This quarterly publication focuses on environmental education regarding fires, featuring updates from the SenForFire project and articles on the science of fire. More than just a magazine, it is an invitation to care for the Earth.

SenForFire NEWS

FIRE-FIGHTING TECHNOLOGY

*Magazine of the **SenForFire** project for the development of sensor networks for the prevention and early detection of forest fires*



JULY–SEPTEMBER

07

ESTE NÚMERO

WHO MANUFACTURES THE SENSORS WHO SELLS THEM

FROM PROTOTYPE TO MASS PRODUCTION

SENSORS WITHOUT RULES

SENFORFIRE ON THIS MAP

In addition to these business initiatives is the SenForFire project, involving the Barcelona Institute of Microelectronics (IMB) and ITEFI, both part of the CSIC; the French CNRS; the University of Extremadura (UEx); and the company Ray Ingeniería Electrónica. They have developed early-warning fire detection devices that combine low-cost commercial sensors with innovative ones manufactured in the IMB's cleanroom and by the CNRS.

Currently, the risk of fire in south-western Europe is assessed primarily using data from weather stations and, to a lesser extent, from satellites, which do not always provide a detailed picture of conditions in each forest area. SenForFire complements these with wireless sensor networks (WSNs) that continuously monitor the terrain.

Initial trials conducted by the UEx using controlled burns show that the particle and gas sensors detect fire with high sensitivity and speed, although their effectiveness depends on the type of sensor, the distance from the fire and the air sample flow rate.

The project is being trialled in pilot areas in Spain, Portugal, France and Andorra. The sensors measure meteorological variables, soil moisture and air composition, and send the data to a platform that assesses the risk and generates alerts. The aim is to demonstrate that these networks enable forests to be monitored automatically, continuously and cost-effectively, complementing traditional regional-level systems with local information.

WHO MARKETS FIRE DETECTION SYSTEMS IN EUROPE?

Until now, this magazine has focused on SenForFire's technology. In this issue, we broaden our perspective to find out which other companies manufacture and market early forest fire detection systems in Europe and how they are being deployed in the field. In just five years, the sector has moved from laboratory prototypes to a diverse range of commercial products. Sensor networks, smart cameras and data analysis platforms aim to meet the needs of public authorities, insurers, forestry companies and private landowners.

Germany stands out with Berlin-based Dryad Networks, which markets Silvanet: a multi-sensor device capable of detecting carbon monoxide (CO), volatile organic compounds (VOCs) and particulate matter associated with plant combustion. The company has deployed networks of these devices across the Iberian Peninsula and other Mediterranean countries and, according to its own figures, reported in early 2025 that it had 20,000 sensors in operation. It also markets Silvaguard, an autonomous drone for verifying alerts, and is developing Florian, an early fire suppression project using fleets of drones.

In Spain, the Valencia-based company Pyro Fire Extinción offers BseedWATCH, a platform that combines gas sensors (CO and CO_2), 360-degree smart cameras and drones equipped with optical and thermal equipment. Its satellite connectivity, supported by Hispasat's infrastructure, enables alerts to be transmitted from areas without mobile coverage or local internet access.

Portugal contributes two further proposals: Bee2Fire, from the ITGest group, and SafeForest, from Leitek Innovative Solutions, based in Lisbon.

In Italy, SLY – a company initially focused on fires associated with power lines – develops gas sensors designed to detect minute traces of combustion. The Polish firm SmokeD combines cameras with artificial intelligence and 24/7 monitoring centres. In Latvia, SEBELO markets solar-powered sensors intended for use in peat bogs and industrial areas, amongst other environments.

France offers complementary solutions. Kinéis provides long-range satellite connectivity for sensors located outside mobile networks. Meanwhile, Toulouse-based Omni Sentinel is developing Fire Sentinel, an ecosystem that integrates early detection, real-time operational analysis and autonomous drone coordination using distributed artificial intelligence.

The European market already offers a range of technologies, although their consolidation will depend on the experience gained in the field. Assessing their reliability, response times and suitability for each environment will be key to distinguishing between advertised performance and proven results.

FROM PROTOTYPE TO PRODUCTION: ARE THE SENSORS ACTUALLY BEING USED?

Having a product in the catalogue is not the same as having it operational on a large scale. It is worth tempering expectations here: most of these technologies remain at an intermediate stage, having moved beyond the laboratory but still a long way from widespread adoption by public forestry services. What we are seeing are pilot schemes, one-off contracts or research collaborations, not comprehensive territorial coverage.

Dryad Networks illustrates this well: in the Eberswalde forest, it installed around 400 sensors as part of a pilot project with the local authorities, and in 2023 it arrived in Spain through Vodafone, with an initial pilot at an industrial complex in Asturias. These are demonstration installations, not continuous monitoring of an entire territory.

In Spain, there are several specialist companies operating: Bee2Fire, Pyro Fire Extinction, AISTECH Space, Aeromedia UAV, Sentinels and Arantec. The Regional Government of Extremadura went a step further than most when, in 2021, it contracted the latter – based in Vielha (Val d'Aran) – to install a system of sensors and weather stations capable of predicting fire behaviour based on wind conditions. It is one of the few examples of specific public contracts identified for this issue.

The closest thing to public adoption comes from the Baltic region and the Balkans. In 2021, the Latvian State Forest Service launched a camera system on twelve watchtowers in the Riga region, to be trialled for five years before deciding whether to roll it out across the rest of the country. Meanwhile, the Polish company SmokeD, which combines cameras with artificial intelligence, has installed its system for the Directorate of Protection and Rescue in North Macedonia. Of all the cases reviewed, these are the instances where this technology comes closest to being part of a public service's day-to-day operations.

Added to this is the fact that these systems have only been in trial for a short time. None of the deployments reviewed has been in operation for more than a decade, and most have been in place for only a few years. It is too early for any forestry service to have completely shifted its monitoring methods – which rely on towers, forest rangers and satellites – to a network of sensors.

The pattern emerging from these cases is that of a technology still in the trial phase: it is being deployed in very different landscapes – such as Mediterranean woodland, Baltic peat bogs or power lines in a rural area of Italy – and is being compared with the teams of people who remain the backbone of forest monitoring. Full coverage of the territory and the replacement of traditional methods are, as yet, the exception rather than the rule.

This provides an initial clue for interpreting the market: a 'pilot' roll-out is not the same as a permanent service. It is always worth asking how much area it actually covers, how many years it has been operating without interruption, and who pays for maintenance once the project's funding has ended.

The result, for now, is a promising technology that has already left the laboratory but has not yet replaced anyone: today it serves as an additional layer of information, not as a replacement.



SPAIN NOW HAS ITS OWN GROUP OF YOUNG COMPANIES (P. 2)

The Iberian Peninsula is also seeing the emergence of companies tackling wildfire detection through cameras, satellites, aircraft and ground-based sensors.

Bee2Fire (a Portuguese-Spanish joint venture) began as Bee2FireDetection, developed by the Portuguese company Compta and powered by IBM's Watson AI; it is now developed and marketed by ITGest, which is headquartered in Portugal and has a subsidiary in Spain. It combines optical, thermal and spectrometric cameras with AI, and its developers claim it can detect fires from up to 15 kilometres away.

Pyro Fire Extinction (Valencia) carries out its R&D at the UPV's Polytechnic City of Innovation. Its BseedWATCH solution combines forest sensors, 360° cameras and satellite observation, and the company reports having installed the system at more than 35 sites.

AISTECH Space monitors forests using its own constellation of nanosatellites fitted with infrared sensors, capable of detecting an abnormal rise in temperature before a fire becomes visible from the ground.

Aeromedia UAV combines drones, on-board sensors and LiDAR to monitor woodland, with applications in emergency situations as well.

Arantec (Vielha, Val d'Aran) has specialised in telemetry and wireless sensor networks (WSN) since 2006, through its SmartyPlanet range. In 2021, it won a tender from the Regional Government of Extremadura to install sensors and weather stations that enable the behaviour of fires to be predicted based on wind conditions; it is also a partner in the SenForFire consortium.

Sentinels Hub (Marín, Pontevedra) has developed Wildfire Sentinel, an 'electronic nose' utilising AI and IoT which, when suspended from trees or posts around the perimeter of a woodland, analyses the air, detects smoke and issues real-time alerts.

Cameras, satellites, drones and sensors complement one another, each addressing a different aspect of wildfire detection. **SenForFire** is part of this ecosystem.

SENSORES SIN REGLAS: LA TECNOLOGÍA VA MÁS RÁPIDA QUE LA LEY

Let's imagine that an autonomous community wants to install a network of sensors in its woodland tomorrow. Who do they buy from, and how do they know that what they're buying works? Today, the answer is that no one can guarantee this entirely. The Forestry Act and the decree implementing it set out what a fire prevention plan should look like, but neither specifies exactly what a 'detection sensor network' is, what it must be capable of doing, or how it should be connected to the party receiving the alarm. Each autonomous community also adds its own regulations, so the legal landscape is, in practice, a patchwork of pieces that do not always fit together.

This lack of common rules has a very specific consequence: this magazine has not found, either in Spain or in the rest of the European Union, a label or certification stating 'this sensor reliably detects fires', as is the case for smoke detectors in buildings. Each manufacturer decides for itself when to trigger the alarm, what information to send and what it means by 'early detection', without anyone outside the company independently verifying this. When a local authority wishes to purchase this technology, it does so on a case-by-case basis, as Extremadura did with Arantec, without a standard contract template or technical requirements that could be replicated in the neighbouring municipality.

This does not mean that companies can do as they please. The sensors comply with general telecommunications and data protection regulations, just like any other connected device. The fact is that legislation on forest fires has not yet addressed them, and in the meantime, they are advancing on their own, driven by the market and by European research funding, far ahead of the ever-slower pace at which public authorities agree on legislation.

There is another missing piece, perhaps even more important than the law itself: interoperability – in other words, the ability of different systems to communicate with one another. Even when sensors from various manufacturers are installed in the same forest, their data almost never 'talk' to one another, and very rarely reaches the centres that coordinate an emergency. Each company stores its information in its own cloud, in its own format, as if they were different languages that nobody has translated.

And what we really need to know — how often the system fails, how often it gives a timely warning, what area it actually covers — is almost never made public: this data remains within the company or the pilot project that generates it and can rarely be compared across different manufacturers. The figures that are published the least – and which matter most to a forestry service – are false alarms and real-time alert times in the field, not in the laboratory. Almost no manufacturer publishes its raw performance data: most of the figures in circulation come from the company's own press releases.

Furthermore, this lag is not unique to Spain. In Spain, there is no record of any public forestry service having made a network of sensors its primary monitoring system. Elsewhere, it is not the norm either: the most advanced case among those reviewed, that of the Latvian forestry service, remains a regional pilot scheme using cameras. Germany continues to lead the way with Dryad Networks; Spain, Italy and Poland are making progress with their own companies, whilst there is still no reliable data from much of south-eastern Europe.

The result is the same gap, made up of different pieces: a standard that does not yet mention sensors, a certification scheme that has not yet been established, data that is not shared, and platforms that are not interoperable. The technology is already in the forests; what is missing is a common framework that would allow any authority, large or small, to rely on it.

The Interreg Sudoe programme icon, under the slogan 'Cooperation is in your hands', highlights news items directly related to the SenForFire project.



OUTSTANDING ISSUES

Overall, four issues remain unresolved: the existence of a Spanish or European seal of approval or certification to attest to the reliability of a sensor network; the publication of comparable performance data across manufacturers; the connection between private platforms and official emergency centres; and further years of real-world experience in the field before drawing definitive conclusions.

This review is not intended to be exhaustive. It covers only those companies and projects that we have been able to verify against public sources as at the time of writing; consequently, names are likely to be missing, both in Spain and Portugal and in other parts of Europe, particularly in the south-east of the continent, where we have not identified any local manufacturers with products on the market. It is, in any case, a snapshot of a rapidly changing sector.

None of these issues depends on a single player. They require manufacturers, public authorities, fire services and research centres to share criteria and findings – a process that takes longer than developing a new device. Projects such as SenForFire, which test their networks over long periods and in a wide variety of scenarios, can provide some of that experience: real-world data, collected in the countryside, which can serve as a reference for those who have to decide what to install and where.

Sources: Dryad Networks, Silicon Canals, Infobae, Gulf News, CB Insights, Solar Impulse, Conecta Industria, El Referente, Vozpópuli, ITGest, Pyro Fire Extinction, Arantec, Comunicación UEx, sly.eco, PreventionWeb, SmokeD, Kinéis, SEBELO, Interreg Sudoe, Ambientum, BOE (Law 43/2003, Royal Decree 716/2025), JCCM and Dialnet.

This issue is based on public sources and press releases from the companies mentioned, available at the time of going to press. As with every issue, we invite local authorities and technical experts from the pilot zone network to verify or expand upon this information based on their direct experience.

FURTHER INFORMATION

REFERENCES FOR THE ISSUE «THE FIRE SENSOR MARKET»

Dryad Networks (Alemania). South Pole, «South Pole and Dryad Networks join forces to tackle forest fires», 26-1-2022, *https://www.southpole.com/news/south-pole-and-dryad-networks-join-forces-to-tackle-forest-fires*; Diario Libre, «"Narices" electrónicas husmean incendios forestales en Alemania», 19-7-2023, *https://www.diariolibre.com/planeta/medioambiente/2023/07/19/sensores-husmean-incendios-forestales-en-alemania/2408071*; Euronews, «These "electronic noses" can sniff out wildfires», 20-7-2023, https://www.euronews.com/next/2023/07/20/these-electronic-noses-can-sniff-out-wildfires-and-alert-fire-authorities-using-ai; Land Brandenburg (EFRE), «Dryad Networks – Sensors against wildfires», https://efre.brandenburg.de/efre/de/foerderperiode-20142020/projektbeispiele/dryad-networks_en; Business Wire, «Dryad Networks Raises €6.3M», 22-10-2024, https://www.businesswire.com/news/home/20241022118527/en/Dryad-Networks-Raises-%E2%82%AC6.3M-to-Lead-Breakthrough-Innovations-in-Wildfire-Detection-and-Drone-Based-Suppression-Technology; Business Wire, «Dryad Networks Leads the Charge in Global Wildfire Mitigation», 15-1-2025, https://www.businesswire.com/news/home/20250115881322/en/Dryad-Networks-Leads-the-Charge-in-Global-Wildfire-Mitigation-With-Record-Growth-in-2024; Dryad Networks, «Dryad Collaborates with Vodafone to Bring "Ultra-early" Wildfire Detection Technology to Spain», 1-3-2023, https://www.dryad.net/post/dryad-collaborates-with-vodafone-to-bring-ultra-early-wildfire-detection-technology-to-spain; Corresponsables, «Securitas despliega en la planta asturiana de DuPont la primera solución IoT para la detección precoz de incendios forestales», 14-4-2023, https://www.corresponsables.com/actualidad/securitas-direct-dupont-deteccion-incendios-forestales/; SatNews, «Dryad Networks and Kinéis provide next-gen satellite-enabled ultra-early wildfire detection», 17-7-2024, https://satnews.com/2024/07/17/dryad-networks-and-kineis-provide-next-gen-satellite-enabled-ultra-early-wildfire-detection.

Spanish and Portuguese-Spanish companies. ITGest, «Bee2Fire Detection», https://www.itgest.pt/bee2fire/; ITGest España, «Bee2Fire Forestal», https://www.itgest.es/proyectos/bee2fire-forestal-deteccion-temprana-de-incendios-forestales; ESMARTCITY, «Una solución basada en inteligencia artificial calcula la probabilidad de que se produzca un incendio», 22-7-2019, https://esmartcity.es/2019/07/22/solucion-basada-inteligencia-artificial-calcula-probabilidad-se-produzca-incendio; Pyro Fire Extinction, «BseedWATCH», https://bseed.eu/; Pyro Fire Extinction, «Hispasat y Pyro despliegan en Portugal el sistema Bseed WATCH», 2024, https://www.pyro.es/l/bseedwatchportugal/; Hispasat, «Hispasat rolls out its comprehensive fire protection system in three new areas reforested by Green Engine», 13-6-2024, https://hispasat.com/en/press-room/press-releases/archivo-2024/473/hispasat-rolls-out-its-comprehensive-fire-protection-system-in-three-new-areas-reforested-by-green-engine; El Referente, «Pyro (ficha de empresa)», 30-1-2025, https://elreferente.es/startup/pyro; El Referente, «La tecnología española que planta cara a los incendios», 31-8-2026, https://elreferente.es/startups/la-tecnologia-espanola-que-planta-cara-a-los-incendios/; Conecta Industria, «Menos incendios y más hectáreas quemadas», 30-7-2026, https://www.conectaindustria.es/articulo/innovacion/menos-incendios-mas-hectareas-quemadas-tecnologia-que-busca-cambiar-ecuacion/20260730090358015005.html; Vozpópuli, «La empresa española que vigila los cambios de temperatura para detectar incendios con una flota propia de satélites», 11-7-2026, https://www.vozpopuli.com/tecnologia/la-empresa-espanola-que-vigila-los-cambios-de-temperatura-para-detectar-incendios-con-una-flota-propia-de-satelites.html; Arantec, «Detección de incendios forestales, cuando la tecnología se alía con los bosques», 28-7-2021, https://www.arantec.com/sistemas-deteccion-incendios-forestales; Comunicación UEx, «El proyecto europeo SenForFire avanza en el desarrollo de sensores y prototipos», 17-11-2025, https://comunicacion.unex.es/2025/11/17/el-proyecto-europeo-senforfire-avanza-en-el-desarrollo-de-sensores-y-prototipos-para-la-prevencion-y-deteccion-temprana-de-incendios-forestales/.

Italy, Poland, Latvia and others. Università Bocconi, «Sensors That Smell the Air to Detect Signs of Fire», 29-11-2024, https://www.unibocconi.it/en/news/sensors-smell-air-detect-signs-fire; SLY, «About us», https://www.sly.eco/about-us; CMCC en PreventionWeb, «Wildfire monitoring and prevention», 25-5-2021, https://www.preventionweb.net/quick/17135; SmokeD, «About», https://smokedsystem.com/about/; Dirección de Protección y Rescate de Macedonia del Norte, carta de referencia para SmokeD, https://smokedsystem.com/wp-content/uploads/2025/03/10.2_MK_PaRD_ref-1.pdf; LSM, «Latvia implements forest fire monitoring system», 22-3-2021, https://eng.lsm.lv/article/society/environment/latvia-implements-forest-fire-monitoring-system.a397612/; SEBELO, «AI-Powered Early Wildfire Detection System», https://www.sebelo.net/.

Legislation. Real Decreto 716/2025, de 26 de agosto, BOE núm. 208, 29-8-2025, https://www.boe.es/eli/es/rd/2025/08/26/716.

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