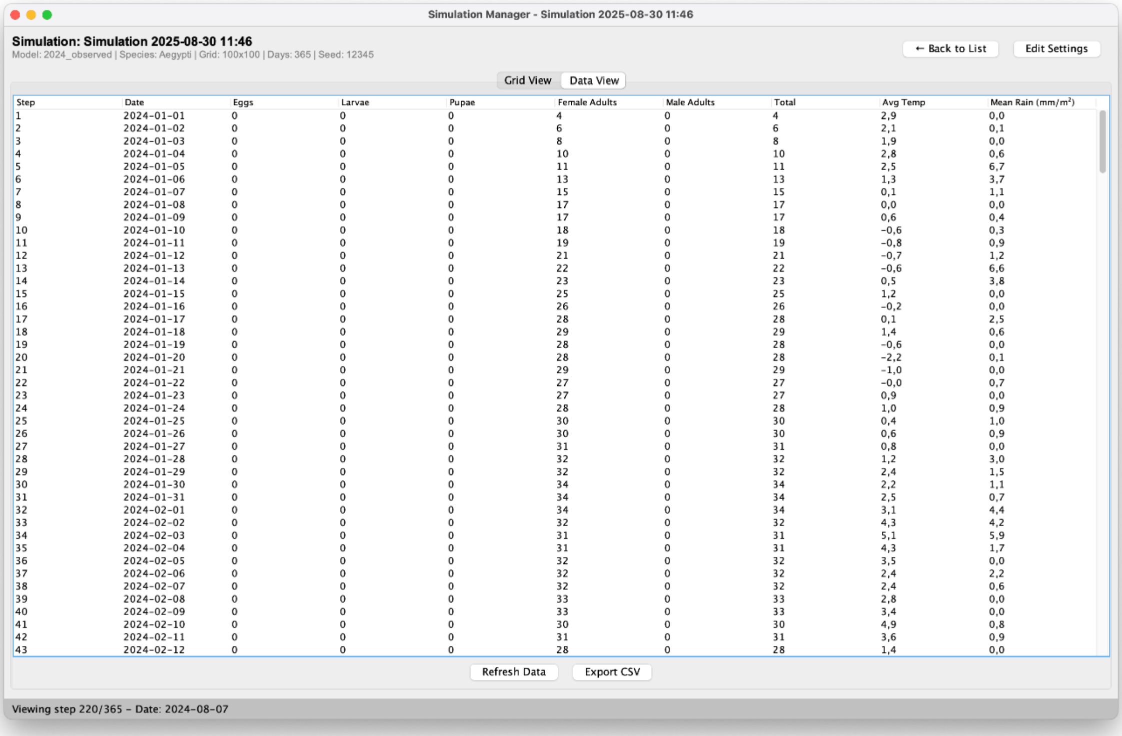
c. Interface overview

The interface was developed with the aim of enabling users to interact with the simulation results in an intuitive yet scientifically sound manner. It is divided into several main areas that are coordinated with each other and serve different information needs.

The basic scenario configuration takes place in the simulation window (dashboard). Here, users can choose between historical observation periods and various future projections based on different climate scenarios. In addition, the vector species to be considered can be selected and key parameters such as the simulation period or spatial resolution can be specified. All underlying data sources are displayed transparently so that the origin and quality of the information used remains traceable at all times.

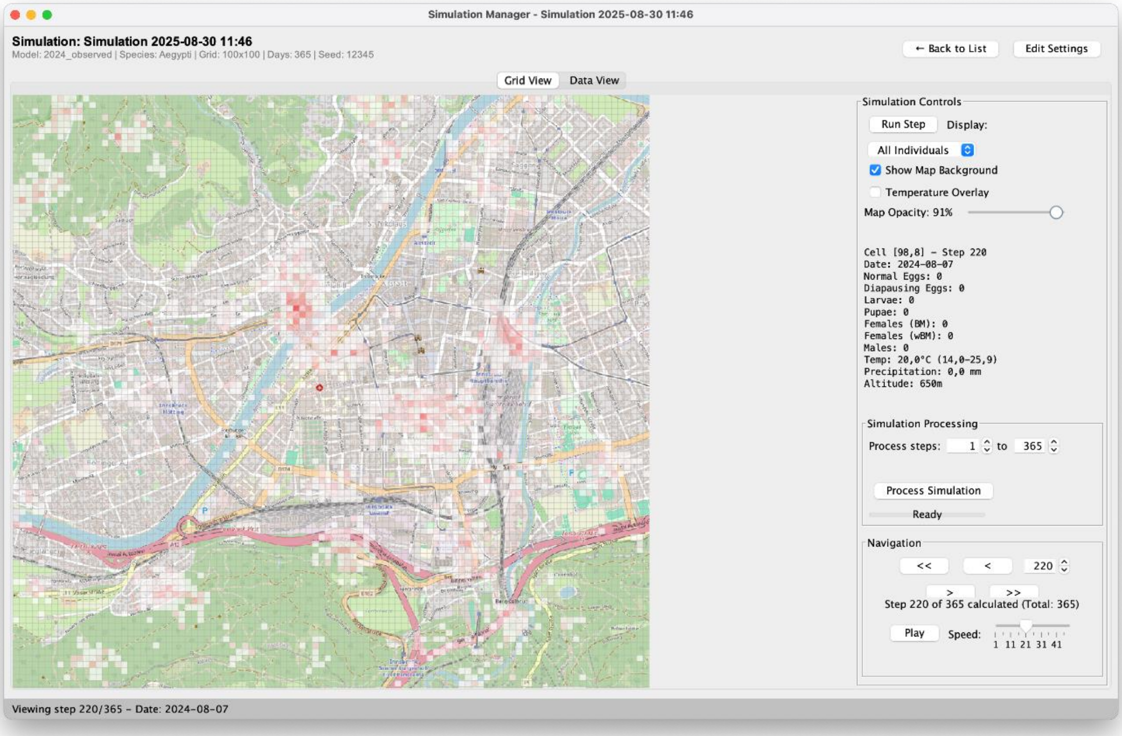


ID	Name	Model	Species	Grid	Days	Status	Created	Progress
bbd4cb4a	Simulation 2025-08-30 11:51	2076_rcp26	Albopictus	100x100	365	planned	2025-08-30 11:51:32	Not started
6b034de8	Simulation 2025-08-30 11:46	2024_observed	Aegypti	100x100	365	completed	2025-08-30 11:46:13	Not started
dec790c4	Simulation 2025-08-30 10:59	2024_observed	Aegypti	100x100	365	completed	2025-08-30 10:59:38	365/365 steps
526bf4e7	Simulation 2025-08-30 10:30	2024_observed	Aegypti	100x100	365	running	2025-08-30 10:30:57	251/365 steps
824c16f6	Simulation 2025-08-30 10:18	2024_observed	Aegypti	100x100	365	completed	2025-08-30 10:18:39	365/365 steps

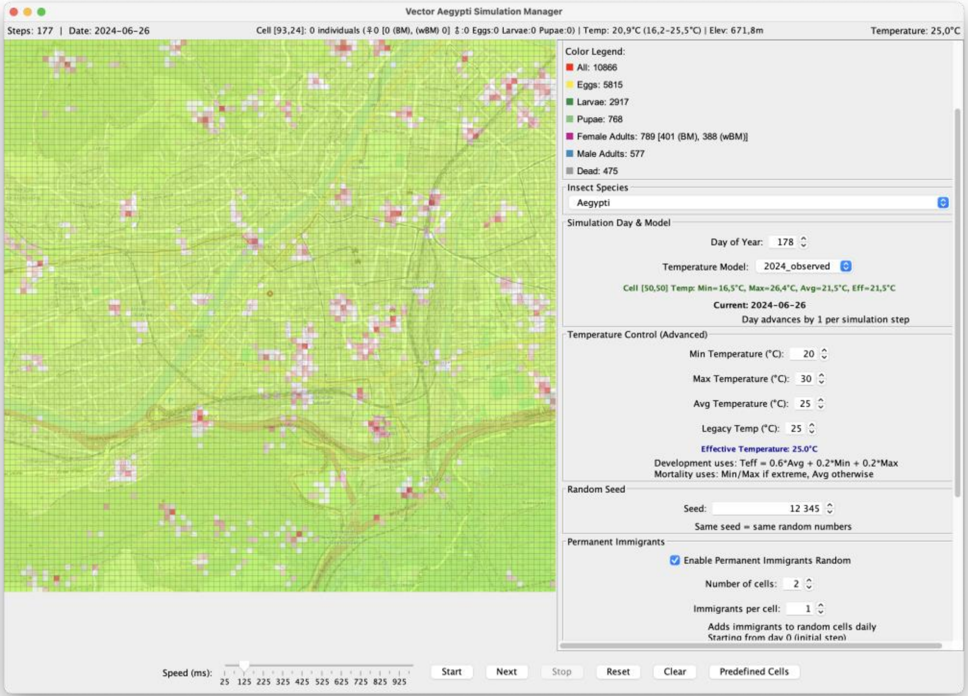


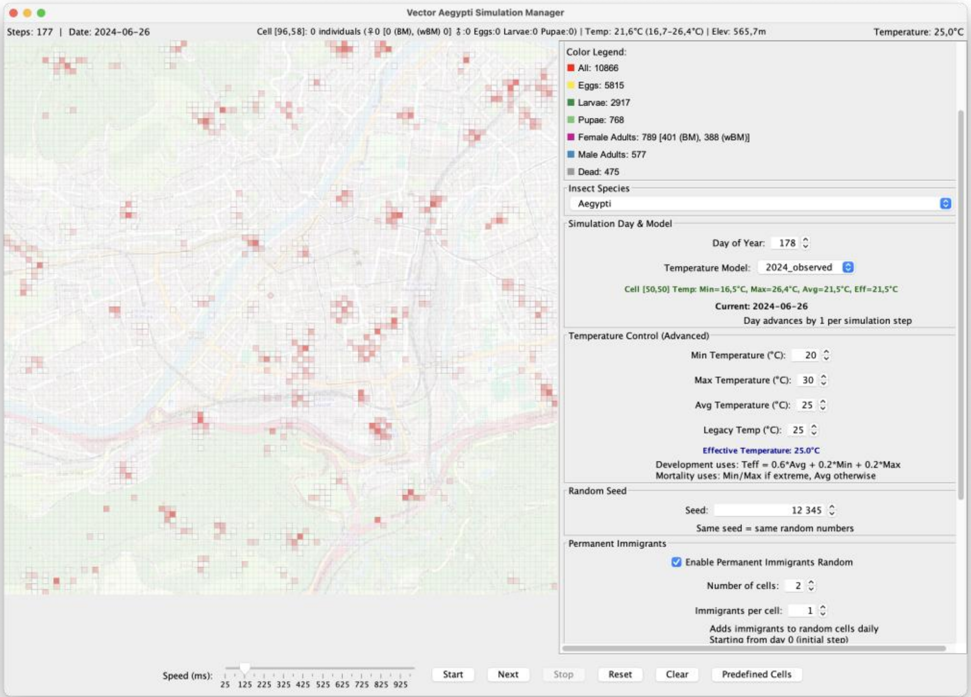
Step	Date	Eggs	Larvae	Pupae	Female Adults	Male Adults	Total	Avg Temp	Mean Rain (mm/m²)
1	2024-01-01	0	0	0	4	0	4	2,9	0,0
2	2024-01-02	0	0	0	6	0	6	2,1	0,1
3	2024-01-03	0	0	0	8	0	8	1,9	0,0
4	2024-01-04	0	0	0	10	0	10	2,8	0,6
5	2024-01-05	0	0	0	11	0	11	2,5	6,7
6	2024-01-06	0	0	0	13	0	13	1,3	3,7
7	2024-01-07	0	0	0	15	0	15	0,1	1,1
8	2024-01-08	0	0	0	17	0	17	0,0	0,0
9	2024-01-09	0	0	0	17	0	17	0,6	0,4
10	2024-01-10	0	0	0	18	0	18	-0,6	0,3
11	2024-01-11	0	0	0	19	0	19	-0,8	0,9
12	2024-01-12	0	0	0	21	0	21	-0,7	1,2
13	2024-01-13	0	0	0	22	0	22	-0,6	6,6
14	2024-01-14	0	0	0	23	0	23	0,5	3,8
15	2024-01-15	0	0	0	25	0	25	1,2	0,0
16	2024-01-16	0	0	0	26	0	26	-0,2	0,0
17	2024-01-17	0	0	0	28	0	28	0,1	2,5
18	2024-01-18	0	0	0	29	0	29	1,4	0,6
19	2024-01-19	0	0	0	28	0	28	-0,6	0,0
20	2024-01-20	0	0	0	28	0	28	-2,2	0,1
21	2024-01-21	0	0	0	29	0	29	-1,0	0,0
22	2024-01-22	0	0	0	27	0	27	-0,0	0,7
23	2024-01-23	0	0	0	27	0	27	0,9	0,0
24	2024-01-24	0	0	0	28	0	28	1,0	0,9
25	2024-01-25	0	0	0	30	0	30	0,4	1,0
26	2024-01-26	0	0	0	30	0	30	0,6	0,9
27	2024-01-27	0	0	0	31	0	31	0,8	0,0
28	2024-01-28	0	0	0	32	0	32	1,2	3,0
29	2024-01-29	0	0	0	32	0	32	2,4	1,5
30	2024-01-30	0	0	0	34	0	34	2,2	1,1
31	2024-01-31	0	0	0	34	0	34	2,5	0,7
32	2024-02-01	0	0	0	34	0	34	3,1	4,4
33	2024-02-02	0	0	0	32	0	32	4,3	4,2
34	2024-02-03	0	0	0	31	0	31	5,1	5,9
35	2024-02-04	0	0	0	31	0	31	4,3	1,7
36	2024-02-05	0	0	0	32	0	32	3,5	0,0
37	2024-02-06	0	0	0	32	0	32	2,4	2,2
38	2024-02-07	0	0	0	32	0	32	2,4	0,6
39	2024-02-08	0	0	0	33	0	33	2,8	0,0
40	2024-02-09	0	0	0	33	0	33	3,4	0,0
41	2024-02-10	0	0	0	30	0	30	4,9	0,8
42	2024-02-11	0	0	0	31	0	31	3,6	0,9
43	2024-02-12	0	0	0	28	0	28	1,4	0,0

The central map view displays the simulation results in the form of heat maps. Here, you can see how the populations are distributed spatially, which regions are hotspots, and how the development of the individual stages is represented in the area. Additional climate variables such as temperature or precipitation can be displayed via layers to directly visualize the relationships between environmental factors and vector distribution.



In addition, the time series module offers detailed insights into the dynamics of individual cells or regions. Here, the developments of the various stages can be viewed over the course of the day and directly compared with the climatic conditions. Particular attention is paid to the possibility of displaying historical data and projections side by side so that differences and trends are clearly visible.





A parameter panel allows users to vary specific assumptions in the simulation, such as the rate of immigration, the duration of individual stages of development, or the effects of extreme precipitation events. This allows users to develop their own scenarios and examine the sensitivity of the results. Each change is documented and saved with a unique configuration to ensure traceability.

Finally, the interface offers various export functions that allow results to be downloaded in tabular form or as geodata. The creation of report files with maps and diagrams is also provided for, so that the results can be directly incorporated into decision-making processes. This combination of clarity, depth of detail, and transparency makes the interface a central tool within Mountadapt that meets both scientific demands and practical requirements.

PR3.2 Air Advanced Sentinel, ex Vision360 (ARIA)

a. Pre-implementation preparation

Before implementation, a comprehensive preparatory phase is essential to ensure the Sentinel platform is effectively tailored to the needs of each demonstrator site.
This begins with collaborative workshops involving key stakeholders to clarify the solution's objectives, whether focused on sensor deployment, atmospheric modelling, or a hybrid configuration. These discussions help define the target user groups, alert thresholds, reporting formats, and governance protocols for data sharing. Spatial and temporal parameters, as well as the selection of relevant pollutants or environmental indicators, must be precisely scoped to ensure operational relevance. Throughout this process, our experts are available to provide guidance and recommendations, helping each site identify and select the most appropriate configuration to meet their specific needs.
The effectiveness of robust modelling depends on the acquisition of high-quality datasets, including meteorological inputs, terrain and land-use profiles, and emission inventories. Whenever possible, locally curated inventories should be prioritised over global datasets to enhance spatial accuracy and contextual fidelity.
In Grenoble, the deployment of Sentinel has been made possible through a formal collaboration with Atmo Auvergne-Rhône-Alpes (Atmo AURA) and the Centre Hospitalier Universitaire Grenoble-Alpes (CHUGA). This partnership grants access to their environmental infrastructure, enabling the strategic installation of KUNAK air quality sensors directly on-site. By leveraging these local assets, the project ensures

high-resolution data capture and contextual relevance, reinforcing the operational robustness of the MOUNTADAPT demonstrator.

In addition to physical deployment, further agreements may be required to secure access to essential modelling input data. Notably, for the Grenoble case, contractual arrangements with Atmo AURA could be necessary to obtain detailed emission inventories, which are critical for accurate and locally calibrated atmospheric simulations.

Early engagement with healthcare operators, municipal services, and regional agencies is vital to coordinate sensor siting, infrastructure access, and communication protocols. Technical planning must also account for the development of any missing connectors (e.g. sensor APIs), validation phases for configuration and modelling chains, and structured user training to ensure operational readiness and long-term sustainability.

b. Solution's architecture and design

Sentinel is built upon a modular and scalable architecture that orchestrates the ingestion, processing, and visualisation of multi-source environmental data. It integrates inputs from physical sensors, partner platforms, and atmospheric modelling outputs into a unified framework designed to support decision-making across diverse user profiles.

At the core of the system lies the f-air orchestrator engine, which governs data flows, computational models, processing chains, and automated reporting. This back-end infrastructure is designed as a distributed and scalable environment, with configurations and outputs stored in MongoDB to ensure historical traceability, parallel task execution, and high system availability.

On the user-facing side, Sentinel delivers an intuitive and customisable user experience, with dashboards tailored to individual profiles and levels of expertise. Users benefit from advanced visualisation tools such as interactive maps for real-time data, time-series charts to monitor trends, and pollution plume modelling for environmental insights. Operational features include configurable alerts, full traceability of citizen complaints, and automated report generation. Seamless integration is supported via an open API, enabling effortless connectivity with client portals, business tools, and existing information systems. The figure below illustrates an example of a dashboard as displayed in the Sentinel user interface.

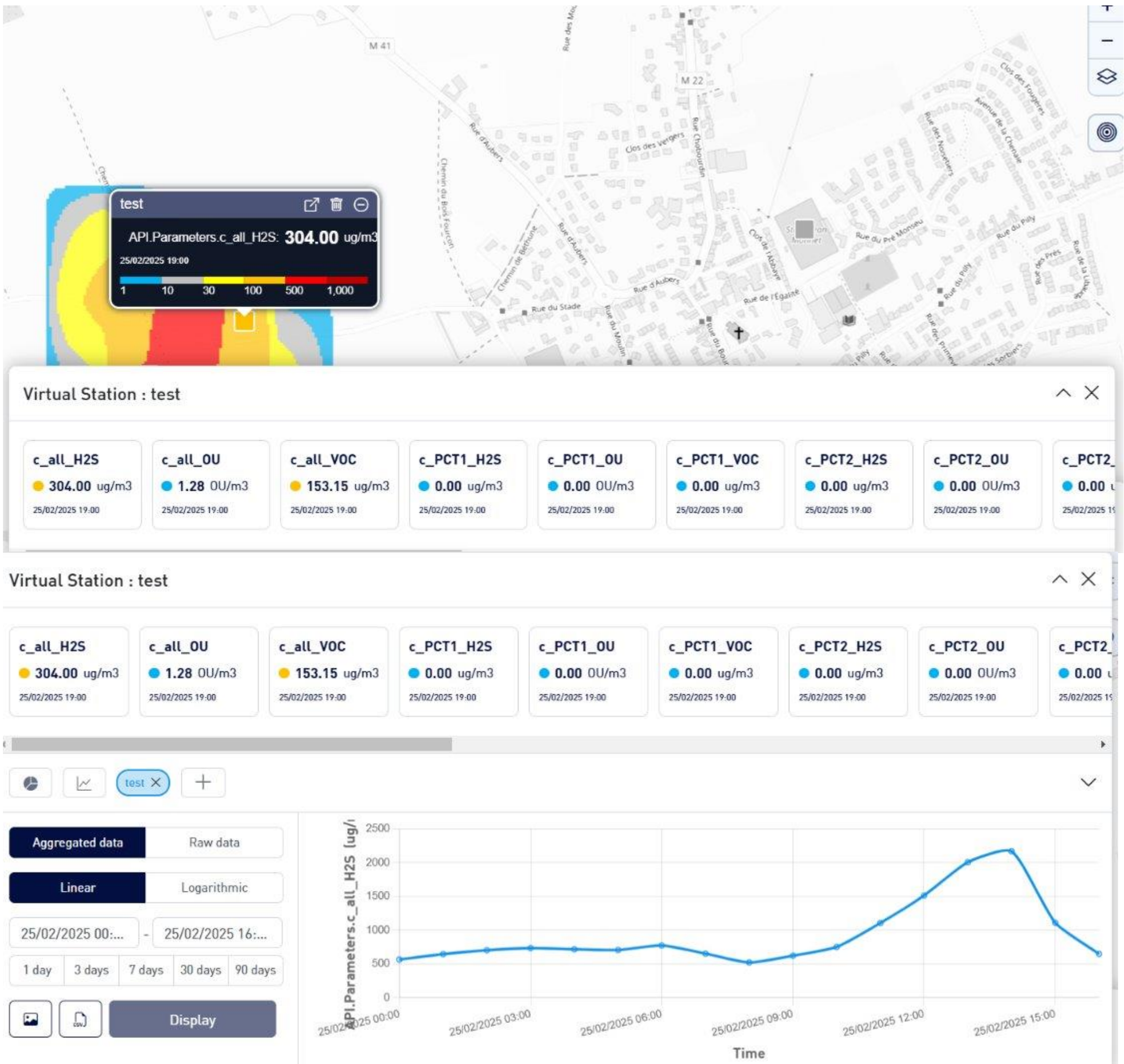


Figure 8: Dashbord example from Sentine with modelling and virtual station.

To support data acquisition and interoperability, Sentinel includes connectors for selected sensor families, such as KUNAK for gaseous and particulate pollutants, and Aerotape for pollen monitoring, as well as for external modelling products. Where connectors are not yet available, dedicated development efforts must be anticipated to ensure full integration and operational continuity.

c. Activation and Operational Readiness

In the MountAdapt framework, the Sentinel platform integrates four core functions designed to enhance real-time environmental monitoring and support decision-making in public health and urban planning:

- **F01 – Microclimate and Air Quality Monitoring:** Enables fine-scale detection of pollution peaks through high-resolution modelling and sensor networks, issuing alerts when thresholds are exceeded.
- **F02 – Pollen and Allergen Tracking:** Identifies ragweed pollen surges issuing alerts when thresholds are exceeded. When measurement data is available, correlates them with health indicators or pharmaceutical data to anticipate allergic reactions and guide eradication efforts.
- **F03 – Heatwave Alerts and F04 – Cold Wave Alerts:** Detects extreme heat and cold events at micro-local levels, particularly around sensitive sites such as hospitals, to inform adaptive healthcare responses. If health data is available, intention to cross-analysis of temperature data and patient records to identify vulnerable zones and pathologies.

Once the use-case configuration is complete, including the selection of sensors, modelling chains, and data sources, Sentinel enters its activation phase. This process is carefully structured to ensure alignment with operational requirements and to facilitate a smooth onboarding experience for end users. The platform is deployed, configurations are validated, and user training is delivered, all within a documented framework that supports transparency and reproducibility.

Validation procedures include smoke testing of data ingestion pipelines, verification of model domains and boundary conditions, confirmation of alert thresholds and designated recipients, and review of automated reporting templates. These checks are essential to guarantee the reliability of the system and its readiness for real-world deployment.

By combining technical rigour with user-centric onboarding, Sentinel ensures that each implementation is not only functionally robust but also operationally coherent, ready to support environmental intelligence and public-health responsiveness from day one.

d. Monitoring devices deployed

Kunak Air Pro Device – Description

The Kunak Air Pro device, supplied by Kunak Technologies S.L., is a modular and connected environmental monitoring station designed for continuous air quality measurement. Compact and self-sufficient, it includes a cellular communication module and a 12W solar panel with mounting kit, allowing installation in remote locations without external power supply.

Operation and Components

The system operates continuously and includes several interchangeable sensors for detecting atmospheric pollutants:

1. Gas Measurement:
   - Nitrogen Dioxide (NO_2): K-NO2-A-01 cartridge, measuring range from 0 to 5,000 ppb.
   - Ozone (O_3): K-O3-A-01 cartridge, measuring range from 0 to 2,000 ppb (mandatory with NO_2).
2. Particulate Measurement:
   - Air Pro Particulate Sensor (K-AP-PM-A-01): measures PM1.0, PM2.5, PM4, PM10, TSP, and TCP, with a range of 0 to 2,000 µg/m^3.
3. Power Supply and Autonomy:
   - Powered by a 12W solar panel, ensuring full autonomy for field campaigns.
4. Data Transmission and Visualisation:
   - Data is transmitted via cellular network to a diagnostic and visualisation platform (Starter + Operation Package), which includes geolocation, calibration, and maintenance management (CMMS).

Generated Data

At the end of each measurement period, the system produces, in addition to localisation:

1. Concentrations of NO_2 and O_3 in ppb.
2. Concentrations of fine particles (PM1 to PM10, TSP, TCP) in µg/m^3.

Aerōtape Device – Description

The Aerōtape device, developed by Oberon Sciences in collaboration with CNRS and CEA, is a fully automated aerosol collector and analyser. Compact in size (339 × 391 × 181 mm, 10 kg), it includes an integrated weather station.

The device operates in cycles (~6 minutes) consisting of:

1. Sampling Phase: Air is drawn in through a 360° intake head and a rectangular slit impactor (7 × 2 mm) using a pump. The flow rate is set between 16.5 and 17.5 L/min depending on the unit. Particles (1 µm – 200 µm) are deposited onto an adhesive tape.
2. Imaging Phase: The tape is examined under an optical microscope using various lighting modes (transmission, lateral, fluorescence, episcopic). For the current campaign, only transmission and lateral lighting images are produced. After each cycle, the tape advances by 1 mm for a new sample.

At the end of each cycle, the acquired images and meteorological data (humidity, temperature, pressure, wind, precipitation) are automatically transmitted via Wi-Fi to an Oberon server for processing and storage.

Pollen recognition and concentration calculation:

- Ragweed pollen grains are automatically identified from Aerōtape images using a Deep Learning algorithm (CNN, Yolo type).
- The raw number of grains identified per image is converted into concentration in grains/m^3. This calculation considers not only the volume of air pumped and the duration of the pumping cycle, but also optical parameters (lens and camera/magnification settings) and the percentage of images actually acquired relative to the general particle distribution (the 'observation pressure' factor), specifically determined for ragweed pollen acquisition with the current setup.
- In parallel, particle size data is calculated from lateral images, allowing characterisation of the collected particles' dimensions.

Thus, at the end of each cycle, three types of data are produced:

1. Pollen count and concentration (identified by AI)
2. Particle size data for all collected particles
3. Meteorological data

PR3.3 LIFE RESYSTAL ECOSYSTEM (NCSRD)

a. Components and Achievements

A key component of LIFE RESYSTAL Ecosystem in the context of MOUNTADAPT project is LIFE RESYSTAL Toolbox, a web-based platform that provides support in Decision Support process on climate adaptation of health care facilities. The Toolbox provides a way to perform vulnerability and risk assessment for a series of hazards and extreme events of interest, which will be more frequent and with higher intensity, due to climate change. The latter provides the necessary information to explore targeted planning options for adaptation towards diminishing the level of climate risk and assess have the information to perform a cost-benefit analysis between doing nothing and taking action. The Toolbox is a way to identify and localize climate risk, quantify it and address it for EU health infrastructure.

b. Interface overview

During the design phase of MOUNTADAPT project, LIFE RESYSTAL was adapted to meet the requirements of the demonstrators:

- Update interface and input data system was introduce

- Utilization of D1.1 information led to updating the vulnerability and impact assessments information
- New hazards were added (heatwave, coldwave, storms, wildfire, drought)
- New analysis to localize the climate information were performed

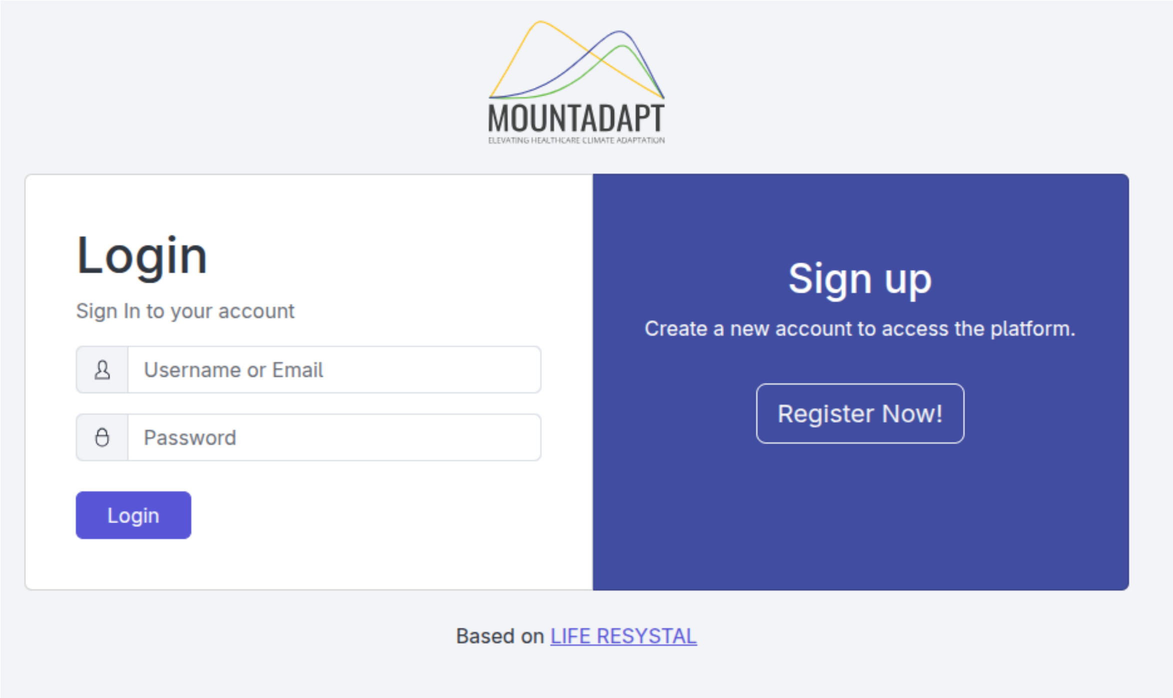


Figure 9: Login page of LIFE RESYSTAL solution developed for MOUNTADAPT project

The demonstrators gain access to the updated LIFE RESYSTAL solution via a secure online web application. To pave the way for efficient use and information input from the demonstrators' side, a series of bilateral consultations meetings were performed in order to explain each step and provide support filling in the information.

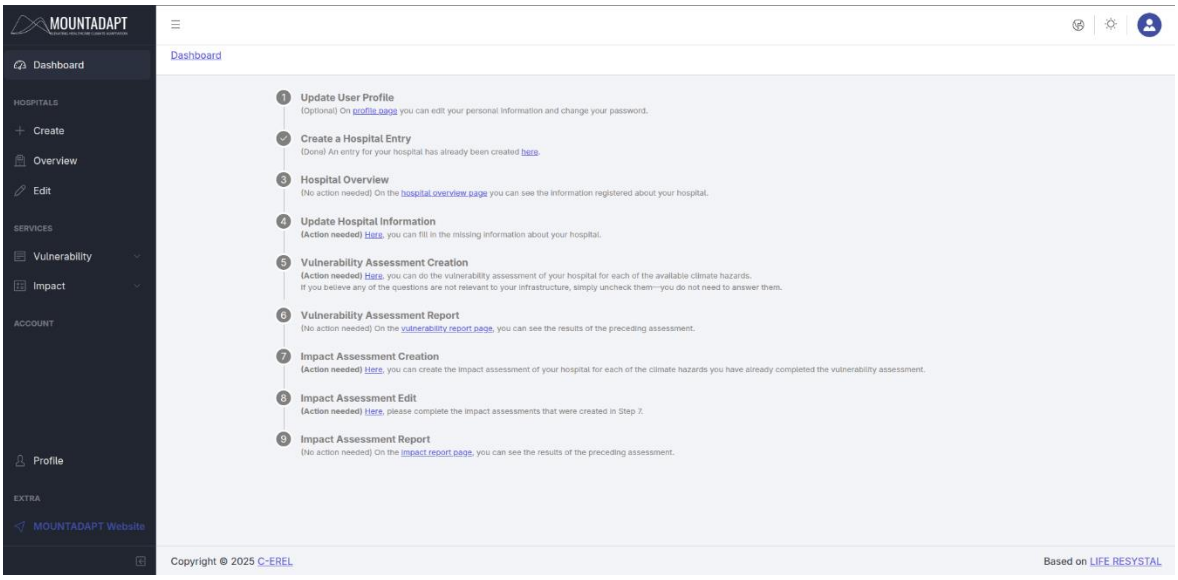


Figure 10: Starting page with instruction developed for MOUNTADAPT project

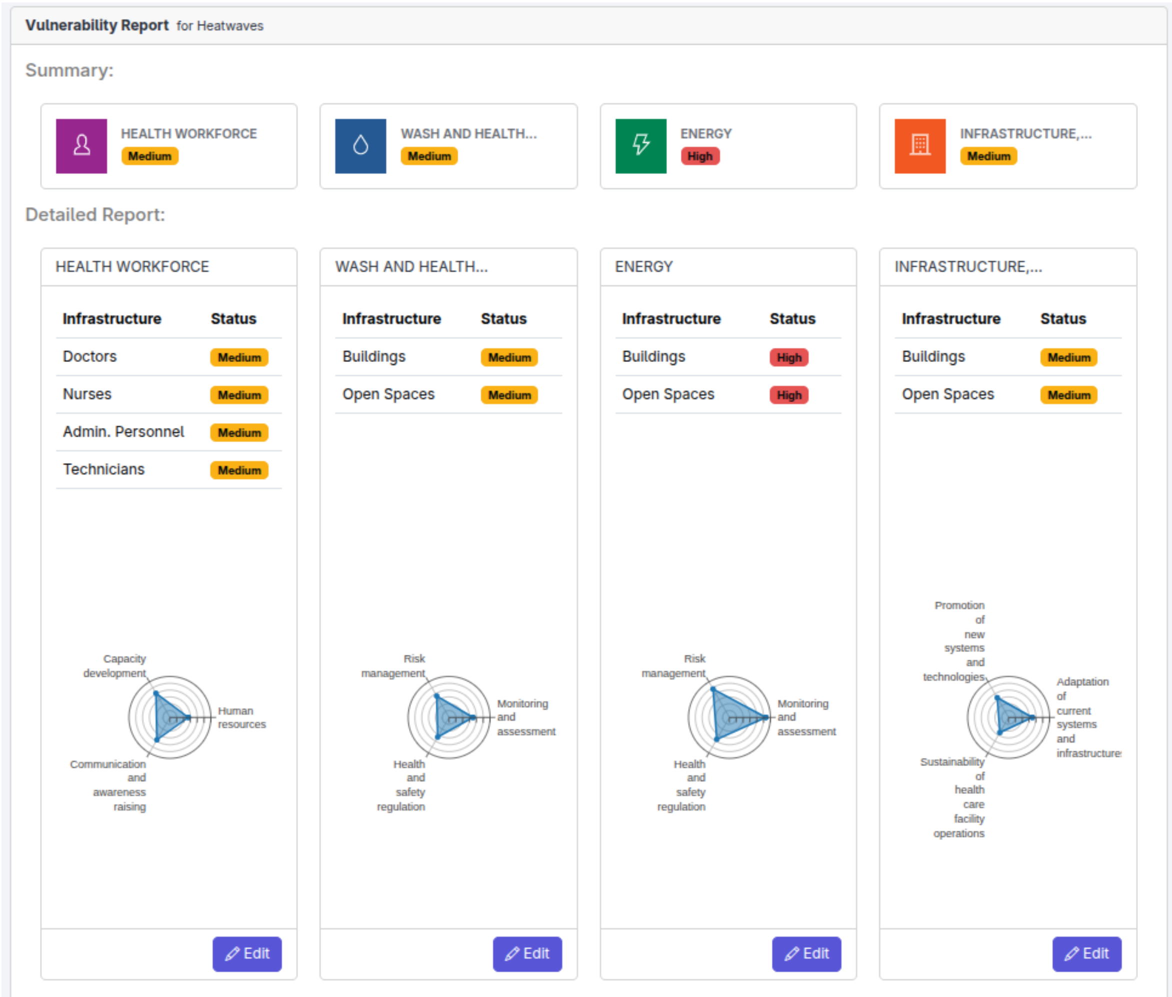


Figure 11: Vulnerability report page for dummy hospital developed for MOUNTADAPT project

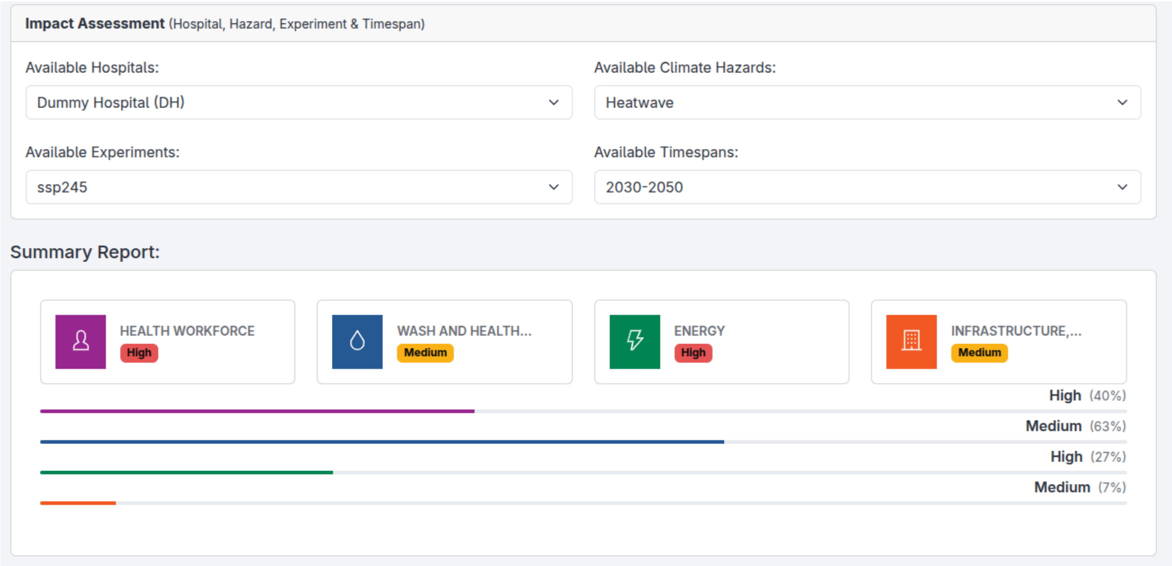


Figure 12: Impact report page for dummy hospital developed for MOUNTADAPT project

PR4: Emergency Management Tool Development and Adaptation

Key Objectives: *Crisisoft contributes to PR4 by delivering a robust emergency management solution designed to enhance healthcare system resilience during crises. The platform enables the efficient mobilisation of healthcare staff, ensuring rapid and coordinated response when urgent action is required. It also strengthens crisis observability, providing decision-makers with real-time insights and tools to improve coordination and responsiveness across healthcare operations.*

PR4 MenKorn CALL (CRISISOFT)

a. Pre-implementation preparation

The implementation of the MenKorn CALL solution takes place in four phases:

Phase 1 allows to :

- Define the organisational chart of the establishment that will use the MenKorn CALL solution.
- Present the technical IT requirements.
- Define the messages (email, text messages, voice) that are desired when a crisis event occurs.

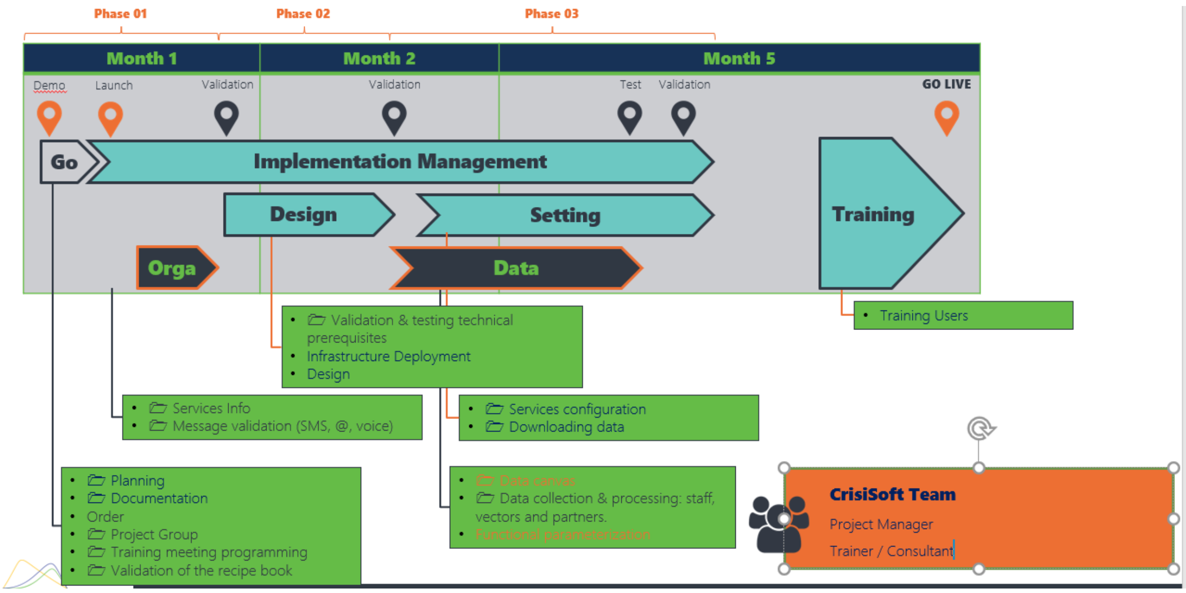
Phase 2 allows to :

- Implement services
- Implement organism
- Implement partner

Phase 3 allows to

- Collect and implement personal data
- Collect and implement partner data
- Collect and implement vehicles data

Phase 4 Training session



b. Solution's architecture and design

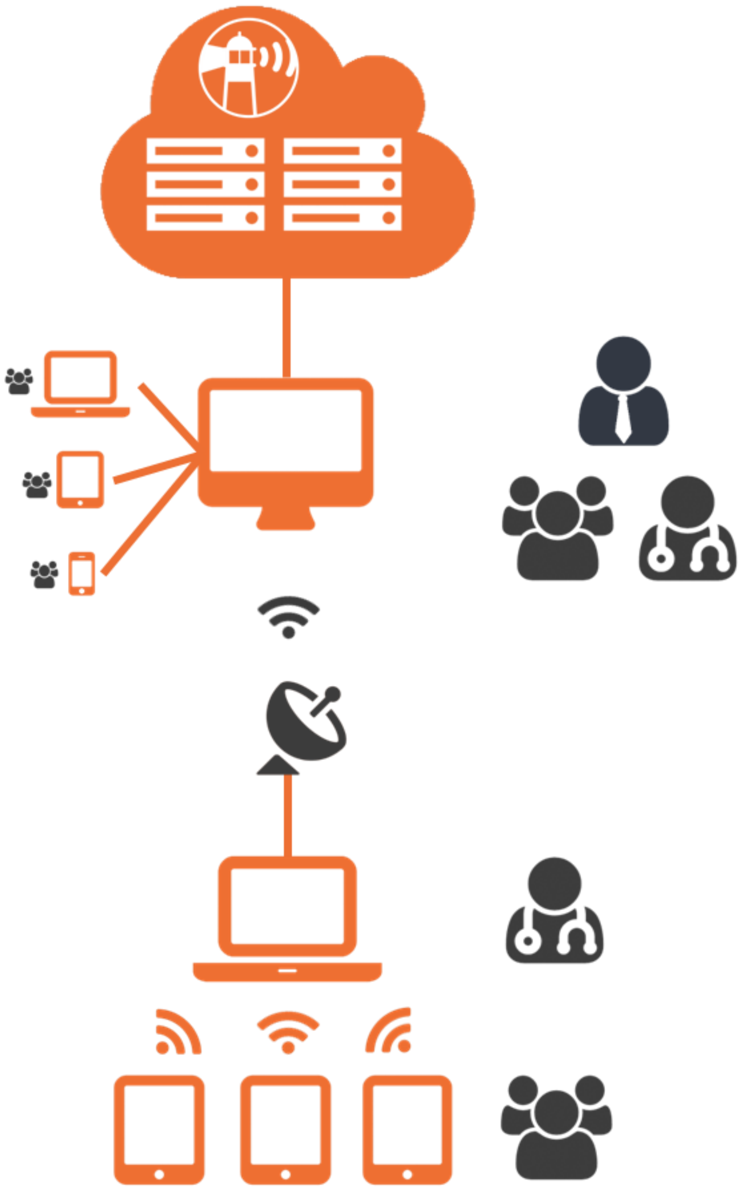
MenKorn, a full-web solution hosted on secure and redundant servers in France.

AGILE and CONFIGURABLE solution via a full Manager. Interfacing API.

Ergonomic device of management interfaces and personalized + Partner interfaces information and provision of resources.

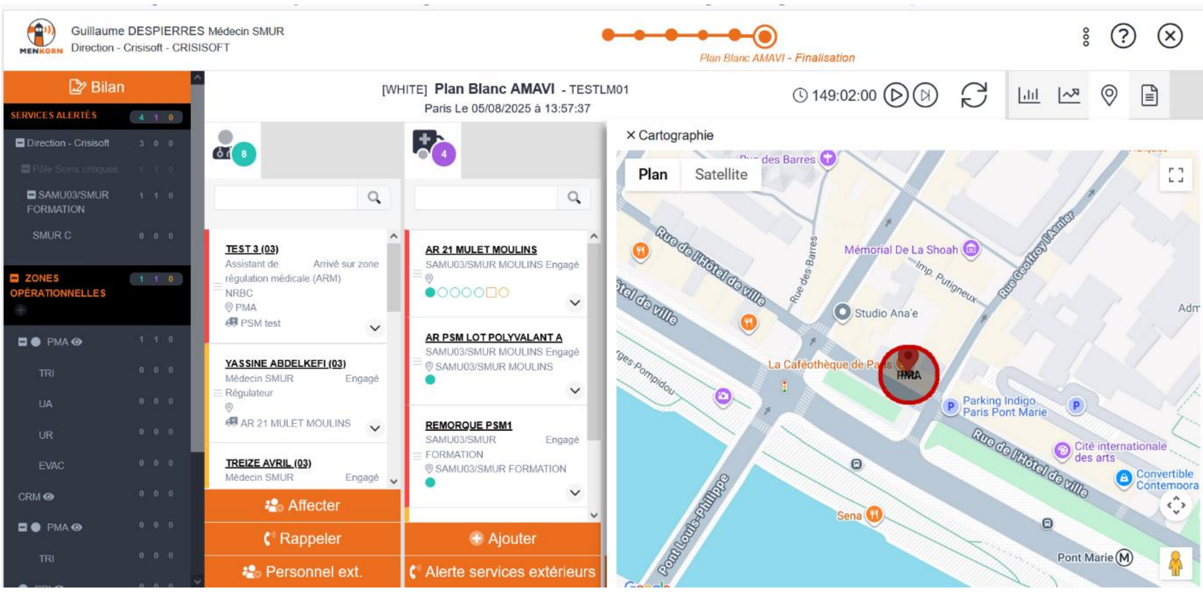
Integrated simulator for individual and/or group training and major exercises.

« Default degraded mode» and resilient local network to ensure the operational activity of on-site actors.

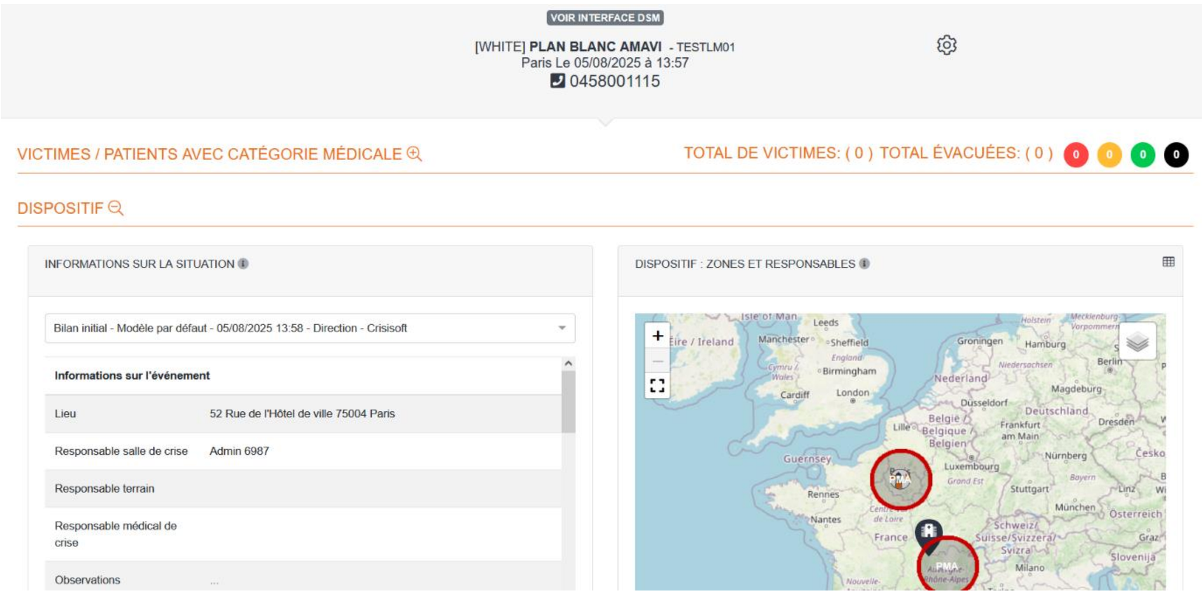


c. Interface overview

Crisisi Room Interface



Observatory



INTEROPERABILITY AND SYSTEM INTEGRATION

The combination of modules PR1 to PR4 constitutes an integrated multi-risk monitoring, early warning and response system. Environmental monitoring tools (PR2), such as VECTRACK (PR2.1), provide continuous monitoring via an interoperable RESTful API, enabling the automated transfer of data on arboviral vectors to applications such as Vision360, thereby facilitating environmental and epidemiological mapping. Climate and health models (PR1) anticipate the impacts of climate events, and the monitored and modelled data are transmitted to integrated systems (PR3), which translate alerts into the emergency management tool (PR4). The latter converts them into clear actions for authorities and health professionals, supported by the disaster preparedness checklist (PR5.1). The SURVIRAL agent model (PR3.2) communicates with MenKorn CALL (PR4) to plan human and hospital resources, while contributing to the validation of climate and health model assumptions. Continuous interoperability between systems ensures the consistency of the MEWRS ecosystem.

SENTINEL (EX VISION 360)

Sentinel functions as a modular and interoperable platform within a broader multi-hazard Monitoring, Early Warning and Response System. This solution ingests and models data from diverse sources, including virtual stations, third-party sensors, and field data from VECTRACK (PR2.1), which communicates arboviral vector information via a RESTful API. This interoperability ensures that monitored and modelled data are translated into operational responses by integrated systems, supporting emergency management and public health decision-making. In particular, interoperability with systems such as MenKorn CALL will be explored using standardised data exchange protocols, which are intended to facilitate the real-time transfer of alerts, environmental indicators, and situational awareness to crisis management operators. While this level of integration is a key objective of the project, its full realisation will depend on ongoing technical alignment and collaborative development between the respective platforms during WP3.

SURVIRAL

The SURVIRAL system forms the central backbone of our modelling and simulation environment. All input data, simulation results, and derived indicators are stored consistently in a Postgres database. This architecture has the decisive advantage that external systems can connect directly without additional middleware or complex integration layers. Using clearly defined database views, we provide partner applications with the content they need – whether in the form of time series on vector population development, scenario-based forecasts for case numbers, or georeferenced hotspot maps for spatial risk assessment. For partners, this means minimal integration effort: standardized database access is sufficient to seamlessly process verified, curated results.

A significant step toward interoperability has already been taken: we can automatically access the field data collected by VECTRACK on arbovirus-transmitting vectors via an existing interface. This data flows directly into the initialization and parameterization of our models. This allows us to ensure that the simulations are based not only on theoretical assumptions, but also on current, field-based observations. This ensures that the forecasts and risk assessments are directly relevant to the connected systems.

This architecture creates an easily expandable, interoperable ecosystem in which monitoring data, model calculations, and decision-making aids are closely interlinked. Systems such as Vision360 can use the data for integrated environmental and health maps, while MenKorn uses the forecasts for forward-looking planning of health resources. With this approach, we ensure that SURVIRAL does not work in isolation, but functions as an open, connectable module within the MEWRS ecosystem – with a clear focus on low integration effort for partners and maximum usability of the results.

2. On-site Implementation

The fully integrated Monitoring, Early Warning and Response System is being deployed across four demonstration sites located in mountainous regions, each presenting its own unique environmental and operational challenges. While several core solutions are implemented uniformly across all sites to ensure consistency and comparability, others are selectively applied to address site-specific constraints and local realities. This

section outlines how the implementation strategy has been adapted to each demo site, balancing standardisation with the flexibility required for real-world application.
The figure below presents the selected solutions, developed as project outcomes, tailored to each demonstration site.

Project Results (PRs)	Demonstration sites				Replication sites		
	TIROL	GRENO.	ALBA	SELN	SAAS	HAM	SCJUT
Climate and health models (PR1)	X	X	X	X			
VECTRACK system (PR2.1)	X	X	X	X			
IEQ monitoring (PR2.2)		X	X	X			
SURVIVAL (PR3.1)	X						
Vision 360 (PR3.2)		X	X				
LIFE RESYSTAL ecosystem (PR3.3)	X	X	X	X			
Emergency management tool (PR4)	X	X	X	X			

Solution Implementation Across all Demonstrators

PR2.1 VECTRACK system (IRIDEON)

The VECTRACK solution is to be deployed across the demonstration sites observing the following requirements:

- Select urban or peri-urban sites for the trials.
- If possible, use already existing vector (mosquitoes) surveillance programs running.
- Technical contact person to discuss about the use and setup of the smart-trap network.
- Logistics for DEMO sites: 1) common basic elements (e.g. mosquito adult traps), and 2) case-study specific elements (e.g. ovitraps and PCR tests).

The specification of the locations involved are those defined by standard Trap Protocols used in mosquito surveillance, as depicted in the figure below.

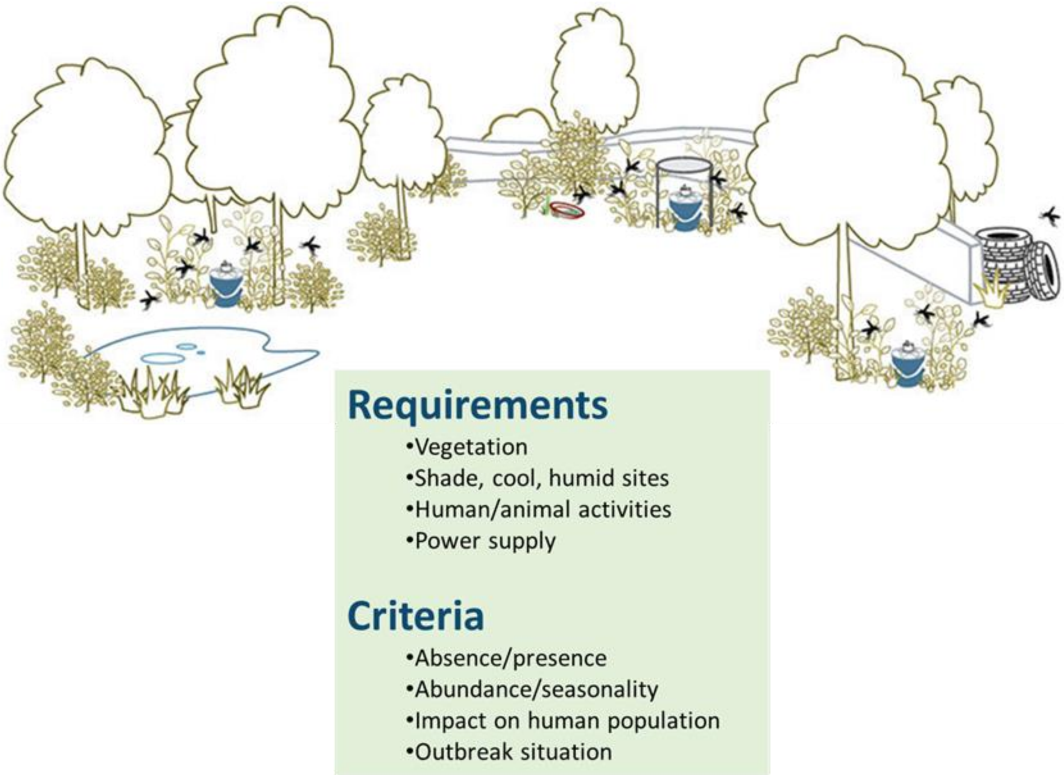


Figure 13: VECTRACK smart-trap installation aligned with standard Trap Protocols.

The VECTRACK sensor is simply installed on top of a commercial mosquito trap that can be sourced from any local supplier of pest management products.

Figure 14: VECTRACK smart-trap set-up: the VECTRACK sensor installed on top of a comercial mosquito trap for professional use, in this case the BG-Sentinel model.

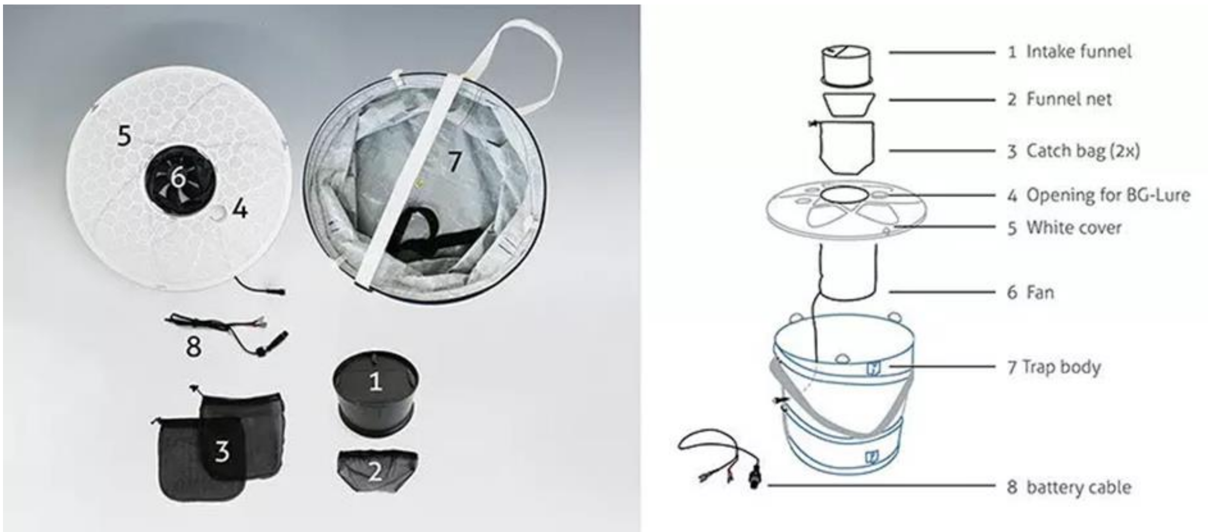


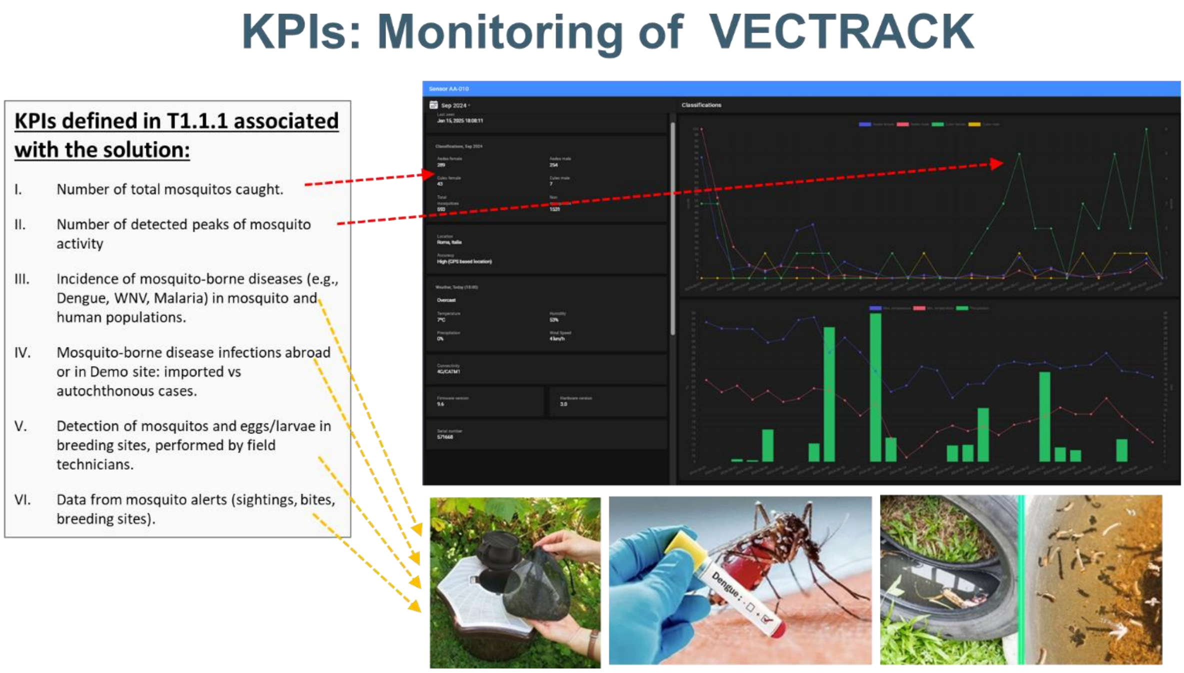
Figure 15: BG-Sentinel mosquito trap.

The BG-Sentinel mosquito trap is essentially a collapsible fabric container with a white lid with holes covering its opening. The diameter is 36 cm, and the height is 40 cm.
The catch method is as follows: In the middle of the cover, air is sucked into the trap through a black catch pipe by an electrical fan, drawing approaching mosquitoes into a catch bag (blue arrows). The air then exits the trap through the white cover, generating ascending currents (red arrows). These are similar to convection currents produced by a human host, both in its direction, its geometrical structure, and, due to the addition of the BG-Lure, also in its chemical composition.

- Process used to activate the solution: The VECTRACK solution only needs to be powered. The activation process is fully automatic.
- Details of system configuration steps: Once the VECTRACK solution is powered, the majority of parameters are configured automatically. The end-user will only need to configure:
    a. The address of the site where the solution will be deployed (recommended but optional as the sensors have a GPS chip)
    b. A name for each unit (optional).
    c. Any description deemed necessary, like for instance additional information about the nature of the site where the sensor was installed (optional).

With each Demo site, it was discussed and defined how many VECTRACK sensors per site would be useful. This information prompted the kick-off of the manufacturing of the necessary units.
The plan for manufacturing, shipping, and deployment of the VECTRACK units is:
- Shipping of sensors: by end of August 2025
- Deployment and use to collect mosquito data: until the end of the project

The performance indicators that will be monitored are shown in the following figure:



The data collection methods to be used, are:

- KPIs I and II- the VECTRACK solution provides the data collection through the Senscape Hub software platform.
- KPIs III, IV, V, VI-Data collected (if available) by the partners managing the Demos sites.

PR3.3 LIFE RESYSTAL ecosystem (NCSRD)

The LIFE RESYSTAL ecosystem will be applied to all 4 demonstrators and it will be open the process to the replicators that can apply the process at voluntary basis (there is no provision in the GA). The demonstrators will need to assess which hazards that are offered via the platform are relevant and which part and level of the infrastructure they want to study under climate pressure. The Table below presents the initial hazards, time period and climate scenario of interest for each demonstrator.

Demostrator	Hazard	Time period	Climate scenario
Grenoble	Floods Storms	-	-

	Heatwave Wildfires		
Tirol	Floods Storms Drought Heatwave Wildfire	2030-2050	SSP245 SSP585
Alba Iulia	Floods Drought Heatwave	2030-2050	SSP245
Selnica	Floods Storms Heatwave	2050-2070	SSP245 SSP585

The process is initiated by following a gradual information exchange between the domo sites and NCSRD, alongside consultation meeting and training on how to use the LIFE RESYSTAL ecosystem online platform.

Phase 1 - Playground | Information collection

- <u>Playground:</u> In this stage NCSRD is providing access to the platform with access to dummy data and analysis in order to familiarise the demonstrators with the platform interface. At the same time, the step permits the demonstrators to gather questions and inquiries to be discussed with NCSRD first consultation meeting.
- <u>Information Collection:</u> In the same step, NCSRD provides an online questionnaire to collect infrastructure information, relevant climate information in order to create the demonstrator entries in the platform (see Table above) and create the plan of consultation meetings.

Phase 2 – Consultations | Use of platform

- Consultations: Based on the plan developed in previous phase, NCSRD arranges a series (2-4) meetings with each demonstrator to accommodate the process; (a) introduction to the platform, (b) vulnerability assessment, (c) impact assessment, (d) next steps and comments on the risk assessment.
- Use of platform: Utilising the data of the questionnaire, NCSRD creates the entries for each demonstrator and provide access and online instructions to the user for the next online steps. The user will be asked to add information for the infrastructure and personnel for specific climate hazard, future time period and scenario. This step is time consuming for each assessment and in many occasions, experts from inside or outside the hospital is needed to be consulted (e.g. technical personnel, procedure protocols etc).

Phase 3 – Results & report | More analysis

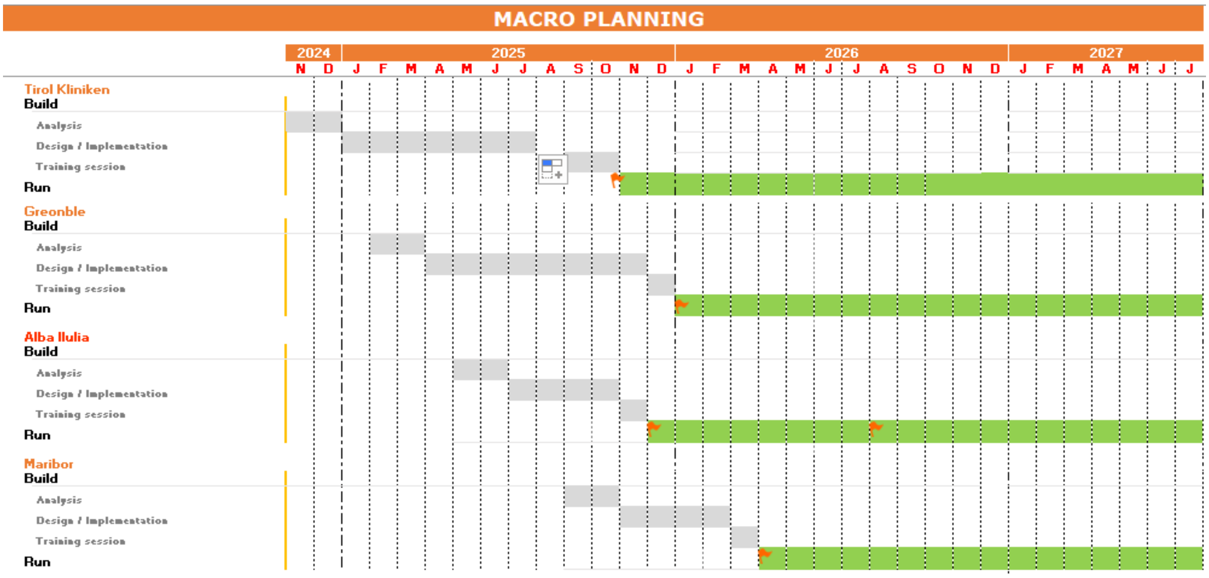
- Results & report: A final report for vulnerability, impacts and risks for each assessment per demonstrator is produced. NCSRD organize an optional final meeting to present the results and discuss the possible utilisations of the report in adaptation measures implementations and cost-benefit analysis.
- More analysis: In this stage the demonstrator can either utilize the platform and perform more analysis for other hazards or time periods, or assess the infrastructure after a planned adaptation measure (perform the analysis as if the adaptation has been taken place).

PR4 MENKORN CALL (CRISISOFT)

The deployment of the MenKorn solution takes place in 3 distinct step:

- First step: The first step consists of analyzing the needs and elements of the site (framework for using the solution, IT parameters, processes used, personnel to be implemented, etc.)
- Second step: This step involves implementing all the data collected from the site in order to implement the MenKorn solution.
- Third step: The final step is to train future users of the solution on site

Below you will find the provisional deployment schedule for each site:



Implementation by Demonstrator Site

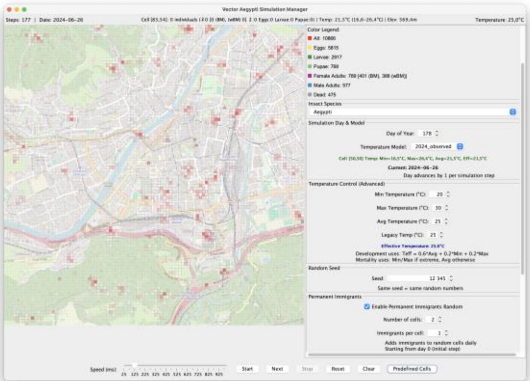
Tirol Demonstration Site

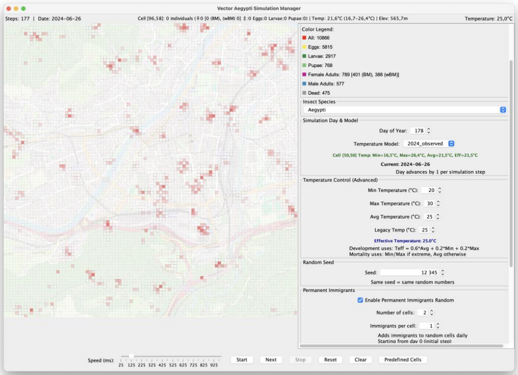
PR3.1 SURVIRAL AGENT-BASED EPIDEMIOLOGICAL MODEL (UMIT)

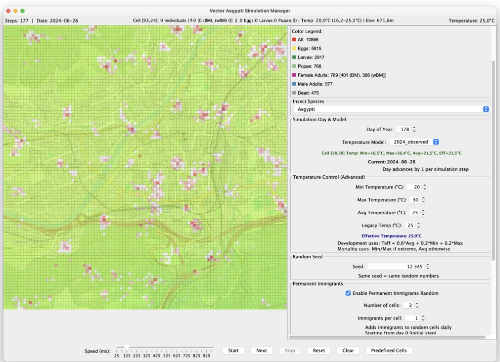
The “Tirol” demonstrator shows how SURVIRAL can be used as an integrative simulation and decision-making tool in a real region. The focus is on modelling the two relevant vector species, Aedes aegypti and Aedes albopictus, which are increasingly likely to occur in alpine regions as a result of climate change. For the province of Tyrol, real climate data (historical measurements from GeoSphere Austria and projections from EURO-CORDEX/REMO2009) and field observations from VECTRACK are used to set the initial conditions of the model and to perform ongoing parameterization. On this basis, SURVIRAL simulates the population dynamics and spread of mosquitoes under different climate scenarios and generates spatially and temporally high-resolution forecasts.

The demonstrator serves several purposes: On the one hand, it shows how epidemiological risks (e.g., potential spread of dengue, Zika, chikungunya) can be spatially localized and temporally predicted. Results are stored in SURVIRAL as standardized data products (e.g., time series, heat maps, risk levels) and can be used directly by other demonstrators for integrated environmental and health maps or for resource and capacity planning in healthcare.

The Tyrol demonstrator thus offers a practical test environment in which climate data, monitoring data, and simulation models are seamlessly integrated. It illustrates how a regional application not only enables scientific modelling but also creates direct added value for authorities, healthcare institutions, and decision-makers. Tyrol is thus a pilot location that exemplifies how SURVIRAL functions as a building block in a comprehensive monitoring, early warning and response system







The SURVIRAL Tirol Demonstrator is designed as a standalone software solution that combines scientific modeling with intuitive visualization. The application offers an interactive map interface in which the spatial and temporal spread of disease vectors can be simulated and visualized. Each grid cell on the map represents a simulation field in which the biological development stages of mosquitoes – from eggs to larvae and pupae to adult females and males – are reproduced. These stages can be selectively shown or hidden using different layers and color scales, allowing complex population dynamics to be clearly illustrated.

Another central component of the demonstrator is the integration of weather and climate data. Historical observation values as well as scenario data (e.g., minimum and maximum temperatures, precipitation) flow directly into the model and control the development and mortality rates of the insects. This makes it possible to run through different climate scenarios and visualize their effects on the establishment and spread of invasive species in Tyrol.

The added value of this solution lies in the direct link between data, simulation, and decision support. Authorities, health organizations, and decision-makers are provided with a tool that allows them to:

- identify risk areas at an early stage,
- track the dynamic development of vector populations,
- examine options for action (e.g., monitoring or control measures), and
- reuse the results from the database in a standardized way for other systems (e.g., Vision360, MenKorn).

In this way, Tyrol demonstrates the scientific capabilities of SURVIRAL, but also shows its practical benefits for public health and disaster management. By visualizing complex model processes in an easily understandable form, a direct transfer of knowledge is made possible—from research to the actors who rely on robust decision-making bases in practice.

MenKorn CALL:

The Tyrolean site wanted to benefit from a crisis management and staff recall tool in the context of climate change. It is in this context that the MenKorn CALL solution was implemented on this site.

First, the site's needs were analyzed to determine in what context the solution would be used. This analysis went through phases of demonstration of the operation of the MenKorn tool, and presentation of its functional scope:

- Triggering the event
- Inputting a situation report
- Alert to key personnel and partners
- Recalling personnel
- Management of operational areas

Then we collected the data needed to implement in the solution, namely the partners, the procedures used, the personnel concerned by the recall and implemented them in the MenKorn CALL solution; A lot of translation work was necessary to make all the data available in German.

Finally, a one-day on-site training session was necessary to train users in mastering the tool.

A complete takeover of the tool is planned for the last quarter of 2025. The duration of use of the tool will be based on the duration of the MOUNTADAPT project in terms of maintenance. The Tyrol site will be able to continue to benefit from the tool beyond the project provided that it contributes to the maintenance costs (server maintenance, tool updates, etc.)

Grenoble Demonstration Site

PR2.2 Indoor environmental quality (IEQ) monitoring method (CSTB)

IEQ monitoring began in June 2025 in two rooms from two hospital buildings and an outdoor sampling location at the air intake of the ventilation system. Ten parameters are monitored, with sampling timesteps ranging from 10 minutes to seven days.

Table 3. Parameters monitored indoors and sampling timestep

Parameter	Timestep
Temperature	10 minutes
Relative humidity	10 minutes
CO2	10 minutes
PM1	10 minutes
PM2.5	10 minutes
PM10	10 minutes
Ozone	10 minutes
NO2	10 minutes
Formaldehyde	10 minutes
TVOC	One week

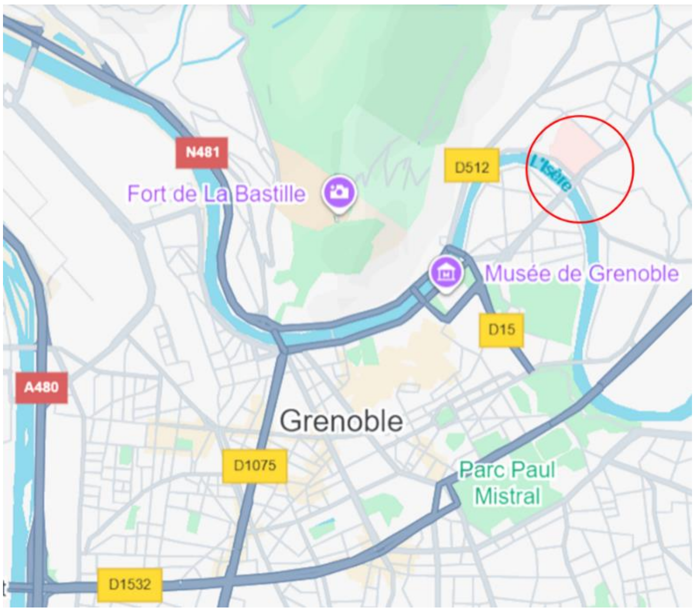


Figure 16. Sampling zone in Grenoble

Figure 17. Indoor sampler

Figure 18. Outdoor sampler

PR3.2 Air Advanced Sentinel, ex Vision360 (ARIA)

In Grenoble, Sentinel has been deployed to reinforce and enrich the existing air quality monitoring and modelling infrastructure operated by Atmo Auvergne-Rhône-Alpes (Atmo AURA). While the city already benefits from advanced modelling capabilities, Sentinel adds granularity and local relevance through the installation of KUNAK air quality sensors around the Grenoble University Hospital (CHUGA), enabling precise outdoor monitoring in sensitive healthcare zones.

- **F01 – Microclimate and Air Quality Monitoring:** Horizontal and vertical detection of pollution peaks around the hospital area, using PMSS high-resolution modelling and KUNAK sensor. Alerts are triggered when thresholds are exceeded. Seasonal statistical analysis is planned to assess the consistency of pollution events and suggest hospital service reorganisation.
  The following figures illustrate the deployment of KUNAK measuring devices as part of the Mountadapt campaign: Figures below shows the installation at the ATMO AURA station in Saint-Martin-d'Hères and indicates the location of two additional stations at Grenoble University Hospital (CHU).

Figure 20: Location of the two other measuring KUNAK stations at Grenoble University Hospital (CHU) for the MOUNTADAPT measurement campaign

Figure 19: KUNAK measuring device installed at the ATMO AURA Saint-Martin-d'Hères station for the MOUNTADAPT measurement campaign

- **F02 – Pollen and Allergen Tracking:** Detection of ragweed pollen peaks via Aerotape sensors and CAMS forecasts, with a risk index provided by Oberon. Retrospective plume analysis using Aerotape measurements and statistical correlation with antihistamine sales are envisaged to identify hotspots and guide eradication.
  Figures below present the Aerotape measuring devices deployed in Grenoble as part of the Mountadapt campaign: the first figure shows the installation of a device in the north-east of the city, while the second indicates the location of three additional Aerotape stations across Grenoble.

Figure 21: Aerotape measuring device installed in the north-east of the city of Grenoble for the MOUNTADAPT measurement campaign

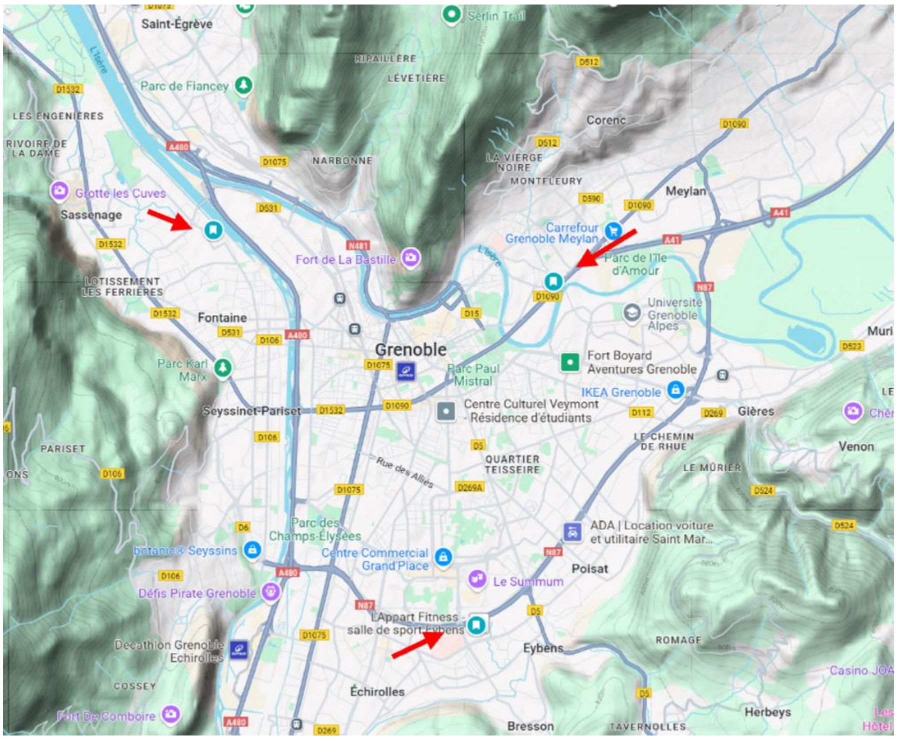


Figure 22: Location of the three measuring Aerotape stations in Grenoble for the MOUNTADAPT measurement campaign

- **F03 – Heatwave Alerts & F04 – Cold Wave Alerts:** Monitoring of heat and cold peaks using SWIFT temperature data, with modelling supported by AROME meteorological inputs and land-use data. Alerts aim to support healthcare service adaptation during extreme heat events. If health data is available, potential correlation between temperature data, patient pathologies, and residential zones to identify areas of heightened vulnerability.

The platform also federates diverse data sources such as mosquito monitoring via Vectrack (IRIDEON) and measurements from Atmo AURA stations into a unified environmental framework. Within MOUNTADAPT Work Package 3 (WP3), Sentinel will enable advanced analyses of pollution patterns, thermal discomfort zones, and ragweed hotspots. These insights are intended to inform adaptive healthcare responses and targeted eradication campaigns. Where health data becomes available, Sentinel will facilitate cross-referencing of clinical and environmental indicators to support refined diagnostics and evidence-based planning.

MenKorn CALL:

The Grenoble site wanted to benefit from a crisis management and staff recall tool in the context of climate change. It is in this context that the MenKorn CALL solution was implemented on this site.

First, the site's needs were analyzed to determine in what context the solution would be used. This analysis went through phases of demonstration of the operation of the MenKorn tool, and presentation of its functional scope:

- Triggering the event
- Inputting a situation report
- Alert to key personnel and partners
- Recalling personnel
- Management of operational areas

Then we collected the data needed to implement in the solution, namely the partners, the procedures used, the personnel concerned by the recall and implemented them in the MenKorn CALL solution; Finally, a one-day on-site training session was necessary to train users in mastering the tool.

A complete takeover of the tool is planned for the last quarter of 2025. The duration of use of the tool will be based on the duration of the Mountadapt project in terms of maintenance. The Grenoble site will be able to continue to benefit from the tool beyond the project provided that it contributes to the maintenance costs (server maintenance, tool updates, etc.)

Alba Iulia Demonstration Site

PR2.2 Indoor environmental quality (IEQ) monitoring method (CSTB)

IEQ monitoring began in June 2025 in one room located in a day centre for elderly and an outdoor sampling location near the building. Eight parameters are monitored (temperature, relative humidity, CO2, PM1, PM2.5, PM10, ozone, and NO2), with a sampling timestep of 10 minutes.

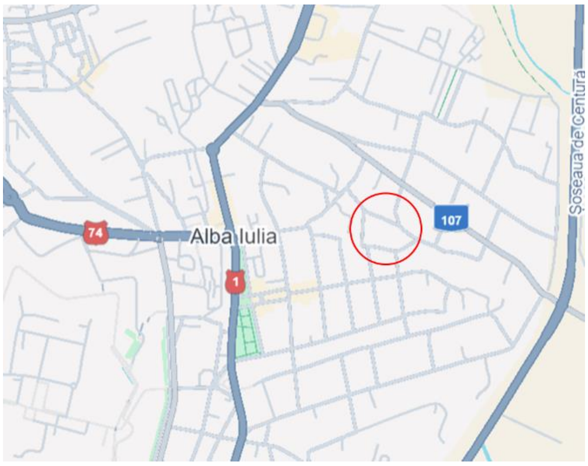


Figure 23. Sampling zone in Alba Iulia

Figure 24. Indoor sampler

PR3.2 Air Advanced Sentinel, ex Vision360 (ARIA)

In Alba Iulia, Sentinel has been adapted to a more constrained context characterised by limited monitoring infrastructure. A solution already present in the city, uRADMonitor—a global environmental monitoring system using IoT sensors to measure air quality and radiation in real time and offering API access—will be integrated into Sentinel. However, with only a single MAGNASCI uRADMonitor device and coarse-resolution CAMS data (10×10 km), the city lacked the capacity for localised environmental surveillance.

- **F01 – Microclimate and Air Quality Monitoring:** City-wide high-resolution forecast modelling using the FARM model at regional scale, supported by European emission inventories, CAMS boundary conditions, GFS meteorological data, and detailed terrain and land-use inputs. Virtual sensors are deployed at elderly-care facilities to extract modelled time-series data, enabling early detection of threshold exceedances and recurring stressors. Seasonal statistical analysis are willing to help identify trends and support service organisation.
- **F02 – Pollen and Allergen Tracking:** Horizontal detection of pollen peaks through FARM modelling, with virtual stations focused on health facilities. Alerts are issued when thresholds are exceeded, and seasonal analysis will help anticipate risks and tailor public health interventions.

The platform also integrates mosquito surveillance data from Vectrack (IRIDEON) and displays the existing uRADMonitor measurement point to complement the visualisation of local air quality.

MenKorn CALL:

The Alba Iulia site wanted to benefit from a crisis management and staff recall tool in the context of climate change. It is in this context that the MenKorn CALL solution was implemented on this site.

First, the site's needs were analyzed to determine in what context the solution would be used. This analysis went through phases of demonstration of the operation of the MenKorn tool, and presentation of its functional scope:

- Triggering the event
- Inputting a situation report
- Alert to key personnel and partners
- Recalling personnel
- Management of operational areas

Then we collected the data needed to implement in the solution, namely the partners, the procedures used, the personnel concerned by the recall and implemented them in the MenKorn CALL solution; A lot of translation work was necessary to make all the data available in Romanian.
Finally, a one-day on-site training session was necessary to train users in mastering the tool.

A complete takeover of the tool is planned for the last quarter of 2025. The duration of use of the tool will be based on the duration of the MOUNTADAPT project in terms of maintenance. The Alba Iulia site will be able to continue to benefit from the tool beyond the project provided that it contributes to the maintenance costs (server maintenance, tool updates, etc.)

Selnica Demonstration Site

PR2.2 Indoor environmental quality (IEQ) monitoring method (CSTB)

IEQ monitoring began in June 2025 in one room located in a kindergarten building and an outdoor sampling location near the building. Ten parameters are monitored, with sampling timesteps ranging from 10 minutes to seven days.

Table 4. Parameters monitored indoors and sampling timestep

Parameter	Timestep
Temperature	10 minutes
Relative humidity	10 minutes
CO2	10 minutes
PM1	10 minutes
PM2.5	10 minutes
PM10	10 minutes
Ozone	10 minutes
NO2	10 minutes
Formaldehyde	10 minutes
TVOC	One week

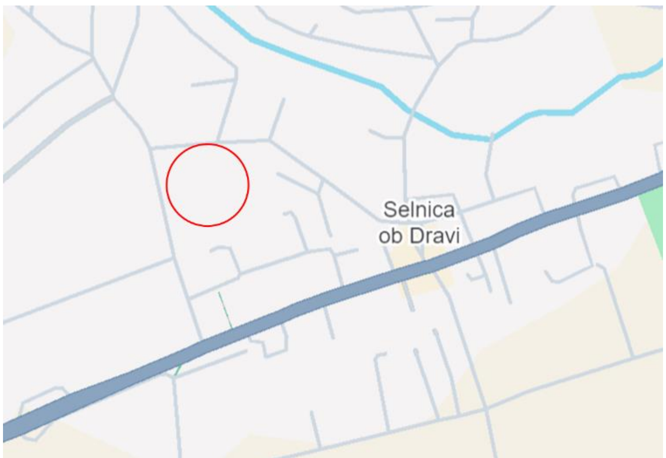


Figure 25. Sampling zone in Selnica

Figure 26. Indoor sampler

MenKorn CALL:

The Selnica site wanted to benefit from a crisis management and staff recall tool in the context of climate change. It is in this context that the MenKorn CALL solution was implemented on this site.

First, the site's needs were analyzed to determine in what context the solution would be used. This analysis went through phases of demonstration of the operation of the MenKorn tool, and presentation of its functional scope:

- Triggering the event
- Inputting a situation report
- Alert to key personnel and partners
- Recalling personnel
- Management of operational areas

Then we collected the data needed to implement in the solution, namely the partners, the procedures used, the personnel concerned by the recall and implemented them in the MenKorn CALL solution; A lot of translation work was necessary to make all the data available in Slovenian.
Finally, a one-day on-site training session was necessary to train users in mastering the tool.
A complete takeover of the tool is planned for the last quarter of 2025. The duration of use of the tool will be based on the duration of the MOUNTADAPT project in terms of maintenance. The Selnica site will be able to continue to benefit from the tool beyond the project provided that it contributes to the maintenance costs (server maintenance, tool updates, etc.)

3. Next Steps

General next steps linked to WP3 include:

- Finalize deployment and operational testing in demonstration sites (T3.3, MS2 at M15);
- Collect and analyse feedback to refine MEWRS components further;
- Expand integration with additional data sources and stakeholders;
- Develop training and dissemination materials to support adoption.

Specifically for each solution developed in this report:

- PR2.1 VECTRACK system (IRIDEON)
    - With each Demo site, it was discussed and defined how many VECTRACK sensors per site would be useful. This information prompted the kick-off of the manufacturing of the necessary units.
      The plan for manufacturing, shipping, and deployment of the VECTRACK units is:
      Shipping of sensors: by end of August 2025
      Deployment and use to collect mosquito data: until the end of the project

- PR2.2 INDOOR ENVIRONMENTAL QUALITY (IEQ) MONITORING METHOD (CSTB)
    - The monitoring campaign started in June 2025. It will continue during the summer period until September and during the winter period between December 2025 and February.

  Chemical samples have been and will continue to be shipped from the demonstration sites to CSTB's laboratory for analysis of chemical concentrations.
  Indoor air resilience will be calculated once the data collection period is finished.

- PR3.1 SURVIRAL (UMIT)
    - Scaling up the demonstrator beyond Tyrol to test the approach in other European pilot regions.
    - Adaptation to additional vectors and other climate-related health risks.
    - Integration of additional climate data sources and scenarios to improve forecast accuracy.

- Further development of the scenario manager to simulate different models and for statistical analysis

- PR3.2 Air Advanced Sentinel, ex Vision360 (ARIA)
    - To ensure the effectiveness and reliability of Sentinel during its multi-month test phase, a structured evaluation framework should be established. This involves defining key performance indicators and corresponding data collection methodologies tailored to the operational context. Indicative metrics may include data availability rates, sensor uptime, latency between data acquisition and visualisation, forecast accuracy against reference stations, alert precision and recall, and user engagement indicators such as training completion and active usage.
    - Ongoing monitoring is supported through the implementation of weekly dashboards and monthly technical notes, providing a continuous overview of system performance and operational insights. These reporting mechanisms serve not only to document lessons learned but also to inform iterative improvements and guide future scale-up strategies. By embedding evaluation into the operational lifecycle, Sentinel ensures transparency, accountability, and continuous enhancement of its environmental intelligence capabilities.

- PR3.3 LIFE RESYSTAL ECOSYSTEM (NCSRD)
    - The planned processed can be adjusted based on demonstrator needs.
    - The process has been already initiated, and the Phase 1 has been finished. Phase 2 is on-going.
    - It is noted that each demonstrator will perform at least on full assessment (from climate hazard to risk).

- PR4 MENKORN CALL (CRISISOFT)
    - N/A

MOUNTADAPT is a Horizon Europe project aiming to boost the community-driven resilience of the health system in European mountain areas, mitigating the impact of climate change on public health. Leveraging the expertise of 27 partners, including healthcare facilities, public authorities, innovators, and researchers, MOUNTADAPT aims to develop solutions and strategies to enhance healthcare climate adaptation and safeguard the health and well-being of communities living in mountain regions.

Co-funded by the European Union

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.