SENFORFIRE. LOW-COST WIRELESS SENSOR NETWORK FOR FOREST FIRE PREVENTION AND EARLY DETECTION (S1/1.1/E0040)

SenForFire research team at the 3rd Project Follow-up Meeting held in Évora (Portugal).

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Momentum and consolidation at the third project meeting

The last quarter of 2025 has been particularly dynamic for the SenForFire project, with significant advances in research, technological deployment and dissemination of results.

In November, the 3rd consortium follow-up meeting was held at the University of Évora. At the same time, monitoring of the sensor network deployed in the Sudoe area continued, as did the analysis of environmental data and forest fuel moisture, in collaboration with fire prevention services and technicians. In the experimental field, progress was made in the calibration and validation of low-cost sensors through laboratory tests, wind tunnel tests and controlled combustion.

Communication and public visibility played a prominent role, with the dissemination of the project magazine, a coordinated campaign to launch the videos of the pilot areas and the presentation of SenForFire at national and international conferences, workshops and technical seminars, reinforcing its institutional, scientific and territorial projection.

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OCTOBER-DECEMBER

Social media management. Updating promotional campaigns on **_LinkedIn_**, **_Facebook_** and **X** channels.

Distribution of the 3rd issue of SenForFire Noticias magazine. The 3rd issue of SenForFire Noticias magazine was distributed and is available at https://interreg-sudoe.eu/noticia-proyecto/no3-revista-senforfire/. This issue addressed the forest emergency situation in south-western Europe (Sudoe), presented the Carucedo (León) model as an example of local planning to combat the risk of fires, included a report focusing on soil as the silent victim of forest fires, and compiled the main developments in the SenForFire project, with special attention to the progress of its network of smart sensors. The publication contributed to the dissemination of the project's results and raised awareness of the importance of forest fire prevention and management.

OCTOBER
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Campaign to disseminate videos of the SenForFire pilot areas. Campaign to disseminate videos of the SenForFire pilot areas. Between 27 October and 7 November, a campaign was carried out to disseminate videos of the SenForFire pilot areas, available on the YouTube playlist: https://www.youtube.com/playlist?list=PLEh0JYiZlekv4PFb_5t2Vrqkhyt5i8eX. The action was planned as a coordinated and progressive campaign, with the aim of raising the profile of the project and showing the real-world application of its technologies in different territories. The dissemination began with the simultaneous publication of the four videos on YouTube and on the project website, accompanied by a main news item that served as a common information base. Subsequently, the launch was reinforced by a press release and mailing and WhatsApp actions, aimed at institutional and scientific audiences and the project partners themselves.

OCT-NOV
27-7

Social media played a key role throughout the campaign, combining general introductory posts with specific content dedicated to each pilot area. The tone and format were adapted to each platform, encouraging partner involvement through mentions and reposts. The campaign ended with a closing post that brought all the content together in a single playlist, reinforcing the visual consistency and overall message of the project.

In addition, a video made in Fundão in 2024 was broadcast on the YouTube channel (in two versions, with subtitles in English and Portuguese).

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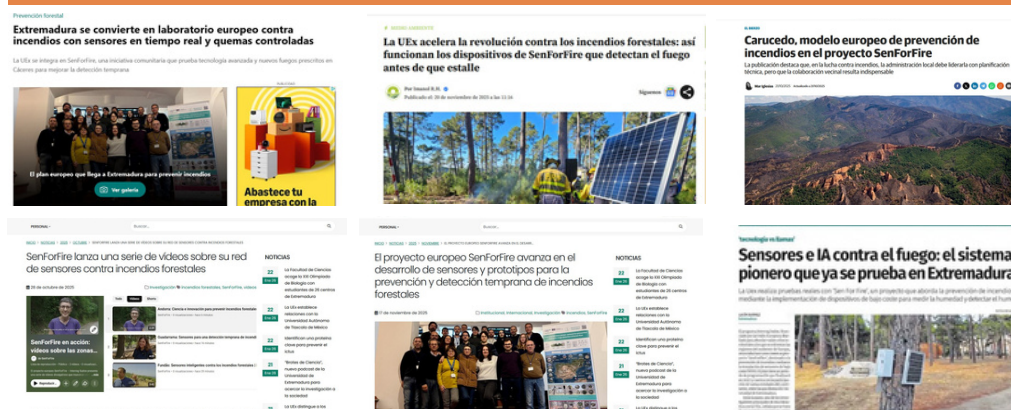
OCTOBER-DECEMBER

Dissemination of press releases for the SenForFire project. Two press releases were issued for the European SenForFire project with the aim of reporting on technical advances and communication activities carried out within the framework of the project.

Firstly, on 28 October 2025, a press release entitled 'SenForFire launches a series of videos on its forest fire sensor network' was issued, aimed at raising awareness of the audiovisual campaign on the pilot areas and showcasing the practical application of the project's sensor network.

Subsequently, on 17 November 2025, the press release 'European SenForFire project advances in the development of sensors and prototypes for the prevention and early detection of forest fires' was released, focusing on the progress made in the design and validation of innovative technologies. Both actions contributed to strengthening SenForFire's public presence, improving understanding of its objectives and results, and expanding the scope of its dissemination activities, with both pieces of content fulfilling the idea of facilitating the transfer of the knowledge generated while continuing to strengthen the brand image of the project itself and of SUDOE.

PRESS CLIPPINGS | Click on the image to see the news

Dissemination of the project at events and conferences. The beneficiaries disseminated the SenForFire project and its results through oral presentations, posters and participation in round tables at various events.

On 27 November, they participated in the workshop 'New technologies in forest fires', organised by the León Fire Centre, held in León, where the progress of the project was presented.

NOV-DIC

27-5

From 2 to 4 December, the project was present at the CONAMA LOCAL Viladecans 2025 Congress, in the session 'Resilient landscapes as a response to fires: management, prevention and rural action', organised by the CONAMA Foundation, held in Viladecans (Barcelona).

From 3 to 5 December, the beneficiaries participated in the 2nd edition of the Mostra dos Fundos Europeus, organised by the Agency for Development and Cohesion (AD&C), within the framework of the Portugal 2030 Agenda Communication Network, held at the University of Coimbra, where a demonstration of the SenForFire project was given during the *Tech4Real* talk.

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On 4 December, the beneficiaries participated in the conference 'Participatory forest management: implementation of prevention and restoration measures against forest fires', organised by the Arrago Circular Green Economy (EVC Arrago) project, funded by the MITECO Biodiversity Foundation, held in Mérida (Badajoz).

SenForFire in Arrago.

SenForFire in Viladecans.

Tech4Real talk poster (Coimbra).

SenForFire in León.

SenForFire in Coimbra.

DECEMBER

16

Collaboration with Flying Rotarians for citizen participation activities. The Flying Rotarians organisation (https://www.iffr.org/), part of the NGO Rotary International (https://www.rotary.org/es/), will collaborate with the SenForFire project in the organisation and implementation of the citizen participation activity called 'Local communities engagement in wildfire prevention' to mark the centenary of its foundation in 2026. At the online meeting between representatives of SenForfire and Flying Rotarians held on 16 December, it was agreed that this activity will consist of the transport and distribution by air, using light aircraft, of low-cost sensor devices designed and manufactured by SenForFire, as well as their delivery to inhabitants of various rural locations in France, Spain and Portugal.

The activity will begin in Toulouse in May, once the project workshop has been completed, and will involve the participation of the Rotary Clubs of this French city.

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NOVEMBER

12-14

3rd SenForFire project follow-up meeting. From 12 to 14 November, the 3rd SenForFire project follow-up meeting was held at the University of Évora, with the participation of all beneficiaries. Members of the University of Extremadura, together with the rest of the project partners, travelled to Évora to analyse the progress made and define the next steps to be taken during three days of work.

The meeting featured presentations of the latest prototypes of microsensors and electronic devices developed by the technology partners for fire prevention and detection, as well as the results of the tests carried out and the communication activities undertaken. The sensor network deployed during the summer in a total of eight municipalities was also presented: four in Spain, two in Portugal and two in Andorra.

The University of Évora presented a new cloud-based map viewer that allows users to visualise the location of sensor network nodes and consult acquired data in real time, including meteorological information, gas and particle concentrations in the air, soil moisture and fire weather hazards. For its part, the University of Coimbra showcased advances in artificial intelligence models based on geospatial data from various sources, aimed at predicting the risk of fires due to natural (non-anthropogenic) causes with high spatial resolution (30 m × 30 m). This participation included three presentations focusing on a cloud platform for monitoring forest fire risk, the collection and construction of data sets, and the training of intelligent models for risk prediction.

The meeting also addressed the project's training activities. The programme for the Massive Online Open Course (MOOC) led by the University of Extremadura was discussed, with the first edition scheduled for the second half of 2026. Likewise, the University of Coimbra confirmed the presentation in February 2026 of a new proposal to the European Union's Erasmus Mundus Joint Master programme, which will incorporate the suggestions of the EU evaluators to the proposal presented in the previous call.

The CNRS presented the preliminary programme and organisational aspects of the workshop to be held, together with the 4th project follow-up meeting, in Toulouse from 18 to 22 May 2026. The meeting concluded with a networking session attended by representatives of the RAT EOS PC (Interreg POCTEP), EUBURN-RISK (Interreg Sudoe) and TREEADS (Horizon Europe) projects.

Submission of expenditure declarations on eSudoe. Expenditure declarations 1 and 2 for the project were submitted on the eSudoe platform. These declarations do not include expenditure declarations 1 and 2 already submitted by all beneficiaries for the period between January 2024 and May 2025.

This exclusion is due to the delay in the validation of these statements by the competent national authorities in Spain and Portugal.

DECEMBER

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SenForFire team during the 3rd project follow-up meeting held in Évora (Portugal).

WG1 SPECIFICATIONS OF THE VALIDATION SCENARIOS AND TECHNICAL CHARACTERISTICS OF THE WSN

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A 1.5

Production of audiovisual material from the pilot areas. Con fecha 31 de octubre, y en el marco del entregable E 1.5.2, se produjeron cuatro vídeos de las zonas piloto del proyecto, correspondientes a los municipios de Fundão (Souto da Casa y Alcongosta), Madrid (Guadarrama), Cáceres (Coria y Cañaveral) y Andorra (Sant Julià de Lòria y La Massana).

OCTOBER
31

A 1.1

DECEMBER
21

Incorporation of new pilot municipalities into the project. At the CONAMA LOCAL Viladecans 2025 conference, RIS technology aroused considerable interest on the part of the Councillor for the Environment of the municipality of Ripollet (Barcelona) and the Mayor of the municipality of Legarda (Navarra). Following subsequent meetings with the heads of both local councils, Legarda and Ripollet confirmed their collaboration as new pilot municipalities in the SenForFire project.

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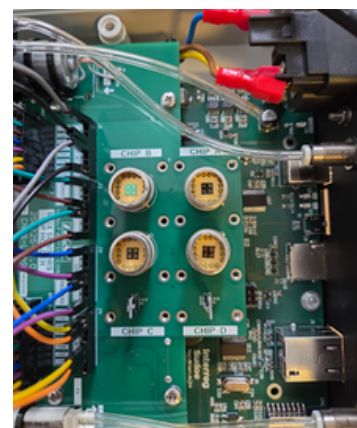lionel.presmanes@univ-tlse3.fr

A 2.2

OCTOBER-DECEMBER

Optimisation and validation of prototypes and microsensors. ITEFI-CSIC continues to work on the optimisation of two low-cost, low-power prototypes designed for real-time monitoring of meteorological and soil parameters. One of the developments consists of a 40 cm long probe equipped with four evenly spaced temperature and relative humidity (T-RH) sensors and powered by a long-life battery. The second prototype is a weather station that incorporates MEMS sensors for measuring atmospheric temperature and relative humidity, wind (speed and direction) and precipitation, powered by a rechargeable battery with a solar panel.

For several months, ITEFI-CSIC has carried out measurement campaigns in which the prototypes have been installed alongside commercial reference equipment, which has allowed certain deficiencies in their operation to be detected. Based on these results, improvements have been identified in the design of the prototypes, which are currently in the implementation phase. In addition, laboratory tests have been carried out to calibrate low-cost soil moisture sensors, the results of which recommend modifications to both the design of the device and the experimental procedure, changes that are also being incorporated.

For their part, CNRS-CIRIMAT and CNRS-LAAS integrated their microsensors into the device developed by Ray IE. To do this, Ray IE installed specific software on one of the CNRS computers that allows control of the sensor box. After verifying that it was working correctly, the device was used by CNRS-CIRIMAT to take measurements at the CSIC-INIA facilities as part of the burning tests.

Ray IE device with CNRS-CIRIMAT and CNRS-LAAS microsensors during measurements in combustion tests at CSIC-INIA.

DECEMBER

Development and validation of the ULP_BMV080 module.
The University of Extremadura has completed the development of the hardware and firmware for the new ULP_BMV080 module, designed to measure particles, humidity, temperature, atmospheric pressure and volatile organic compounds. In January, tests will begin using controlled burns to verify the correct functioning of the module in scenarios involving fire. Depending on the results obtained, and if they are favourable, several units will be produced for subsequent installation.

ULP_BMV080 module developed by UEx for environmental measurement, currently undergoing validation through controlled burning.

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A 2.4

OCTOBER
16

Wind tunnel tests. INIA-CSIC carried out a series of wind tunnel tests to verify the performance of the sensors developed by the University of Extremadura. Dry needles from the dead cover of Pinus pinea were used as forest fuel in these tests, which were conducted under conditions of increasing wind speeds.

As part of these tests, the University of Extremadura visited the INIA-CSIC facilities, where two SEC units of electrochemical sensors and sixteen ULP units of MOX sensors were deployed to verify their performance. To assess the influence of solar radiation and the diffusion effect on different enclosures, the sensors were installed both in solar radiation shields and in 3D-printed polycarbonate casings. The tests combined the use of the wind tunnel with the combustion of characterised plant matter, aimed at detecting volatile compounds.

Wind tunnel tests carried out by INIA-CSIC to validate sensors developed by the University of Extremadura, using dry Pinus pinea needles under conditions of increasing wind speed.

The units were left in place and a second test was carried out to evaluate the response of the sensors once they had stabilised.

NOVEMBER
4

OCTOBER-DECEMBER

Field and laboratory tests for sensor validation. Between October and December, various experimental activities were carried out at the INIA-CSIC facilities (Madrid) aimed at validating and testing the sensors and prototypes developed in the project.

On 16 October, ITEFI-CSIC installed soil moisture modules at two different locations on the INIA-CSIC campus, together with a LoRaWAN gateway. Each module includes a temperature and relative humidity (T-RH) probe and two commercial soil moisture sensors: one low-cost (SEN0308) and one medium-cost (Teros 10). These sensors have enabled uninterrupted monitoring of soil moisture over the following three months. The data obtained from the different sensors installed at INIA-CSIC is currently being analysed and compared, as well as with sensors of the same type deployed during the summer in some pilot areas and with those used in the calibration tests carried out in the ITEFI-CSIC laboratory.

At these same locations, INIA-CSIC periodically monitored the moisture content of plant fuel associated with soil moisture modules, specifically in species such as *Quercus ilex*, *Quercus suber*, *Quercus pyrenaica* and *Syringa vulgaris*.

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Cone calorimeter tests. Between 28 and 31 October, INIA-CSIC carried out a series of cone calorimeter tests to validate the sensors developed by IMB-CSIC, CNRS-CIRIMAT and CNRS-LAAS. These tests used different types of forest fuel, including green needles from *Pinus pinea*, green leaves from *Quercus pyrenaica* and green leaves from *Arbutus unedo*, subjected to different levels of drying in order to obtain different moisture content values. The tests were carried out with and without forced ignition, and with and without the use of a filter.

OCTOBER

28-31

From left to right.
Experimental setup for data acquisition and sensors during combustion tests in the laboratory.
Research team conducting sensor validation tests in the laboratory.
Heat flow calorimeter test for sensor validation during controlled combustion of plant material.

A 2.5

OCTOBER

29-30

Participation in international activities on artificial intelligence applied to sensors. On 29 and 30 October 2025, members of the University of Extremadura travelled to the city of Chongqing (China), where they participated in a round table on artificial intelligence held at Chongqing University of Education. Following this activity, a meeting was held with Professor Fengchun Tian, a lecturer at the university and specialist in machine learning applied to electronic noses.

During these sessions, various conferences were given to raise awareness of the SenForFire project and discuss possible approaches for applying artificial intelligence techniques to gas sensors designed for fire detection.

Participation of the University of Extremadura in international activities on artificial intelligence applied to sensors, held at Chongqing Normal University (China).

WT2 DEVELOP AND MANUFACTURE COMPONENTS AND SYSTEMS AND VERIFY THE PERFORMANCE OF WSN

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NOVEMBER
17

Jesús Lozano (UEx) participated in the International Symposium on Sensor Science (I3S), held in Barcelona. During his presentation at the conference, he discussed the SenForFire project, explaining its objectives and current state of development.

UEx participation in I3S (Barcelona).

R 2.1

OCTOBER-DECEMBER

- **Consortium meetings** to prepare the application for the EMJM 2026 call.
- **Internal meetings at the University of Coimbra** with the Portuguese accreditation agency (A3ES) on the completion of accreditation in Portugal.

WT3 VALIDATING WSN FOR THE PREVENTION AND EARLY DETECTION OF FOREST FIRES

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A 3.2

OCTOBER-DECEMBER

Monitoring and analysis of the RIS sensor network. During the last quarter of 2025, the operation and performance of the sensor network (RIS) deployed during the summer in six municipalities in Portugal, Spain and Andorra was monitored: Fundão; Guadarrama, Coria and Cañaveral; and Sant Julià de Lòria and La Massana. The RIS continuously records, in real time, data on atmospheric temperature and relative humidity, soil temperature, volumetric water content and soil water potential, as well as levels of volatile organic compounds in the air. During this period, statistical analysis of the data acquired by the RIS over the last six months began, as well as its comparison with open databases, including ERA5 (Copernicus).

Likewise, within the framework of collaboration with the Forest Fire Department of the Madrid Fire Brigade, INIA-CSIC monitored the moisture content of forest fuel associated with the sensors installed in Guadarrama, in species such as *Pinus pinaster*, *Quercus ilex* and *Cistus ladanifer*.

Similarly, and applying the same methodology, the Forest Fire Planning and Analysis Team (EPAIF) in Cáceres monitored forest fuel moisture linked to sensors located in Coria (*Quercus ilex*, *Cytisus multiflorus* and *Lavandula stoechas*) and Cañaveral (*Cistus ladanifer*, *Retama sphaerocarpa*, herbaceous plants and *Pinus pinaster*), whose data is being incorporated into the database managed by INIA-CSIC.