Demonstrations of innovative approaches in **prevention** were made (Criss model - Mejor technology); Undergrowth reduction by preliminary multicriteria analysis using goats (UF) (**task 6.1**)

Preparation – Presentation of new fire equipment by the Fire Service - Stara Zagora (contribution to **task 6.3**)

Detection (Ember eye) – **task 6.1**.

Firefighting (Lusi - Mejor technology) – **task 6.2**.

Recovery – analysis of post-fire afforestation by the UF (contribution to sub-task 2.3.3.)

An interesting contribution was made in task 8.1 by presenting an exhibition of children's paintings dedicated to protecting nature from fires (Fig. 13).

Figure 13: Pupils' pictures and awarding

Over 80 children up to 10 years old from schools in the LL participated in the course on **forest pedagogy** during the innovation days (**tasks 7.1 and 8.1**). All of them received presents and materials from the project.

4.4.2. The IA demonstration results at LL level

IA1.3 Early-warning indicators of EWEs

Accurate and timely warnings are essential to prevent and mitigate the impacts of EWE. In IA1.3 we used advanced probabilistic modelling to forecast the daily occurrence of EWEs at an 8 km resolution across Europe up to 9 days in advance. Our model significantly improved the current estimation of EWE probability while providing key insights into the environmental and climatic drivers of EWEs. Compared to the Fire Weather Index (FWI), our model increased precision by a factor 5 for EWE predictions at the NUTS3 level and by a factor of 10 at 8km resolution. To assess further assess it operational relevance, we evaluated the model's forecasting skill in a test area. Our results demonstrate that EWE forecasts up to nine days in advance outperformed FWI- based nowcasts, emphasizing

the model's potential for operational use and its superiority in anticipating EWEs compared to current fire danger rating systems

IA2.2 Novel management practices – Component 2

The parameterization of indicators and criteria for prioritization of management areas in LL Bulgaria was done to prevent large forest fires, protect areas with high asset value and optimize firefighting activities, since this area experiences a significant number of forest fires. The selection of areas to parameterize forest management alternatives targeted areas where (i) the probability of experiencing a large forest fire exist, (ii) the presence of valuable assets demands actions to decrease fire hazard, (iii), performing fire mitigation/prevention activities is possible, and (iv) lack of management would increase fire hazard and risk. First, indicators related to fire hazard, exposure/vulnerability, management, and future changes were selected. Then, for each indicator, the corresponding spatial datasets were collected to calculate average values per unit of management and determine thresholds and weights. Finally, a multicriteria analyses was applied to identify priority areas for management. Results were validated using past wildfires in the region of study.

IA2.5 Strategic networks of managed areas

The case study area for this research is the Regional Forest Directorate (RFD) Stara Zagora, involving 15 stakeholders and experts on the process. In total 33 indicators were selected on the prioritization process, grouped on 4 major criterion groups. In this case, most of the criterion were common to the other living labs (fuel hazard, fire behaviour, exposed values and infrastructure to support firefighter activities), but the potential impact of climate change on habitat, and areas of future development were considered, providing relevance to the landscape and socio-economic dynamics. An issue to be considered is the grouping on many indicators within the fire hazard group, which may reduce the relative importance of those indicators. The importance of health-related aspects, and the road network were also relevant results of the project. A major breakthrough related to the application of this innovation action on this study case, was the use of the newly developed Pan-EU fuel server (https://www.cirgeo.unipd.it/fire-res/app/), to estimate indicators related to fuel hazard, and be able to sun fire simulations, to obtain fire behaviour metrics.

IA5.6 High Altitude Pseudo Satellites

In the simulations done in Bulgaria there is a single HAPS allocated to the Living Lab during the simulation period, from May to September. This dedicated regional HAPS achieves an average arrival time of 2 hours and 24 minutes, a monitored area percentage of 98.4 % and an average burnt area of 43 ha for the non-monitored fires.

IA5.10 Pan-European system to define management priorities

The innovation action "Pan-European System to Define Management Priorities for Mitigating Fire Impact" aimed to design a prototype system for identifying strategic fuel management priorities based on multiple criteria.

To develop this system, we began by defining a set of relevant criteria and assessing the need to model and map these variables. Among the most critical variables were fuel accumulation and potential fire behaviour, which, at the start of the project, were not adequately covered by existing information. During the initial years, the University of Padova mapped all fuel-related variables necessary to estimate fuel accumulation and simulate fire behaviour. This effort resulted in four scientific articles and the development of a server where the information is publicly available for download (https://www.cirgeo.unipd.it/fire-res/app/). Technosylva used this data to simulate high-intensity fire behaviour across the EU. Simultaneously, ISCI developed a multi-criteria decision support system calibrated to the generated data. This system can assign priority scores once the data is harmonized, and criteria are weighted accordingly. Currently, a strategic prioritization exercise is underway for the Iberian Peninsula, demonstrating the supranational capacity of this analysis and illustrating how large-scale, policy-oriented frameworks are most suited for this system. After the Iberian exercise is completed, the multi-criteria system, programmed as a QGIS plugin, will be publicly available.

Looking ahead, we plan to develop a dedicated server where users can easily download relevant data for such analyses. This platform will also store new data, especially concerning values and risk assessments, alongside existing datasets.

4.4.3. Next steps until 2030

Roadmap 2030

It should be recognized that the formation of a long-term and sustainable policy requires stability of the public system and perseverance. Nowadays, the participants in the CWI group are not convinced that such a thing exists, which is why the roadmap was divided into realistic and optimistic. The deadlines for the vision are indicative and not generally agreed upon.

The realistic roadmap towards 2030:

- 2024-2025: Communication campaign between departments
- 2025: Clarification of responsibilities, needs and gaps
- 2025-2026: Adoption of the understanding of common planning as part of integrated management
- 2026: Determination of common priorities in prevention and preparation
- 2026-2027: Determination of opportunities for provision with technology, equipment and people at vulnerable points
- 2027: Educational activities based on the experience of countries with more traditions in training
- Providing with Public Relation campaigns at every step

The optimistic roadmap towards 2030:

- 2025-2026: Analysis of the regulatory framework introducing elements of integration in management and criminal liability for non-implementation of fire-prevention
- 2025-2030: Stimulation of territory insurance
- 2027-2028: Coordination between departments through the mediation of municipalities and full information from the cadastre
- 2026- 2027: Development of the monitoring system based on GIS and satellite images
- 2028-2029: Preparation of a General Sustainability Plan for the territory and a regional plan for the Development of the Forest
- 2029-2030: Financial provision of these plans. Consistence in financing the technical provision of combat equipment with fires (incl. aviation)
- Securing with Public Relation campaigns at every step

4.5. CWI feedback

On 05.05.2023, the participants in the CWI group supported the proposed documents. Since some stakeholders did not participate, it can be assumed that the approach is supported by more than 75% of participants.

Figure 14: Meeting of the CWI team for discussing the Road map – 05.05.2023

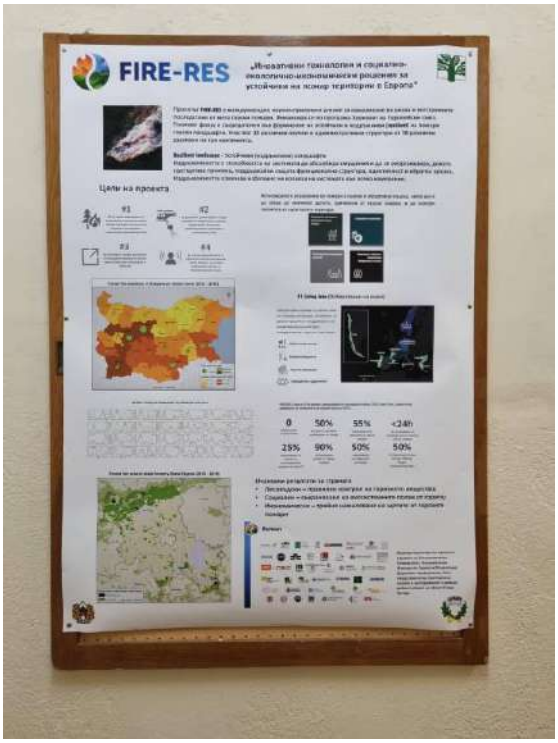

Figure 15: Poster of Bulgarian LL.

With the conduct of the OID, approval for the proposed innovative approaches is complete. In this regard, firefighters from Bulgaria are planning a visit to Catalonia in early August 2025.

* - Identified within FIRE-RES project

4.6. References

1. Law on the Ministry of the Interior (2014) - https://lex.bg/laws/ldoc/2136243824
2. Regulations for the implementation of the Law on the Ministry of Internal Affairs (2006) - https://lex.bg/laws/ldoc/2135540282
3. Forest Act (2011) - https://lex.bg/laws/ldoc/2135721295
4. Biodiversity Act (2002) - https://lex.bg/laws/ldoc/2135456926
5. Disaster Protection Act (2006) - https://lex.bg/laws/ldoc/2135540282
6. Law on territorial planning (2001) - https://lex.bg/laws/ldoc/2135163904
7. Penal Code (1968) - https://lex.bg/laws/ldoc/1589654529
8. Agricultural Land Protection Act (1996) - https://lex.bg/laws/ldoc/2133870081

9. Regulation No. 1 of 30.01.2012 on the control and protection of forest territories http://www.iag.bg/docs/lang/1/cat/3/index

10. Regulation No. 2 of 7.02.2013 on the terms and conditions for afforestation of forest areas and agricultural lands used to create special, protective and economic forests and forests in protected territories, inventory of crops created, their reporting and registration http://www.iag.bg/docs/lang/1/cat/3/index

11. Regulation no. 8 of August 5, 2011 on Felling in forests http://www.iag.bg/docs/lang/1/cat/3/index

12. Regulation no. 18 of 7 October 2015 on Inventory and planning in forest territories http://www.iag.bg/docs/lang/1/cat/3/index

13. Organizational regulations of the South-Eastern State Forest Enterprise

14. The National Strategy for Disaster Risk Reduction - https://www.strategy.bg/StrategicDocuments/View.aspx?lang=bg-BG&Id=1279

15. National Climate Change Adaptation Strategy and Action Plan to 2030 - https://www.strategy.bg/StrategicDocuments/View.aspx?lang=bg-BG&Id=1294

16. Lyubenov, K., 2014. Protection of forests from fires. Sofia. Forestry University.

17. EU Strategy for Adaptation to Climate Change https://learning-corner.learning.europa.eu/learning-materials/climate-adaptation-strategy_bg

18. https://www.mvr.bg/docs/librariesprovider43/%D0%BD%D0%B0%D0%BC%D0%B0%D0%BB%D1%8F%D0%B2%D0%B0%D0%BD%D0%B5-%D0%BD%D0%B0-%D1%80%D0%B8%D1%81%D0%BA%D0%B0-%D0%BE%D1%82-%D0%B1%D0%B5%D0%B4%D1%81%D1%82%D0%B2%D0%B8%D1%8F/%D1%81%D0%BF%D0%BE%D1%80%D0%B0%D0%B7%D1%83%D0%BC%D0%B5%D0%BD%D0%B8%D0%B5-%D0%BC%D0%B5%D0%B6%D0%B4%D1%83-%D0%BC%D0%B2%D1%80-%D0%B8-%D0%BC%D0%B1%D0%B2%D1%80/%D0%B4%D0%BE%D0%BA%D0%BB%D0%B0%D0%B4%D0%B8-%D0%BE%D1%82-%D1%81%D0%BF%D0%BE%D1%80%D0%B0%D0%B7%D1%83%D0%BC%D0%B5%D0%BD%D0%B8%D0%B5-%D0%BC%D0%B5%D0%B6%D0%B4%D1%83-%D0%BC%D0%B2%D1%80-%D0%B8-%D0%BC%D0%B1%D0%B2%D1%80/%D0%BA%D0%BE%D0%BC%D0%BF%D0%BE%D0%BD%D0%B5%D0%BD%D1%82-4/%D0%B4%D0%BE%D0%BA%D0%BB%D0%B0%D0%B4-%D1%81-%D0%BF%D1%80%D0%B5%D0%B4%D0%BB%D0%BE%D0%B6%D0%B5%D0%BD%D0%B8%D0%B5-%D0%B7%D0%B0-%D0%BD%D0%B0%D1%86%D0%B8%D0%BE%D0%BD%D0%B0%D0%BB%D0%B5%D0%BD-%D0%BF%D0%BB%D0%B0%D0%BD-%D0%B7%D0%B0-%D1%83%D0%BF%D1%80%D0%B0%D0%B2%D0%BB%D0%B5%D0%BD%D0%B8%D

0%B5-%D0%BD%D0%B0-%D1%80%D0%B8%D1%81%D0%BA%D0%B0-%D0%BE%D1%82-%D0%B1%D0%B5%D0%B4%D1%81%D1%82%D0%B2%D0%B8%D1%8F-%D0%B2-%D0%B1%D1%8A%D0%BB%D0%B3%D0%B0%D1%80%D0%B8%D1%8F.pdf?sfvrsn=6f938f85_2

5.Canary Islands (CAN)

Authors: Samblàs Vives, Eva; Balguerías Quintero, Eduardo; Arencibia Aguilar, Luis Fernando; Grillo Delgado, Federico

5.1. Wildfire context

5.1.1. Fire regime, socio-ecological context, and impacts

The climate of the Canary Islands is highly influenced by trade winds originating from the eastern flank of the Azores anticyclone, with average speeds of 20-22 km/h, and a northeast component. These winds create a 2-layer stratification in the atmosphere (a lower humid layer and a higher, drier one), leading to a thermal inversion (typically between 950 and 1,500 m) that acts as a barrier to vertical air movement and, thereby, inhibits cloud formation above it.

Additionally, the Canary Islands are significantly affected by the proximity of the Sahara Desert, which brings warm, dry air laden with dust, and generates winds, often strong and predominantly from the east or southeast. These winds are most prevalent during summer, when the Azores anticyclone shifts northward and weakens. This climatic condition, referred to as *Tiempo sur* (Southerly weather), generates conditions of high temperatures and low relative humidity that become particularly critical to the development of EWE.

In view of the above mentioned, two predominant synoptic situations associated with the risk of wildfires in the Canary Islands can be identified:

- **Standard conditions**: average situation of summer months without the influence of Sahara winds and under the effect of the humid trade winds. In these conditions, the thermal inversion occurs at 800-1,200 m. Two clearly differentiated scenarios are defined, with an upper layer where the risk of wildfire is much higher than in the areas located below the inversion layer.
- **Conditions associated with EWE**: meteorological situations of heat waves associated with episodes of Saharan advection. In these conditions, the base of the thermal inversion reaches an altitude of 300 m and relative humidity drops to 50% under the inversion and to 10-20% over the inversion, where average maximum temperatures reach 30-34ºC.

The critical wildfire season runs from 1st July to 30th September, with July and August witnessing the highest incidence. The main wildfire typology in the Canary Islands, and specifically in Gran Canaria, are small wildfires of less than 1 ha that are normally controlled in few hours. However, despite the overall decline in the number of fires, recent years have seen an increase in EWE, which burn thousands of hectares and stay active for several days or even weeks. According to the Spanish General Wildfire Statistics (EGIF), 85% of small wildfires that occurred in Gran Canaria for the 2000-2023 period were

small fires, while only 0.5% were large wildfires that accounted for 93% of the total burned area in the same period.

Most wildfires in Gran Canaria are either intentional or caused by negligence, with agricultural burning being the main cause in the latter case. Regarding fires caused by accidents, excluding those provoked by burnings, three cases are worth mentioning: power lines, fireworks and machinery. Electric storms, however, are infrequent and account for less than 0.5% of fire incidents.

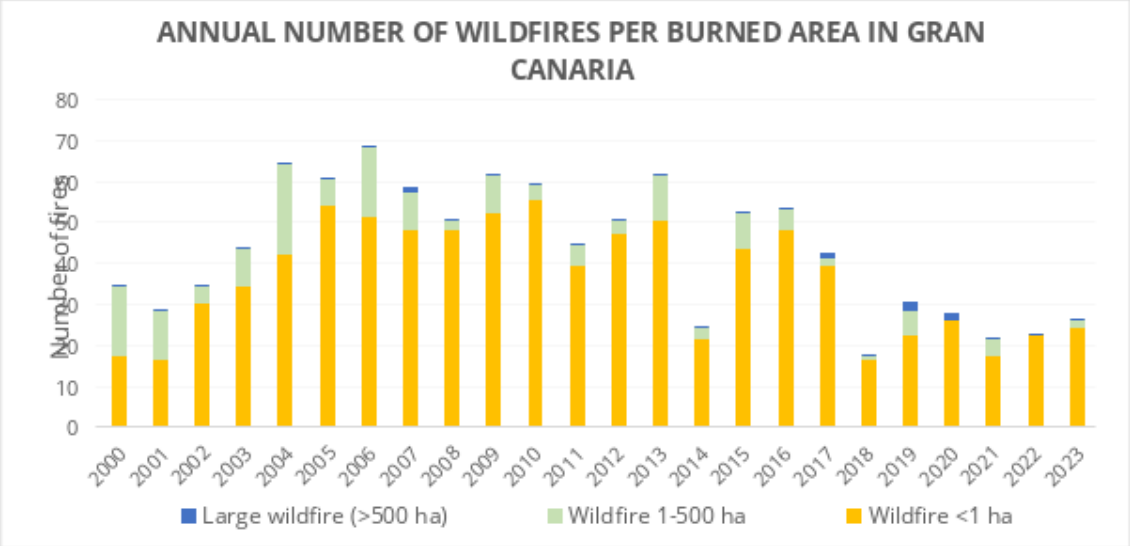

Figure 16: Annual number of wildfires per burned area in Gran Canaria. Source: ISTAC, EGIF.

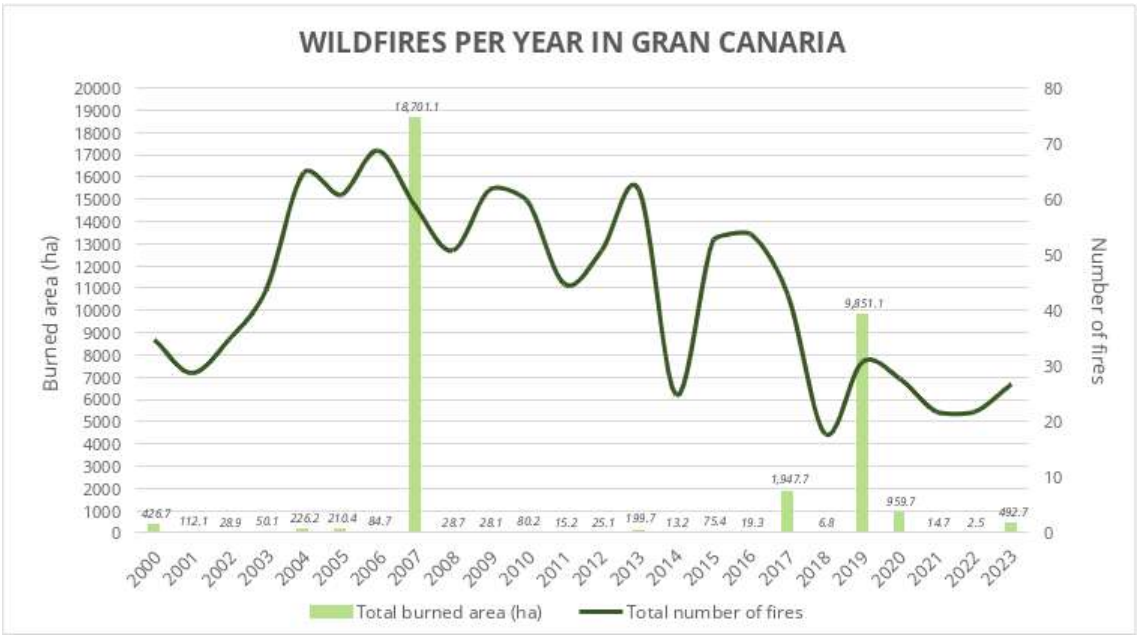

Figure 17: Wildfires per year in Gran Canaria. Source: ISTAC, EGIF

Based on the main fire propagation factor, three main wildfire typologies have been identified in Gran Canaria:

- **Topographic**: The wildfire spreads following the maximum slope. In the initial stages, it is often driven by local winds, unaffected by the general wind patterns, as it is confined within the ravines or on the slopes. The perimeter of the fire typically mirrors the contours of these slopes and watersheds, with its main path of progression following the direction of the ravines. Critical areas to monitor include the gullies, the junctions of these gullies, and the tail or flank positions, which have the potential to start new fire runs.
- **Convective and convective under windy conditions**: Large convective fires are closely influenced by macro-topography. Under windy conditions, fires spread along the main ridge axes following the wind direction. The wind not only increases the distance from which secondary outbreaks can occur but also generates new ignition points outside the immediate influence of the convective column, thereby accelerating the overall spread of the fire. Both the convective column and secondary ignition sources are carried in the wind's direction. Critical points include ridge axes and ravine junctions.
- **Wind with subsidence**: The phenomenon of subsidence occurs most frequently on the southern slopes of the island. During the day, diurnal topographic winds effectively counterbalance the trade winds that persist at higher elevations. However, at night, these topographic winds take on a descending nature, which exacerbates the effect of trade winds. As a result, fires exhibit different behaviour depending on the time of day: they act as topographic fires during daylight hours and transform into fires driven by descending winds at night. This shifting dynamic means that the tail or flank of the fire during the day becomes its head at night, and vice versa. Such complexities make these fires particularly challenging to control.

Canarian vegetation is highly adapted to fire (Höllermann, P., 2000). The endemic Canary Islands pine (*Pinus canariensis* C.Sm.), the main forest species of the Archipelago, is one of the most resistant *Pinus* species to fire-induced mortality, since it possesses several fire-resistant traits such as thick bark, serotinous cones and resprouting capacity (Climent et al., 2000). The *Fayal-Brezal* is a forest formation located in the transition area between Laurel and pine forests, represented by species such as *Erica arborea* and *Myrica faya*. Species within these forests are characterized by their strong colonizing ability, high flammability, and remarkable re-sprouting capacity a few months after fire. Laurel forests (*Laurisilva*) are perhaps the forest formations that exhibit the greater fire resistance due to their humid conditions and the low flammability of its constituent species. However, these forests become particularly vulnerable to fire at younger or regressive stages, where species typical of the *Fayal-Brezal* emerge.

Gran Canaria is one of the most densely populated islands of the Canary Islands (857,171 inhabitants in 2023), accommodating almost 40% of the total population of the archipelago. Overall, approximately 80% of the island's population resides in the coastal

strip in the north, east and south, leading to significant depopulation in the central more mountainous and forested areas. This creates a striking contrast in WUI patterns between the coastal and inland regions: the coast features more compact urban or densely clustered structures, while the interior and more mountainous regions are characterized by isolated buildings. The municipalities of Artenara, Tejeda, La Aldea de San Nicolás, and Moya exhibit the highest percentages of this dispersed building typology. The construction materials of houses are predominantly concrete and brick (wood constructions are practically anecdotal), with rooftops covered with tiles or flat and covered with cement to be used as terraces. The main used materials for windows are aluminium and wood.

Settlements situated in forested land face a dual threat. On one hand, there is the increased risk of fire ignitions, while on the other, the residents themselves may become victims of such fires. This expansion of danger to both property and human life not only heightens the likelihood of fires occurring but also complicates prevention efforts and, more significantly, the tasks involved in extinguishing them. In September 2017, an EWE that burned 1,893.49 hectares affected several WUI areas forcing the evacuation of more than 400 people, and damaging non-forest assets (homes, roads and civilian and military infrastructure). Tragically, the fire also resulted in the death of a civilian near her home.

Regarding the economical context, in the past the main economic driver in the islands was the primary sector. However, in recent decades this has been replaced by service sector activities linked to tourism. Before 1960, the primary sector employed more than 50% of the population and generated 32% of the Gross Domestic Product (GDP). Today it only accounts for 20,000 direct jobs and contributes little more than 1% of GDP (Data from Government of Canarias).

This decline of traditional forest exploitation practices (e.g., firewood and pine needle collection) along with the abandonment of extensive livestock farming, has led to significant recolonization and accumulation of forest biomass, creating homogeneous and continuous landscapes that are particularly vulnerable to wildfires. According to data from the Department of Agriculture, Livestock, Fisheries, and Water of the Canary Islands Government, 20 out of the 21 municipalities in Gran Canaria experienced a loss of agricultural land between 2013 and 2019.

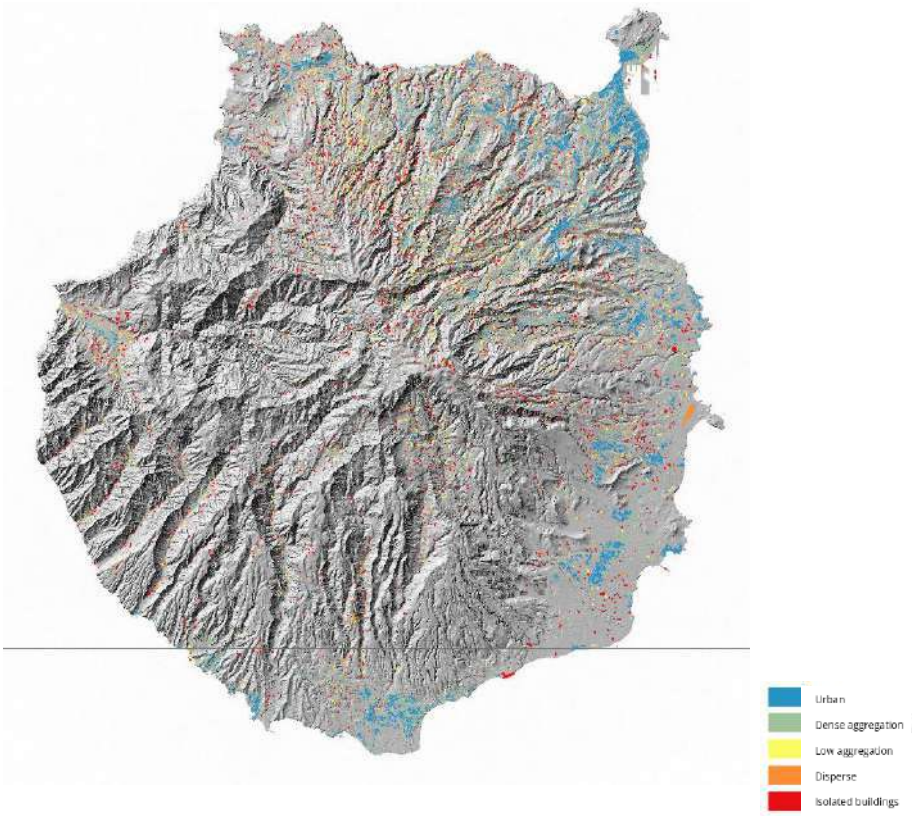

Figure 18: WUI characterisation in Gran Canaria using Pyrosudoe methodology. Source: Gobierno de Canarias.

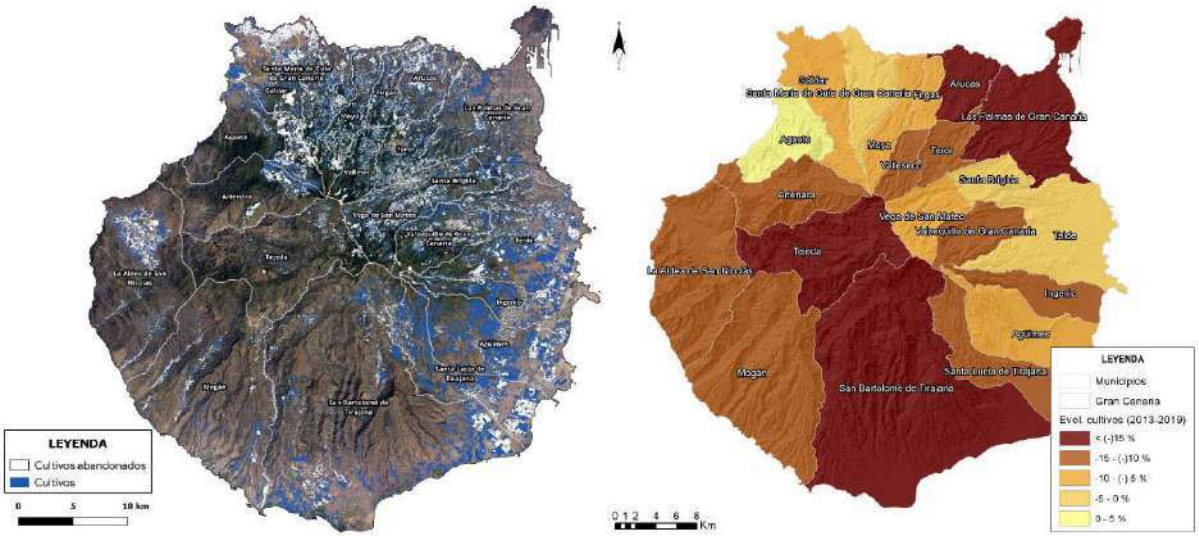

Figure 19: Cultivated land in Gran Canaria in 2019 (left) and cultivated area balance between 2013 and 2019 (right). Source: ISTAC

5.1.2. Wildfire governance

The **Canary Islands Forest Plan** is the strategic planning instrument that defines the necessary lines of action for the proper management and restoration of the archipelago's forest resources. Initially established in 1999, a new Forest Plan is currently being developed, with its approval expected in 2025. Regarding wildfire governance, the plan adopts a comprehensive approach to wildfire risk management across the islands, focusing on the promotion of preventive, climate change-adapted silviculture, the protection of the WUI areas, the recovery of traditional land uses, public participation, post-fire restoration, and the strengthening of inter-institutional cooperation during emergencies.

In parallel, work is also underway on a new **Canary Islands Forest Law** and on updating **Decree 146/2001 on wildfire prevention and suppression**, with the aim of reinforcing preventive measures in the WUI and adapting them to the challenges posed by climate change.

Additionally, wildfire emergencies in the Canary Islands are governed by the *Special Civil Protection and Emergency Response Plan for Wildfires in the Autonomous Community of the Canary Islands* (**INFOCA**), whose purpose is to guarantee a rapid and efficient response to wildfires and the emergencies derived from them in the Canary Islands, by establishing an organized framework and procedures for coordinating firefighting efforts among the various island administrations. INFOCA activates under high wildfire risk situations.

The main functions of INFOCA are: (i) organizational structure and intervention procedure, (ii) wildfire risk zoning, (iii) resource allocation and infrastructure development for emergency operations, (iv) self-protection and prevention plans development, (v) to establish the fire risk periods based on weather forecast and local parameters, (vi) to implement measures to facilitate the investigation of wildfire causality and (vii) to set public information protocols.

INFOCA is integrated into the *Territorial Civil Protection Emergency Plan of the Autonomous Community of the Canary Islands* (**PLATECA**). Additionally, each Island Government (Cabildo) has its own Wildfire Prevention and Extinction Plan (e.g., **INFOGRAN in Gran Canaria**), which act as key instruments for firefighting operations and prevention in each island and are subjected to the coordination of INFOCA. At a local level, municipalities develop their Local Action Plans for Wildfire Emergencies (**PEMU**). Finally, entities and organizations engaged in activities that may either generate forest fires or be impacted by them due to their proximity to WUI areas are required to implement **Self-Protection Plans**. Furthermore, National Parks, Rural Parks, Natural Parks, and other protected natural areas situated within High Fire Risk Zones are also required to have Self-Protection Plans in place.

This is the legislative and planning framework in place at the regional level. Based on it, each Cabildo develops its own strategies for wildfire risk management, tailored to the specific territorial and operational characteristics of each island. The following sections

outline the strategy adopted in Gran Canaria, including the main lines of action, implemented measures, and the organization of resources.

How is the wildfire preparedness organised?

- **Fire Prevention Planning:**
  - Annual Wildfire Prevention, Surveillance and Extinction Plans (PAPVEIF): These documents, prepared annually by each Insular Government, address the wildfire challenge from two key perspectives: prevention and operation. The preventive approach focuses on actions aimed at avoiding or mitigating the impact of forest fires, primarily through the establishment of low-load areas. The operational perspective emphasizes the regulation of surveillance, resource use, and coordination among public and private entities.
- **Fuel management in public land**: preventive work carried out by the Cabildo with the main objective of creating and maintaining Low Fuel-load Areas (ABC in Spanish). To achieve this, several strategies and actions are being implemented:
  - Preventing abandonment of agricultural crops: The Cabildo of Gran Canaria is working on the future implementation of payment for environmental services to promote the profitability of the primary sector.
  - Gran Canaria Pastorea: A project that allocates prescribed grazing in strategic areas of public forests and ravines, financially compensating shepherds for their wildfire prevention services under the figure of Payment for Ecosystem Services (PES). In 2023, a total of 34 shepherds participated in the project.
  - Prescribed burns: Since 2002, the Environment Service of the Cabildo of Gran Canaria has conducted prescribed burns for fire prevention, pasture improvement and forest restoration. Prescribed burns are predominantly carried out in strategic areas of Canary pine stands. Since its establishment in 2002, more than 600 hectares have been managed using this technique in Gran Canaria.
  - Mechanical treatments: Clearing, thinning, and selective logging are carried out in strategic areas to reduce certain types of fuel which cannot be directly addressed through controlled grazing or prescribed burns. Currently, the primarily focus is on clearing underbrush in pinewood (to prevent crown fires) and giant cane removal (subsequently combined with grazing to control regeneration). At present, approximately 200 hectares are managed per year.
  - Forest use by local communities: Such as the collection of pine needles, cane, firewood, or logs. The administration seeks to facilitate the legal procedures to promote these traditional activities and, therefore, fire prevention.
- **Fuel management in private land**: In 2022, the Cabildo of Gran Canaria launched the *Fondo Verde Forestal*, an annual grant programme for private individuals to carry out preventive work on private land, prioritizing WUI areas located in high wildfire risk zones (ZARI). The annual budget is 300.000€.
- **Citizen awareness**: One of the main campaigns carried out by the Cabildo of Gran Canaria is *Gran Canaria Mosaico*, whose objective is to prevent Large Wildfires by promoting the recovery of the mosaic landscape and encouraging traditional agricultural, livestock and forestry activities. Thus, as part of this programme

educational material is prepared and talks, courses and conferences are organized to raise awareness and promote fire prevention among citizens. As an example, in 2019 a comic book was published for children and young people to explain basic notions about wildfires. In 2022, a web page was created to provide practical information on fire prevention. In 2023, more than 60 talks were given in different municipalities located in high wildfire risk areas and several workshops were held in schools. In addition, every May, a digital and radio campaign is carried out to reinforce the messages addressed to citizens living in WUI areas, urging them to prepare their homes for the period of maximum fire risk. Finally, for several years now, the Forest Firefighter's Day has been celebrated in Gran Canaria, coinciding with the International Forest Firefighter's Day, to recognize the work of professional and volunteer forest firefighters.

- **Regulations and restrictions**: According to Decree 146/2001 cultural activities involving the use of fire in agricultural or forest lands, as well as the burning of forest or agricultural residues are subject to prior authorization at any time of the year. Additionally, certain activities such as the recreational use of natural areas or forests interventions with machinery that can cause sparks may be restricted based on the level of fire risk.
- **Training of emergency teams**:
  - Annual Training Plan: Each year, a series of specific courses and workshops are offered for personnel involved in the wildfire suppression unit. These courses focus on developing competencies in areas such as wildfire management, safety, machinery operations (chainsaw), operational protocols, human factor in emergencies, among others.
  - Practical Exercises: During the summer period, practical exercises are carried out to improve the execution of manoeuvres and the assimilation of work protocols.
  - Physical preparation: On every shift day during the wildfire season, a physical training session is conducted, guided and supervised by a fitness coach specifically hired for this purpose.
  - Drills: These simulate emergency situations to practice the deployment of the unit, application of operational protocols and communication procedures, as well as coordination among the different components of the team.
  - Prescribed Burns: These can also be considered a training activity that helps improve the understanding and handling of technical fire, as well as the deployment of operational protocols, communication, and team coordination.

How is the response organised?

The main means and resources in a wildfire emergency in Gran Canaria are:

- ***Unidad Operativa de Fuegos Forestales* (UOFF, created in 2002):**
  - Helicopter-borne teams (PRESAS)
  - Ground brigades
  - Patrols in light vehicles with 400L motor pump.
  - Technical Director of Emergencies
  - Technical Director of Extinction

  - Planning, Operations and Logistics Technician
  - Fire Analyst
  - Forest Fire Investigation Brigade (BIIF)
  - Environmental Agents of the Firefighting Group (BRIEX)
  - Communications Managers
  - Logistics managers
  - Supply and warehouses
  - Fire wardens
- ***Consorcio de Emergencias de Gran Canaria***: Firefighters with a rural/industrial profile who act as reinforcement in Large Wildfires or as specific defence units in WUI areas.
- **Civil Protection Volunteer Groups**: approximately 350 volunteers operating annually. They play a particularly important role as first responders, helping to prevent incipient fire outbreaks from developing, as well as providing support in logistics and surveillance during major emergencies.
- **Municipal Firefighters**: Firefighters with an urban/industrial profile belonging to the municipalities of Las Palmas and San Bartolomé de Tirajana. They serve as reinforcement in EWE or as specific defence units in WUI zones.

How is the suppression strategy organised?

There is currently no predefined suppression strategy in place for wildfire incidents in Gran Canaria. Instead, it is adapted to each situation and scenario, without a predefined objective. Overall, efforts are aimed at minimizing the burned area. However, if there is potential risk to people or property, these become the priority by Law, and the strategy shifts to minimizing the impact on them. Another key objective of the suppression strategy is to prevent the collapse of the system in the event of simultaneous incidents. In such cases, the focus is on avoiding system overload.

In all cases, the strategy is always based on the search for areas of opportunity and on trying to prevent the fire from reaching the critical points identified, with the intention of limiting its potential and always prioritizing the safety of the emergency personnel and others.

Additionally, given the island's geographical and demographic characteristics, the probability of wildfires affecting WUI areas, isolated dwellings, or critical infrastructures is high. Consequently, and in order to minimize impacts on the population, the **most frequently adopted approach is full suppression**.

In specific and limited scenarios, selective suppression may be employed by letting burn those sectors that do not represent a civil protection threat. However, due to the widespread and complex distribution of WUI areas throughout the territory, opportunities to apply this approach are limited. Moreover, in critical situations selective suppression may serve as a contingency measure to prevent emergency services from becoming overwhelmed, keeping resources for areas of higher priority.

An illustrative example of selective suppression occurred during the most recent EWE in Gran Canaria (Valleseco, 2019), where the Tamadaba Natural Park was intentionally left to burn. This decision was supported by the convergence of various technical assessments: the scale and intensity of the emergency had severely limited the availability of suppression resources, fire behaviour in the affected area remained within ecologically acceptable thresholds and there were no nearby settlements and critical infrastructure at risk.

Regarding the response structure, it is organised following a combined strategy. Initially, all efforts focus on the first attack, where the key factors are the early warning and response time of the deployed resources. The automatic mobilisation of minimum resources in response to any fire warning is protocolized, and these resources will work in a coordinated ground-air manner. If the initial attack fails, the system moves to an extended attack phase. In this phase, the dispatch of resources will be scaled according to the emergency's needs. Again, this is based on the integration of both ground and air resources into the existing operation.

Finally, the investigation of the causality of wildfires is carried out by the BIIF, a specialized unit within the Environmental Agents Corps of the Cabildo de Gran Canaria. The brigade seeks to determine the real causes of ignition and, when possible, their presumed authors and motivation in the case of intentional fires. It is important to highlight the progress made in recent years regarding the investigation of ignition causes. According to the Spanish General Wildfire Statistics (EGIF) it was the actual cause of 48% of the fires that occurred in the period 2000-2014 was identified. This percentage increases by 73% when including fires up to 2022.

How are the post-fire actions organised?

- **Damage inventory**: Assessment and quantification of damage is led by the island, regional, or national governments. Public administrations at different levels (island, regional or national) can establish extraordinary aid programmes for individuals. The involvement of the National Government in the recovery phase requires the official declaration of the affected area as “catastrophic”, requested by local, island or regional governments and approved by the Council of Ministers in accordance with Law 17/2015.
- **Statistics**: The Wildfire Investigation Brigade (BIIF) is responsible for determining the causes of all wildfire incidents and filing the corresponding complaints when necessary.
- **Recovery actions**: Post-wildfire restoration efforts typically focus on three main goals: (i) reduce the risk of extreme hydrological events caused by the fire, in order to protect both people and infrastructure; (ii) restore the visual quality of the damaged landscape; and (iii) properly manage the accumulation of dead vegetation (fuel load). The new Canary Islands Forest Plan aims at establishing protocols for immediate action after a fire and for long-term environmental restoration actions.

- **Financing and responsibility**: Insular and regional governments (Cabildos and Gobierno de Canarias) are the main responsible entities of the restoration of burned areas. If the affected area is officially declared as "catastrophic", the National Spanish Government will also contribute to restoration actions. Regarding insurance, while wildfire damage insurance is available on the open market, it is not mandatory for homes in the WUI, forests, or agricultural lands. As a result, if property owners do not have insurance coverage, they must rely on specific aid programmes that may be established by public authorities to mitigate the damage.

5.2. Vision for wildfire-resilient landscapes in 2030

5.2.1. A 2030 wildfire-resilient landscape in Canary Islands

The landscape is the complex product of the interaction between human activities and the natural environment. Thus, **it is unrealistic to envision a resilient landscape as one that has zero risk of ignition**. Instead, a resilient landscape is one in which fires occur but remain low in impact and do not escalate into EWE out of extinction capacity.

Such a landscape should be diverse, dynamic, and safe for its inhabitants. Conceptually, it can be envisioned as a **mosaic that integrates traditional agricultural and livestock practices, while simultaneously preserves ecological networks and native biodiversity**. It should facilitate adaptive forest management strategies that enhance ecosystem resilience to disturbances. This may involve practices like prescribed burning or the establishment of green firebreaks using native species. Moreover, for a landscape to truly embody resilience, it is crucial to **empower local communities** by providing training in self-protection and emergency preparedness.

Figure 20: Results of the ice-breaker activity carried out in the 1st CWI meeting of Canary Islands LL.

5.2.2. Resilience in fire preparedness and prevention

- Stable and appropriately scaled **resources are allocated for preventive tasks** continuously throughout the year, regardless of the seasonality of the risk.
- **Actively maintained multifunctional and biodiverse landscapes**. A territory where the agroforestry mosaic has been restored, with a landscape structure that breaks fuel continuity and reduces the risk of large wildfires.
- **Strategic management of WUI areas and land-use planning for wildfire risk management**. An urban development model based on resilience criteria, which avoids new vulnerable developments, reorganizes already built-up areas, and promotes safe infrastructure in WUI zones.
- **Revitalization of the primary sector as a driver of active prevention**. A dynamic rural environment, with modernized agricultural and livestock sectors, that offers employment opportunities, incentivizes land management, and connects local production with wildfire prevention.
- **Strengthened local capacity to plan and implement prevention**: Municipalities have enough resources and technical support to develop and implement effective wildfire prevention and protection planning.
- **Effective transfer of scientific knowledge to operational management**.
- Standardized, interoperable, and accessible information systems. **A shared and up-to-date data infrastructure among administrations**, enabling efficient risk planning and management, with homogeneous mapping also accessible to the private sector.
- **Informed, co-responsible, and prevention-committed citizens**: A society aware of the risk, that understands the environment in which it lives, participates in preventive actions, and coexists harmoniously with the rural environment and its traditional practices.
- **Effectively implemented and regulated Self-Protection Plans in sensitive areas**. All activities located in high-risk areas have adapted, standardized, and operational Self-Protection Plans in place, ensuring the safety of people and property in the event of an emergency.

5.2.3. Resilience in wildfire emergency management

- **Solid and harmonized inter-administrative coordination structure**. The different emergency bodies at island, regional, and national levels operate under common protocols, with unified operational criteria, and can integrate effectively in large-scale emergency situations.
- **Interoperable and standardized communication and decision-making systems among administrations, ensuring a constant flow of information** between the different actors participating in the emergency.
- Centralized **technological tools adapted to new EWE scenarios** are available, incorporating predictive models, scenario simulations, and vulnerability analysis.

- **Civil society** is aware of the new generation of wildfires, **trained in self-protection**, proactive, and willing to collaborate with emergency teams, especially during confinement or evacuation.

5.2.4. Resilience in post-fire management and adaptation

- Restoration efforts focused on achieving **future ecological resilience** (not on returning to the past), promoting functional ecosystems adapted to the new climate conditions.
- **Adaptive management** of high fire-resistant forests formations such as ***monteverde* and *laurisilva*** is carried out, with the priority of increasing the structural maturity of these ecosystems to improve their fire resistance.
- A coherent and proactive **financial framework that prioritizes prevention over reactive restoration**. Resources do not arrive only after disaster strikes but are invested in a structured and anticipatory way to avoid or minimize the impacts of wildfires.
- **Strategic, multi-scale planning** as the foundation for all post-fire restoration. Intervention is based on solid diagnostics that identify critical areas, recovery timelines, appropriate measures, and long-term results.
- **Monitoring and evaluation** systems to promote continuous improvement: Restoration actions are assessed through technical follow-up, generating evidence to refine future interventions.
- A comprehensive socio-ecological approach that **links land restoration with human recovery**. Measures are implemented to prevent rural depopulation and consider the psychological well-being of affected communities as a key element of territorial resilience.
- Education, **effective communication, and community involvement** with a clear technical and scientific criterion, so that citizens understand the actions carried out in the territory.

5.3. Gaps to reach that vision

5.3.1. Preparedness and prevention phases

- **More resources** need to be allocated **to the prevention and planning phases**. Current suppression teams are already highly trained and specialized, so increasing investment in suppression is unlikely to significantly improve operational capabilities.
  - In several cases, the lack of human resources hinders prevention efforts. Preventive treatments are typically carried out outside the high wildfire risk season, which largely coincides with the time of the year with less personnel availability. As a result, some actions cannot be undertaken, or at best, implementation efficiency is significantly limited.

  - In recent years, a conscious effort has been made by public authorities to improve land management and reduce fuel loads in strategic areas through the application of silvicultural treatments, prescribed burns, and preventive grazing. However, investment remains insufficient to manage all strategic areas (ca. 30 hectares managed annually with prescribed burns and ca. 1,000 hectares managed with preventive grazing).
  - Regarding ignition cause investigation, the work carried out by the *Brigada de Investigación de Incendios Forestale* (BIIF) has led to a significant increase in the percentage of known fire causes (from 47.8% in 2014 to 73.15% in 2022). Understanding the specific causes behind wildfire ignitions is essential for developing effective management policies and strategies.
- **Rural abandonment**:
  - Loss of agro-forestry mosaic and increase of forest biomass. Forest expansion towards former agricultural land, giving rise to fuel models dominated by shrub species and resulting in landscapes with greater continuity and higher flammability.
  - Increase of wildland-urban interface areas and their associated risks.
  - Loss of indirect services provided by the communities living in rural areas such as ignition surveillance or fuel discontinuity maintenance. Cultivated land around villages used to act as an effective buffer zone to prevent wildfires from reaching populated areas.
  - It is necessary to protect agricultural land from urban development processes, as they not only create fuel discontinuities in the territory but can also be refuges for biodiversity. Abandoned lands could be used to create green barriers where biodiversity can recover, rather than removing all vegetation (with a prior analysis of the return periods; in areas with higher recurrence of fires, this strategy will not be viable).
  - The primary sector should be modernised to create more attractive conditions for the population. Strategies are already being implemented to revitalize this sector, such as promoting local consumption, livestock and grazing schools, or encouraging viticulture. Efforts are also being made to promote land stewardship through Payments for Environmental Services (PES), currently focusing on preventive grazing, but work is ongoing to expand this to the collection of pine needles and strategic agricultural areas.
- **Lack of legal support to act on private land:**
  - Most land management actions are limited to public land. The Administration can only act on private properties with the explicit consent of their owners, as it lacks the necessary legal means to intervene in lands whose ownership is unknown, or in cases where the owner has passed away or refuses to grant permission.
  - To date, the results of the Fondo Verde Forestal are promising (in 2023, 13 out of 29 applications were approved, each receiving a minimum grant of 10.000€) but further efforts are needed to enhance its impact.

- **Citizens' involvement in wildfire prevention** has improved in recent years. For example, the population is willing to collaborate to reduce fuel in areas of ravines or palm groves. However, there is still a lack of risk awareness that leads to an insufficient management of WUI areas. This is further complicated by the increasing settlement of rural areas by population from urban environments, who often have limited knowledge of the local landscape and its inherent risks and an often-limited understanding of many rural activities, which can sometimes lead to conflicts driven by misconceptions about ecological awareness.
- **Lack of land use and urban planning**. There is a significant number of isolated buildings in WUI areas connected by inadequate road infrastructures. These locations become particularly vulnerable in case of an emergency. How many extreme events are necessary for land use planning to become socially accepted?
- Significant gap in effective communication between the Administration, the public, and the academic community, resulting in a **deficient scientific knowledge transfer from academia to administrative bodies**. Frequently, technical documents are developed without fully integrating relevant scientific data, often due to limited access or a lack of familiarity with the information.
- There is a **lack of coordination between administrations** (both at the insular and regional levels) when it comes to sharing data, resulting in a disparity of information among islands. For example, the cartography of fuel models differs for each island, and in some cases, it is not updated. Data should be standardized, and a uniform methodology should be applied. On the other hand, in some cases data is not readily available, complicating effective planning, even for the private sector.
- The competence of fire prevention and emergency planning at a local level (Local Emergency Plans, PEMU) belongs to the **town councils, but they often lack the resources** to develop these instruments or to efficiently implement them. There are few municipalities with already approved PEMUs.
- According to INFOCA, activities located in the WUI, as well as National, Rural, and Nature Parks, are required to have Self-Protection Plans (PAUs). Despite this requirement, the **current number of developed PAUs is low**. Although some work has been done, it is essential to work on the regulation of these Self-Protection Plans and to better define their minimum content.

5.3.2. Detection and response phases

- Considerable improvements have been made in the last 20 years regarding wildfire detection and response, resulting in highly trained and specialised teams with the necessary resources to combat wildfires and that feature response times of less than 15 minutes. However, there is still **room for improvement regarding team coordination and strategy planning**.
  - Lack of specialization in some command positions. Suppression Directors are land managers from the competent administration, but they are not necessarily specialists in wildfires or emergency management.

  - There is a need to enhance and strengthen coordination among the different bodies involved in emergency response at both the insular and regional levels. Each Island Council has its own resources, as does the Government of the Canary Islands. The challenge arises during major emergencies that require joint activation of teams coordinated by different administrations. Improving this coordination through common protocols and the unification of key operational criteria is essential for more effective emergency management.
  - There is a feeling of "bunkerization" of information and decisions between the different bodies. Although information is shared between insular and regional administrations, each entity uses its own formats and applications, leading to inconsistencies and fragmented communication. Efforts should focus on standardizing and integrating information systems across administrations to improve coordination and collaboration.
  - Lack of coordination with the bodies that do not work directly in the decision-making of extinction (Local Police, National Police, Guardia Civil, Civil Protection volunteers...).

- There is **a lack of tools to share real-time information** that enable near real-time fire spread analysis during emergencies. Effective information management is essential for decision-making and for improving the efficiency and safety of operations. Administrations should leverage technology to develop centralized management tools that allow information to be shared in real time, ensuring that all actors involved have access to relevant data necessary for carrying out their duties.

- There is **uncertainty about EWE** behaviour and their associated challenges. It is likely that the infrastructures and strategies that have worked so far will not be enough in the future. It is necessary to adapt the current means to the new scenarios of EWE.

- In recent years, there has been a notable shift in the mentality of civil society regarding emergency response. People express confidence in fire-fighting teams but **lack adequate training in self-protection during emergencies**. This gap can create challenges in in the collaboration with emergency services, especially during evacuation and/or confinement. Given that traditional awareness campaigns might not be efficient enough (e.g., low participation rate in prevention talks), it is essential to explore innovative approaches to engage the population more effectively. Strategies could include involving community members in drills or incorporating interactive activities for schoolchildren.

5.3.3. Restoration and adaptation phases

- **Climate Change has reshaped the context of restoration**. Historically, restoration efforts aimed at returning ecosystems to their pre-disturbance states. Today, however, these efforts must focus on developing more resilient and adaptive ecosystems, even if that means creating entirely new landscapes.
  - The distribution ranges of many species are shifting, meaning that they may no longer be suitable for areas where they had previously thrived.

  - It is crucial to preserve and promote *monteverde* and laurisilva formation, but they should be managed with a more adaptive approach. Due to its higher moisture content, laurisilva forest is typically highly resistant to fire, but water stress increases its susceptibility to burning. A large proportion of these forests in the Canary Islands, and particularly in Gran Canaria, are in regressive states where more flammable species predominate. The more advanced stages of these formations are indeed more fire-resistant, and therefore, it is necessary to manage them to increase their maturity level.

- It is **better to invest in "green" than in "black"**. There is no consistent financial framework for prevention but after a wildfire, there is suddenly a large amount of money for restoration that may even be excessive in some cases.

- **Effective planning is essential** before starting any restoration project. Time should be invested in identifying the critical points where intervention is needed and in defining the appropriate measures to implement.
  - The design process should adopt a long-term vision to ensure sustainable outcomes.
  - The design process should consider the micro-scale level.
  - Return periods should be considered in the design to ensure that the implemented actions are established before the next wildfire event occurs.

- There is **limited knowledge on technical aspects** such as the recovery of ecosystem services. Follow-up and monitoring of post-fire actions is crucial to generate knowledge for better future planning.

- It is key to **consider the human factor** during the restoration phase.
  - To implement socioeconomic measures targeting local population to prevent depopulation in rural areas.
  - To consider psychological impacts on the local population that are not adequately addressed.

- **Effective communication between Administrations** is crucial, but also to educate and raise awareness among civil society at every stage of the process.
  - While voluntary efforts can be well-intentioned, they may lack effectiveness if they do not follow established technical guidelines.
  - To understand the difference between restoration (ecological) and human times. After a fire, society needs to see green forests as soon as possible, but it is important to make them understand that forests also have the capacity to regenerate by themselves. In instances where reforestation is necessary, raising awareness about appropriate technical criteria is vital. Not every species is suitable for a sustainable restoration.

5.4. Steps and milestones: the roadmap

5.4.1. Progress achieved during the project at CWI level

The composition of the CWI in the Canary Islands LL is described in table 7.

Table 8: Description of the CWI in the Canary Islands LL.

Entity name	Description	Stakeholder type	website	CWI meetings
La Laguna University. Agricultural and Environmental Engineering Dept. Animal Production	Professor	Academia/ science	https://portalciencia.ull.es/investigadores/81340/detalle	1st
Sky Helicopters. Technical assistance to Cabildo of Gran Canaria (Environment, Climate, Energy and Knowledge Dept.)	Wildfire Analyst	Private sector	https://cabildo.grancanaria.com/es/area-tematica/medio-ambiente-y-residuos	1st, 2nd, 3rd, 4th
Cabildo of Gran Canaria. Environment, Climate, Energy and Knowledge Dept.	Gran Canaria MOSAICO Strategy	Public sector	https://grancanariamosaico.com/ https://cabildo.grancanaria.com/es/area-tematica/medio-ambiente-y-residuos	1st, 2nd, 4th
Cabildo of Gran Canaria. Environment, Climate, Energy and Knowledge Dept.	Environmental education	Public sector	https://cabildo.grancanaria.com/es/area-tematica/medio-ambiente-y-residuos	1st
Cabildo of Gran Canaria. Environment, Climate, Energy and Knowledge Dept.	Head of Environmental Technical Service	Public sector	https://cabildo.grancanaria.com/es/area-tematica/medio-ambiente-y-residuos	1st
Canary Islands Radio-Television	Meteorologist. Specialised in Civil Protection and Emergency Management	Society	https://rtvc.es/	1st
Cabildo of Gran Canaria. Environment, Climate, Energy and Knowledge Dept.	Head of the Wildfires Operational Unit	Public sector	https://cabildo.grancanaria.com/es/area-tematica/medio-ambiente-y-residuos	none
Cabildo of Gran Canaria. Environment, Climate, Energy and Knowledge Dept.	Coordinator of Natural Protected Areas	Public sector	https://cabildo.grancanaria.com/es/area-tematica/medio-ambiente-y-residuos	1st
Canary Islands Regional Government. General Dept. of Emergencies	Technician the Security and Emergencies Dept.	Public sector	https://www.gobiernodecanarias.org/emergencias/ https://www.gobiernodecanarias.org/politicaterritorial/	1st
Sky Helicopters. Technical assistance to Cabildo of Gran	Wildfire Analyst	Private sector	https://cabildo.grancanaria.com/es/area-tematica/medio-ambiente-y-residuos	1st, 2nd, 3rd

Entity name	Description	Stakeholder type	website	CWI meetings
Canaria (Environment, Climate, Energy and Knowledge Dept.)				
Cabildo of Gran Canaria. Environment, Climate, Energy and Knowledge Dept.	Geographer	Public sector	https://cabildo.grancanaria.com/es/area-tematica/medio-ambiente-y-residuos	none
Cabildo of Gran Canaria. Environment, Climate, Energy and Knowledge Dept.	Forest Engineer	Public sector	https://cabildo.grancanaria.com/es/area-tematica/medio-ambiente-y-residuos	1st
Canarian Botanical Garden 'Viera y Clavijo'. CSIC- Cabildo of Gran Canaria	Researcher. Biologist	Academia/science	https://cabildogc.grancanaria.com/web/jardin-canario/inicio	1st
Spanish Ornithological Society (SEO/BirdLife)	Environmentalist	Society	https://seo.org/canarias/	4th
Cabildo of Gran Canaria. Environment, Climate, Energy and Knowledge Dept.	Inspector of the Environmental Agents Unit	Public sector	https://cabildo.grancanaria.com/es/area-tematica/medio-ambiente-y-residuos	1st
Canary Islands Regional Government. General Dept. of Emergencies	Head of the Civil Protection Service	Public sector	https://www.gobiernodecanarias.org/emergencias/ https://www.gobiernodecanarias.org/politicaterritorial/	1st
Canary Islands Regional Government/GESPLAN. Forest Fire Intervention and Reinforcement Teams (EIRIF)	EIRIF Coordinator	Public sector	https://www.gesplan.es/	none
Canarian Botanical Garden 'Viera y Clavijo'. CSIC- Cabildo of Gran Canaria	Researcher. Biologist	Academia/ science	https://cabildogc.grancanaria.com/web/jardin-canario/inicio	1st
Canary Islands Regional Government/GESPLAN. Forest Fire Intervention and Reinforcement Teams (EIRIF)	EIRIF Coordinator	Public sector	https://www.gesplan.es/	4th
Cabildo of Gran Canaria. Environment, Climate, Energy and Knowledge Dept.	Forest Service Coordinator	Public sector	https://cabildo.grancanaria.com/es/area-tematica/medio-ambiente-y-residuos	1st, 4th
Fénix Canarias Association	Forest Engineer	Society	https://fenixcanarias.org/ https://surikat.io/	1st

Entity name	Description	Stakeholder type	website	CWI meetings
Medi XXI GSA	Forest Engineer specialised in wildfire emergency management. CEO	Private sector	https://www.medixxi.com/es/	none
Medi XXI GSA	Forest Engineer. Project Technician	Private sector	https://www.medixxi.com/es/	1st, 2nd, 4th

To date, a total of four meetings has been conducted.

1st CWI meeting. 5th-6th November 2024

The Cabildo de Gran Canaria hosted the 1st meeting of the Community of Wildfire Innovation in Gran Canaria Living Lab. The meeting brought together 15 representatives from public administrations, private sector, research organisations and civil society. During this first meeting, group exercises were carried out to:

- Define the current situation and the critical factors for integrated fire management on the island,
- Outline the common vision to be achieved in the short and medium term and,
- Identify current deficiencies and necessary innovations to achieve the objectives

The conclusions generated from the debate between the different actors have been used to draw up the roadmap towards integrated fire management based on the common vision agreed by the participants.

Additionally, this first CWI meeting was also used to advance on some of the Innovative Actions implemented in the LL. Thus, within the framework of IA 4.5, a debate session was held to analyse the level of integration of fire risk and prevention in the conservation policies of Protected Natural Areas on the island of Gran Canaria. Another of the Innovative Actions addressed in this event was IA 1.5. One of the wildfire preventive measures proposed in the framework of this action is the use of extensive grazing as a fire prevention tool on the island. For its implementation, FIRE-RES collaborates with the strategy for the prevention of large forest fires of the Cabildo of Gran Canaria, GRAN CANARIA MOSAICO. Finally, the third Innovative Action addressed in the meeting was IA2.6, where participants discussed about how to implement it in Canary Islands LL.

Figure 21: First CWI meeting in the Canary Islands LL.

2nd CWI meeting. 5th-6th May 2025

The Cabildo of Gran Canaria hosted, in the framework of the 2nd CWI meeting, the test of one of the two OICs (WP6) allocated to the Canary Islands LL. The tested system was the FireFence Wildfire Containment System (Hoze Solutions), which creates a curtain of water to protect areas at the WUI. Prescribed burns were carried out to demonstrate the effectiveness of the pilot. Participants were invited to share their feedback about the tested solutions following the demonstrations.

Figure 22: Second CWI meeting in the Canary Islands LL.

3rd CWI meeting. 13th May 2025

The Cabildo of Gran Canaria hosted, in the framework of the 3rd CWI meeting, the test of the second OIC (WP6) allocated to the Canary Islands LL. The tested system was the Q.SYSTEM (HighTek), an advanced multi-camera aerial imaging solution designed for firefighting helicopters. Prescribed burns were carried out to demonstrate its effectiveness, and they were conducted with the support of the EIRIF brigades. Participants were invited to share their feedback about the tested solutions following the demonstration.

Figure 23: 3rd CWI meeting in the Canary Islands LL

4th CWI meeting. 24th November 2025

The last CWI meeting was held online on the 24th of November 2025. The final results of the project were discussed, and several IA leaders were invited to present their results as well. Particularly, the presented IAs were:

- IA 2.1 Improving data acquisition for landscape design based on novel remote sensing methods
- IA 3.2. Financial incentives for fire-resilient landscape measures
- IA 4.3. Fire Education Platform – An immersive tool for policymakers, schools and families
- IA 4.4. Fire-safe villages
- IA 4.8 Demonstrating strategies and tools for smart communication to citizens
- IA 5.3. Advanced vegetation characterization based on Earth Observation data fusion and Artificial Intelligence over forestland ecosystems

5.4.2. The IA demonstration results at LL level

IA1.5 Post-fire restoration and adaptation strategies

In LL Canary Islands, prescribed burning and grazing were implemented in strategic, fire-prone area. Prescribed burning was carried out on 10 ha of forests dominated by *Pinus canariensis*, located within Strategic Management Points, that included areas such as mountain ridges, natural protected areas and strategic infrastructure. **An assessment was conducted to evaluate the effectiveness of these prescribed burns in containing a large wildfire that occurred in 2023**. On the other hand, prescribed grazing was implemented in other strategic areas, including 7 ha of ravines where the invasive and highly flammable Arundo donax dominates, and 11 ha on ridges affected by a wildfire one year earlier, with the aim to maintain a low-fuel load and prevent high regeneration densities.

IA2.3 Recommendations for improving security on WUI - Component 1 (Fire resilient buildings)

In the Canary Islands Living Lab, an inventory of building characteristics was conducted across different locations to capture a representative overview of construction configurations found in WUI. Large-scale fire exposure tests were carried out on the EXPLORII platform to evaluate the resistance of various types of windows and shutters identified in the region. Based on the results, several practical recommendations were developed to strengthen fire resilience in WUI areas. Authorities are encouraged to promote the replacement of single-glazed windows and, during renovations, to recommend aluminium shutters in place of combustible ones. Fuel management measures were also proposed, including maintaining a 2-meter vegetation-free buffer around buildings, preserving vegetation with high moisture content, avoiding the use of highly flammable plant species, and ensuring sufficient distance between vegetation and structures to prevent flame contact with façades or roofs.

IA2.3 Recommendations for improving security on WUI - Component 2 (Creating barriers to fire spread)

Gran Canaria, the third largest and most populated island in the Canary Islands, with 857,000 inhabitants across 21 municipalities. The island's volcanic origin and complex topography, combined with the influence of northeast trade winds, create significant microclimatic variation. Most of the forest cover consists of Canarian pine—an endemic, fire-resilient species—alongside laurel and drought-adapted thermophilus forests. The island's economy is dominated by tourism, though agriculture and livestock remain important. Geographic data, including fuel maps and vegetation structure, were developed by the company Technosylva using data from the Forest Map of Spain. To capture fire behaviour under different conditions, we designed four weather scenarios based on typical summer patterns and conditions favourable to EWE. These considered the island's two-layer wind stratification (humid lower and dry upper layers) and associated fuel moisture levels, defined using the Scott and Burgan model with stakeholder input. Risk layers were generated by the regional government and combined four components: population (20%), buildings (20%), protected areas (40%), and burned area (20%). We conducted 10,000 wildfire simulations per scenario, used burn probability

and Downstream protection value (DPV) metrics to identify high-risk zones, and then compared risk reductions after applying optimized treatment strategies across all scenarios. The results showed a reduction of almost 60% in risk loss treating only 2.5% of the landscape.

IA2.6 Post-fire restoration strategies

The methodology was applied to two wildfires that occurred on Gran Canarian Island. To identify priority areas for restoration, three key variables were considered: the natural recovery capacity of the affected plant communities, their ecological value, and the potential for soil erosion. These variables were weighted according to fire severity, which was calculated using the Relative Differenced Normalized Burn Ratio (RdNBR). The selection of criteria and sub-criteria was guided by expert knowledge. To ensure practical applicability of the methodology, the most up-to-date and publicly accessible cartographic layers were used to characterise all sub-criteria. For each sub-criterion, raster values were reclassified to facilitate their integration into a final priority restoration map. The process required the calculation of several intermediate layers, including potential regeneration capacity, potential vulnerability, ecological vulnerability, and natural vulnerability. Results of the final prioritisation map were validated using field data.

IA5.1 Integrative umbrella system for estimating EWE risk and impact

The ISS application's main page highlights different LLs, including the Canary Islands LL. By clicking on this area, you access the implemented solutions and services for the LL. These include:

TSYLVA analysed external services, considering outcomes from WP1, and integrated a set of EUMETSAT and Copernicus services into the ISS to provide users with EWE conditions forecasts.

Weather layers from the SPIRE weather forecast (IA 5.5) from the Basic, Upper-Air and Thunderstorm bundles.

Daily wildfire risk simulation solution (FireRisk) and an operational wildfire simulator adapted to EWE conditions (FireSim) in the approach of IA 5.2. The first, it provides a daily risk assessment forecast for each 3 hours, for a total of 96h of risk.

Daily creation of high-resolution weather data solution for the LL, a 96h high-resolution weather forecast (1-2 km spatial resolution) for 45 variables.

IA5.2 Real-time EWE simulation and smoke spread

The ISS integrates a daily wildfire risk simulation solution and an operational wildfire simulator adapted to EWE conditions, both implemented by TSYLVA. The first provides a daily risk assessment forecast for each 3 hours, for a total of 96h of risk forecast. The operational simulator FireSim features two main simulation modes, a fire propagation mode and a probabilistic simulation mode. The solution includes an EWE adjustment factor which is based on the inclusion of the Lifted Index weather variable provided by SPIRE.

Both solutions make use of base data such as vegetation fuel maps, boundary maps, population and buildings data, among other, that has been shared by the LL. Furthermore, it makes use of high-resolution weather forecast data that is created daily for the LL, a 96h high-resolution weather forecast (1-2 km spatial resolution) for 45 variables.

Besides, CNRS has worked with the LL on the reanalysis of real fires that occurred in this region—EWEs with significant impacts selected by the LL themselves - CNRS worked with the LL to determine what simulation results information were most useful for them in crisis situations. The collaboration focused on developing a limited set of representations that allow for quick and readable interpretation of results to support decision-making during emergencies. Thanks to these discussions, CNRS identified three fire/atmosphere effects which were to be highlighted in these representations.

IA5.10 Pan-European system to define management priorities

The innovation action "Pan-European System to Define Management Priorities for Mitigating Fire Impact" aimed to design a prototype system for identifying strategic fuel management priorities based on multiple criteria.

To develop this system, we began by defining a set of relevant criteria and assessing the need to model and map these variables. Among the most critical variables were fuel accumulation and potential fire behaviour, which, at the start of the project, were not adequately covered by existing information. During the initial years, the University of Padova mapped all fuel-related variables necessary to estimate fuel accumulation and simulate fire behaviour. This effort resulted in four scientific articles and the development of a server where the information is publicly available for download (https://www.cirgeo.unipd.it/fire-res/app/). Technosylva used this data to simulate high-intensity fire behaviour across the EU. Simultaneously, ISCI developed a multi-criteria decision support system calibrated to the generated data. This system can assign priority scores once the data is harmonized, and criteria are weighted accordingly. Currently, a strategic prioritization exercise is underway for the Iberian Peninsula, demonstrating the supranational capacity of this analysis and illustrating how large-scale, policy-oriented frameworks are most suited for this system. After the Iberian exercise is completed, the multi-criteria system, programmed as a QGIS plugin, will be publicly available.

Looking ahead, we plan to develop a dedicated server where users can easily download relevant data for such analyses. This platform will also store new data, especially concerning values and risk assessments, alongside existing datasets.

5.4.3. Next steps until 2030

Based on the challenges described in the previous section and in the results of the CWI meetings in Gran Canaria, the following list of the most urgent challenges was created:

- Availability of resources and long-term funding for preventive actions:

  - Implementation of the *Céntimo Verde*, a fiscal instrument taxing gasoline consumption to fund environmental and climate policies, including wildfire risk management.
  - Increase year-round staff stability.
  - Simplify administrative procedures for hiring temporary personnel.
- Inter-institutional coordination between Local, Insular, Regional and National governments:
  - Harmonize protocols for integrating external resources during emergencies.
  - Provide technical and financial support to municipalities for the development of Local Emergency Plans.
  - Create a shared data platform among administrations to enable real-time access to data relevant for decision-making in prevention, detection, and emergency management.
  - Promote networks and collaboration agreements for knowledge exchange among administrations.
- Develop R&D programmes to improve knowledge about:
  - Wildfire ecology, to produce guidelines for silvicultural practices and post-fire recovery measures.
  - Technology for rapid and efficient identification, monitoring, and prediction of wildfire behaviour.
  - Technology for post-fire measures assessment and monitoring.
- Active citizen participation
  - Extensive awareness campaigns.
  - Encourage the development of Self-Protection Plans in WUI areas.
- Territorial management
  - Incentivize private landowners to carry out preventive work. Expand the Payment for Environmental Services (PES) mechanism beyond extensive livestock farming to include agricultural land and sustainable forest management.
  - Land use regulation in WUI areas.
  - Rural development through the promotion of traditional activities (extensive grazing, agriculture, sustainable forest management).
  - Establish protocols for immediate post-fire response and plan long-term environmental restoration.