

THE SERRA DO AÇOR FOREST PROJECT **A STORY OF REBUILDING AND HOPE**

RESTORING AND TRANSFORMING **2,500
HECTARES** IN ARGANIL AFTER THE 2017 WILDFIRES



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**Jerónimo
Martins**



FLORESTA DA
**SERRA
DO AÇOR**

1. From degradation to regeneration: a reimagined landscape in the Serra do Açor Forest

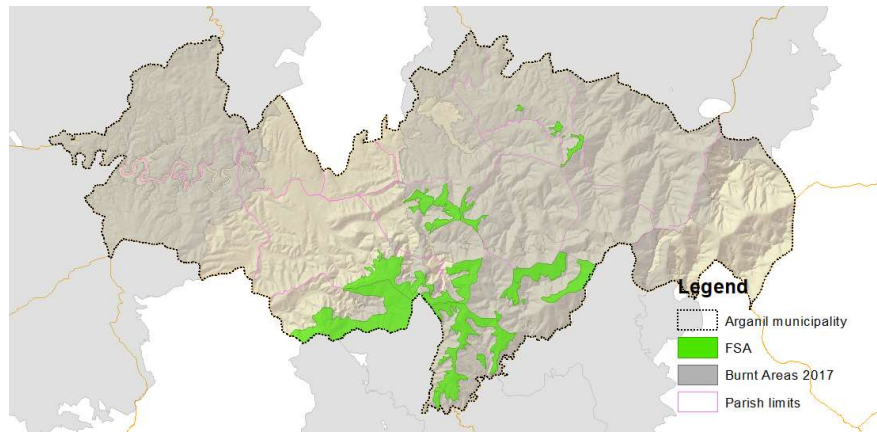
The Serra do Açor Forest Project (FSA) emerged as an urgent response to the need to reverse the cycle of ecological and social-economic degradation affecting the region. Grounded in the principals of Forest Landscape Restoration (FLR), the project proposes an integrated and transformative approach aimed at recovering ecological diversity, revitalising productivity and enhancing the cultural value of the territory.

Unlike conventional interventions, which are often limited to localised actions focused solely on ecological recovery, the FSA operates at the landscape scale. It integrates ecosystem conservation with the improvement of local living conditions, promoting a sustainable, inclusive and multifunctional development model.

Forest production remains a relevant component, but it has been reconfigured through a logic of diversification and quality. The focus is on higher-value timber – for construction and sawmilling - alongside the valorisation of non-timber forest products such as cork, arbutus berry, honey and mushrooms. This productive strategy is integrated into a broader vision of ecological restoration, including the creation of a coherent ecological structure, the enhancement of biodiversity and the promotion of ecosystem services such as nature tourism and recreation.

The transformation of ecological and socio-economic systems also demands new forms of governance. The FSA relies on collaborative models rooted in local communities but open to new stakeholders – from responsible tourism operators to bioeconomy entrepreneurs. These models treat the landscape as a strategic asset capable of attracting investment, generating economic value and fostering innovative rural development.

From its inception, the project incorporated the aesthetic and symbolic dimensions of the landscape, acknowledging their role in territorial identity. The Serra do Açor landscape, defined by its sharp geomorphology, deep-set watercourses and vast horizons, was historically a rich ecological and visual mosaic – now profoundly altered by decades of accumulated disturbances. The devastating fires in 2017 (Pic. 1) became both a peak in this disturbance, but also a starting point in acknowledging the need for change in land management.

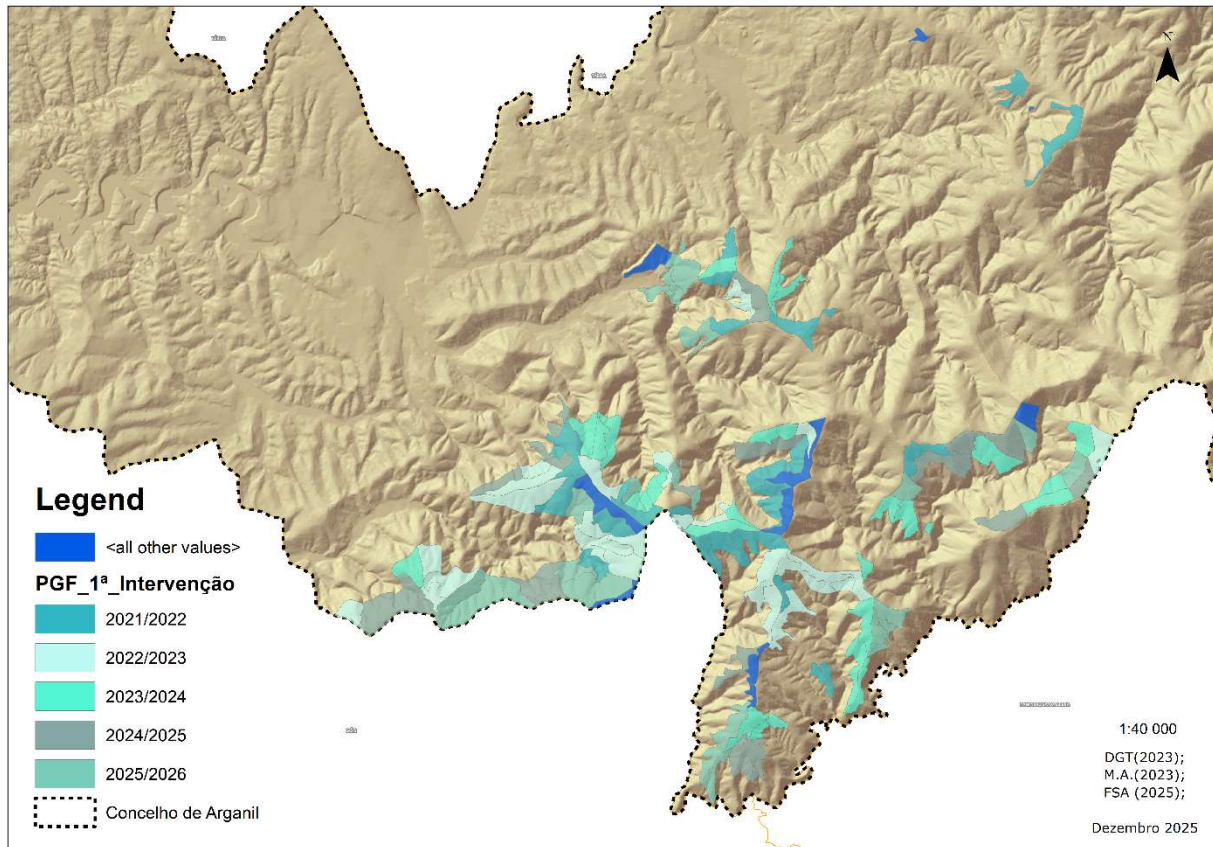


Picture 1: Extent of burnt areas in 2017 fires in the Municipality of Arganil

The FSA is committed to restoring this ecological and visual diversity by re-establishing characteristic plant formations using native species and spontaneous vegetation in strategic locations. This approach seeks to recover ecological coherence and visual legibility, reinforcing the landscape's cultural and scenic attributes.

Furthermore, the valorisation of the landscape is linked to the preservation of historical marks of human-territory interaction – such as terraces (*socalcos*), irrigation channels (*levadas*), rural buildings and agricultural mosaics - integrating them into the restoration process as natural, productive and cultural heritage.

Throughout the project's implementation, measures were adopted to minimise the visual impact of forestry operations, such as the phasing of interventions in time and space (Pic. 2). This attention to landscape quality is also reflected in the functional restoration strategy, which focuses on restoring fundamental ecological processes – such as nutrient cycling, water regulation and ecological connectivity – essential for ecosystem resilience in the face of climate change.



Picture 2: Phasing of Interventions in time and space as planned in the Management Plan

Ultimately, the FSA adopts a transformative approach that recognises the need for structural changes in land use, governance models and the roles assigned to forests. The production of timber and non-timber goods is promoted within an ecological sustainability framework capable of supporting local economies adapted to a changing climate. By combining technical innovation, natural resource enhancement and community participation, the project contributes to a more resilient, sustainable and socially equitable territory.

2. Strategic alignment and the FSA's demonstrative value within national and European agendas

Since its beginning, the Serra do Açor Forest Project (FSA) has stood out for its integrated, collaborative and multifunctional approach to managing vulnerable territories. Anticipating the creation of Integrated Landscape Management Areas (*AIGP - Áreas Integradas de Gestão da Paisagem*), the FSA promotes the active and coordinated management of forest and agricultural spaces in a context of high land fragmentation, aligning ecological restoration goals with fire risk reduction, climate change adaptation and rural economic revitalisation.

This pioneering character positions the FSA as an operational model for future interventions in complex and vulnerable landscapes. Its strategic coherence with Portugal's National Plan for Integrated

Management of Rural Fires (*PNGIFR - Plano Nacional de Gestão Integrada de Fogos Rurais*) was recognised by the European Commission, which selected the project as a pilot case in the Coimbra experimental area under the REFORM/Sc2021/063 study. This choice reflected academic experts' recognition of the project's innovation, maturity and high potential for replication.

At the European level, the FSA aligns with key policies on biodiversity, ecological restoration and sustainable land management. It is consistent with the EU Biodiversity Strategy for 2030 and the Nature Restoration Law (2024), establishing ambitious targets for restoring ecological functionality, enhancing connectivity and enhancing ecosystem services.

The project also embodies the strategic axes of the New EU Forest Strategy for 2030 by integrating high-quality forest production, ecological restoration and the valorisation of biodiversity and landscape as core assets. The promotion of a circular bioeconomy based on high-value timber and non-timber products, the establishment of climate-resilient forest stands and the application of participatory governance and adaptive monitoring demonstrate the FSA's concrete alignment with European priorities: ecological resilience, innovation, socio-economic sustainability and community involvement.

The project's contribution to climate change mitigation is equally significant, with an estimated sequestration of approximately 45 million tonnes of CO₂ over the life cycle of the restored stands, establishing the FSA as an effective instrument for climate action and the transition to carbon neutrality.

This strategic alignment is further reinforced by the FSA's integration into the transForm Agenda, funded by Portugal's Recovery and Resilience Plan (*PRR – Plano de Recuperação e Resiliência*), which aims to structurally transform the Portuguese forestry sector. The FSA was selected a pilot area for *Ação 1.4 – Melhor Floresta* (Action 1.4 – Better Forest), recognising its maturity and capacity for innovation. Its participation in this agenda catalyses applied innovation, particularly through the modernisation and digitalisation of monitoring systems using Artificial Intelligence (AI) and drones (UAVs) to develop advanced forest inventory methodologies.

3. A new governance paradigm in forest landscape restoration

One of the central pillars of the FSA's transformative approach lies in its governance architecture, designed to allow for adaptive, dynamic management deeply rooted in the territory.

A key early structural result was the formal reorganisation of the nine *baldios* (common land) communities involved and the consolidation of the inner-community association representing them. At project launch, most of the community councils were inactive or lacked the formal structure required to make decisions regarding land management. This was exacerbated by a lack of technical support and functional capacity. In response, the FSA invested in the organisational reinforcement of these

councils, promoting their deliberative and operational autonomy. This process culminated in the creation of the Floresta Serra do Açor association, which allowed for a larger scale intervention and an integrated, multi-scalar approach.

The role of the patron (funding entity) was also decisive, particularly through their willingness to fund an initiative with a 40-year planning-horizon – a rarity in Portugal, where public funding cycles are typically short and discontinuous. This long-term vision provided the stability needed to track ecosystem evolution and incorporate successive learning, consolidating the ecological and socio-economic outcomes of the interventions. Beyond financial support, the patron took an active role in project governance, participating in monitoring processes and the definition of annual strategic priorities. This commitment reinforces the institutional solidity of the platform, fosters a culture of shared responsibility among partners and positions the FSA as a benchmark for technical, ecological and social innovation.

This involvement is anchored in an equally innovative funding model. The FSA is a pioneering case in Portugal as it is funded under a corporate social responsibility programme by a private entity with no direct link to the forestry sector. This form of patronage represents a paradigm shift in resource mobilisation for nature conservation, engaging new economic actors and extending environmental and climate commitments beyond traditional sectors. By combining financial independence with strategic and active governance involvement, the FSA demonstrates the transformative potential of unconventional partnerships in delivering sustainable and lasting solutions for forest territories.

Throughout this process, the Municipality of Arganil provided vital institutional leadership. From the outset, it supported a high-risk, experimental initiative whose maturation horizon far exceeds conventional political cycles. In a context where local authorities tend to prioritise actions with immediate impact, the Municipality distinguished itself through strategic vision, driving a long-term project marked by technical and social complexity. Beyond its role as a promoter, it acted as an essential unifier, leading community mobilisation, coordinating diverse partners and contributing to the creation of the collaborative platform underpinning the FSA. This visionary leadership was decisive in consolidating a solid institutional foundation, building trust among stakeholders and ensuring the strategic and operational viability of a profound transformation of the landscape and forest-territory relations.

The inclusion of a higher education institution in the collaborative platform acted as a catalyst for incorporating technical and scientific knowledge. This collaboration allowed for new approaches on ecological restoration, enhanced by the processes of consultation and integration of local knowledge, and bridged the gap between science and practice. Academic presence favoured the application of up-

to-date methodologies, the development of resilient silvicultural models and the consolidation of evidence-based adaptive management strategies. Simultaneously, it enabled a more sensitive and contextualised reading of the territory, promoting dialogue between technical, scientific and community knowledge as the foundation for shared and sustainable decision-making.

The project was thus structured upon a collaborative platform comprising four entities with complementary roles:

- The local *baldios* communities and their managing association, ensuring territorial embeddedness and continuity of participatory management;
- The patron, whose active involvement extends far beyond financing to include strategic oversight and validation;
- The Municipality, providing institutional framing, leadership and logistical and administrative support;
- The higher education institution, jointly responsible for technical and scientific oversight of interventions and for monitoring their ecological and socio-economic effectiveness.

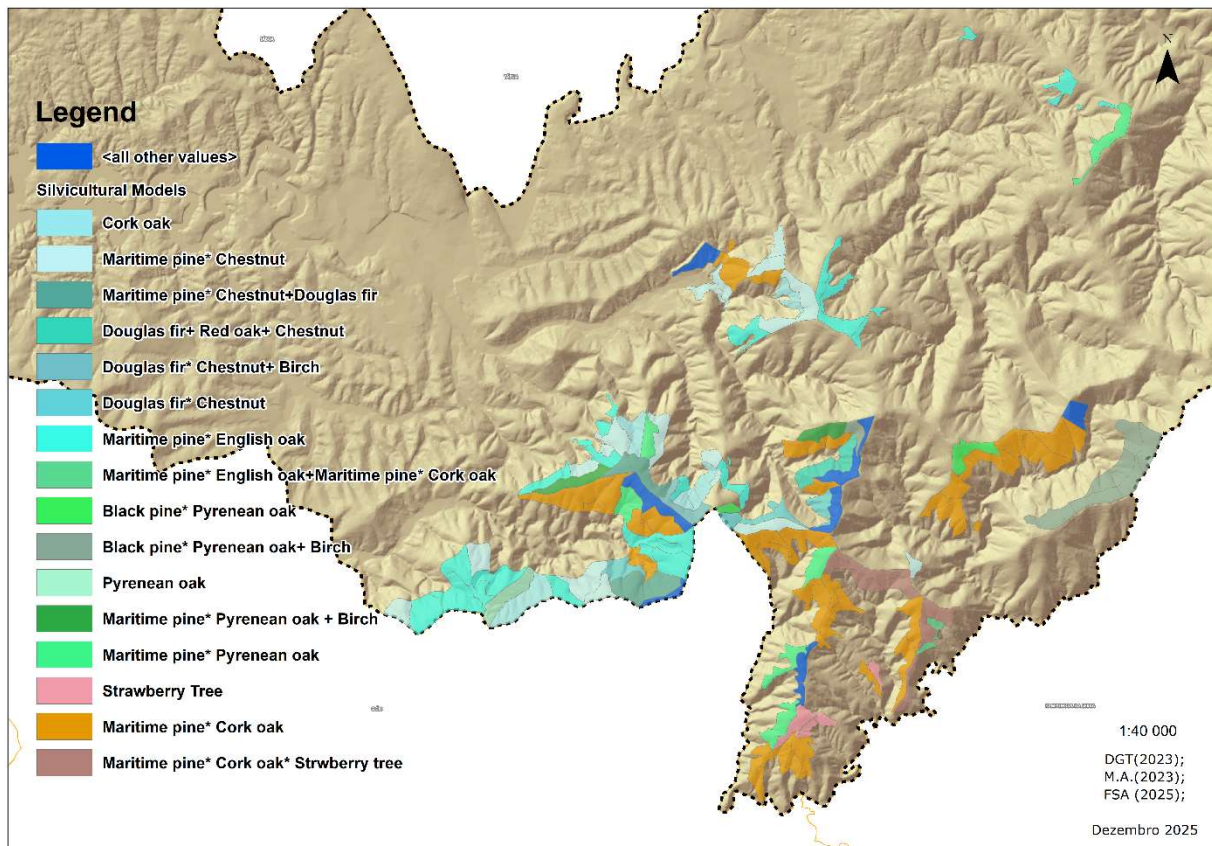
This institutional architecture is reinforced by a shared management model, where each partner is responsible for mobilising and funding of its own technical teams. This direct co-financing logic translates into strong institutional commitment, ensures continuity of on-the-ground actions and promotes the operational autonomy required to achieve the platform's shared objectives.

4. An integrated strategy for forest resilience: restoration, adaptation and landscape enhancement

The technical design of the FSA places forest to climate change adaptation at the heart of its priorities. It recognises the forest as a multifunctional and dynamic system whose ecological, economic and landscape resilience is essential to face growing impacts of climate variability, increasing wildfire intensity and biodiversity loss.

To meet these challenges, the project developed a strategy centred on the structural and functional diversification of ecosystems (Pic. 3), applying silvicultural models adapted to local conditions, the Atlantic-Mediterranean duality of the territory, different management objectives and climate change projections. Key technical options include successive cut systems, continuous cover forestry and the establishment of mixed stands dominated by native species. The ecological complementarity and biological diversity associated with these solutions grant forest systems greater stability and response capacity.

This approach not only ensures adaptation to extreme weather – such as prolonged droughts, pest outbreaks or changes in water regimes – but also allows the sustained production of goods (timber, cork, berries, mushrooms) and the provision of essential ecosystem services such as climate regulation, soil conservation, pollination and the cultural and recreational valorisation of the landscape. Thus, the forest becomes both more resilient and more value-generating.



Picture 3: Diversification of silvicultural models planned according to local conditions, mainly aspect (Mediterranean/ Atlantic duality), altitude and soil quality.

Reducing fire vulnerability is another structural axis of this adaptive strategy. Rather than relying solely on traditional DFCI (Forest Defence Against Wildfires) infrastructures, the project focuses on an ecological landscape configuration that embeds prevention within territorial design itself. Reducing fuel loads, strategic stand fragmentation, species diversification and practices such as silvopasture (Pic.4) converge into a less flammable forest model, where fire resilience is built systemically, reducing risks and costs in the medium and long term.



Picture 4: Silvopasture system areas integrated with infrastructures.

Furthermore, the principle of ecological continuity was also incorporated into the project strategy, promoting connections between remnant natural stands, restoration areas and zones of high conservation value. The creation of ecological corridors, transition zones and the maintenance of native vegetation ensure habitat connectivity, facilitating wildlife movement, genetic flow and biodiversity resilience at landscape scale. This approach prevents ecological fragmentation and reinforces the integrity of natural systems.

In parallel, the project valorised the aesthetic and symbolic dimension of the landscape, recognising it as a strategic resource for environmental, cultural and social enhancement. The design of afforestation areas and access routes respects natural landforms, the altitudinal limits of the Serra do Açor and dominant visual axes. All intervention typologies include measures to minimise visual impact (Pic. 5), such as localised clearing operations and minimal soil disturbance, ensuring partial ground cover (Pic 6). Final harvests are selective and phased, avoiding large clearings and promoting ecological continuity and landscape quality.



Picture 5: Example of low disturbance intervention with minimum impact on soil, ensuring vegetation cover to avoid erosion and avoiding invasive species expansion. The plantation is visible along the contour lines.

This integrated approach strengthens the articulation between ecological functionality, economic sustainability and landscape enhancement, consolidating the Serra do Açor forest landscape as a natural, productive and identity-defining asset.



Picture 6: Transition zone in altitudinal limit. Mixed stand with black pine* Pyrenean oak with birch. The black pine (2/3) is mixed with the oak (1/3) along the contour line. The birch was installed in the ephemeral water stream.

5. Observe, evaluate, adjust: the role of monitoring in landscape transformation

The implementation of the FSA is distinguished by its adaptive management strategy – an innovative approach in the context of Portuguese forest restoration. This strategy recognises that ecological systems are dynamic, that environmental conditions are constantly changing – particularly under climate change – and that intervention outcomes are often unpredictable.

Adaptive management thus takes the form of a continuous cycle of planning, action, monitoring and adjustment. Decisions are based on the best available knowledge but remain open to continuous learning, allowing practices and strategies to be refined based on observed results (Pic.7).



Picture 7: Whenever natural regeneration is viable and considered compatible, its incorporated in the operations and in the silvicultural system predicted to the specific plot.

In the FSA, this logic is operationalised through a Forest Management Plan conceived as a flexible guide rather than a rigid set of prescriptions. In each planting campaign, objectives and targets are defined according to current realities, based on updated analysis of local ecological conditions, operational

feasibility and intervention urgency. This flexibility enables effective responses to climatic, logistical or social constraints, prioritising actions where they are most relevant.

The articulation between technical planning, scientific knowledge and direct field observation ensures a responsive, evidence-based approach rooted in the local landscape context.

The project's adaptive strategy is supported by a robust monitoring and evaluation system structured across three complementary and interdependent levels, operating at different spatial and temporal scales:

- Physical implementation monitoring: verifying on-the-ground interventions for compliance with operational plans;
- Annual performance evaluation: analysing campaign results against defined objectives and contractual specifications;
- Long-term technical-scientific monitoring: conducted in dedicated plots, collecting and analysing ecological, silvicultural and ecosystem evolution indicators using rigorous protocols.

This multiscalar model enables data-driven management, fostering the continuous readjustment and reinforcing the project's experimental, innovative and progressive nature.

Each monitoring level involves distinct teams and clearly defined responsibilities:

- At the first level, participants include the local association technician, the patron's technical representative and an independent expert responsible for preparing the technical report.
- At the second level, the Technical Advisory Committee – comprising representatives from the partner scientific entity, the FSA technical coordinator and the patron's technician – issues strategic recommendations based on the campaign reports.
- At the third level, the scientific entity leads the process, taking responsibility for methodological design, coordination and the analysis of data collected from permanent plots.

This participatory monitoring architecture ensures technical quality, scientific rigour, social legitimacy and transparency across all phases of the process. Rather than being a mere a control instrument, monitoring establishes itself as a driver of continuous improvement, granting the project a resilient and innovative character capable of responding to the complex challenges of landscape-scale forest management in a climate change context.

6. The challenge of community engagement in landscape restoration

In a landscape restoration project such as the Serra do Açor Forest Project (FSA), public participation plays a structural and indispensable role in ensuring legitimacy, effectiveness and long-term sustainability.

From the design phase, the active involvement of local communities has been essential to incorporate traditional ecological knowledge, identify territorial priorities and align the project's objectives with the social uses and aspirations of the population. The creation of a collaborative platform – integrating representatives of *baldios*, the Municipality, scientific entities and the patron – ensured shared governance that extended well beyond initial consultation into ongoing implementation. By fostering a dialogue between local, technical and scientific knowledge, the project promotes and adaptive management that is truly rooted in the territory, strengthening the sense of belonging, collective responsibility and social ownership of the solutions adopted.

Community ownership of the FSA's goals and results is a critical factor for its institutional and territorial resilience. When residents recognise themselves as active participants – rather than merely passive beneficiaries – the likelihood of maintenance, surveillance and defence of restored areas increases significantly, even after initial funding ends. In this regard, several awareness-raising and community mobilisation initiatives have already been developed to promote active participation in managing the restored landscape.

Despite these efforts, social engagement remains one of the project's primary challenges. Firstly, the local population is predominantly ageing, with limited mobilisation capacity and little familiarity with shared forest management models. For decades, the management of *baldios* was centralised by the State, specifically through the ICNF (Institute for Natural Conservation and Forests), which contributed to the alienation of communities from decision-making regarding their own territories.

Secondly, the FSA proposes a profound reversal of the dominant paradigm in traditional forest management, which has historically been focused on just two species: maritime pine and eucalyptus. In contrast, the project adopts a multifunctional approach oriented towards the diversification of species, products and services and the enhancement of the landscape. This shift confronts deep-seated social perceptions of what constitutes a “good forest”, which is often associated with homogeneity and exclusively with timber production.

Furthermore, the FSA challenges conventional forest restoration practices. Instead of industrial-scale plantations involving heavy soil disturbance and the complete removal of existing vegetation, the project focuses on natural regeneration, minimal soil tilling and the partial maintenance of native

vegetation (Pic 8). Although ecologically grounded, these choices are often perceived as incomplete or of questionable effectiveness due to the absence of immediate visible results. Such perceptions largely stem from limited awareness of the negative impacts associated with conventional techniques, including soil degradation, biodiversity loss and visual impoverishment of the landscape.



Picture 8: Example of plantation with no soil disturbance and limited removal of existing vegetation. In 1 year the contour lines will fade with the vegetation growth turning barely visible. Note in the background the impact on the landscape of the traditional heavy machinery driven terraces with total vegetation removal.

Changing these perceptions requires deep and ongoing pedagogical outreach, based on practical demonstration of the benefits of these new approaches and the construction of a new forest culture centred on ecological resilience and long-term sustainability.

In this context, the awarding of a landscape prize to the Serra do Açor Forest Project would represent a decisive contribution to shifting perceptions and practices associated with land management. Beyond institutional prestige, such recognition would bolster the social legitimacy of the approach, publicly valorising landscape multifunctionality, biodiversity conservation and climate change adaptation. It would thus serve as a powerful pedagogical tool, with significant symbolic and communicational impact, capable of inspiring other communities, decision-makers and stakeholders to follow similar paths of sustainable territorial regeneration rooted in local values.

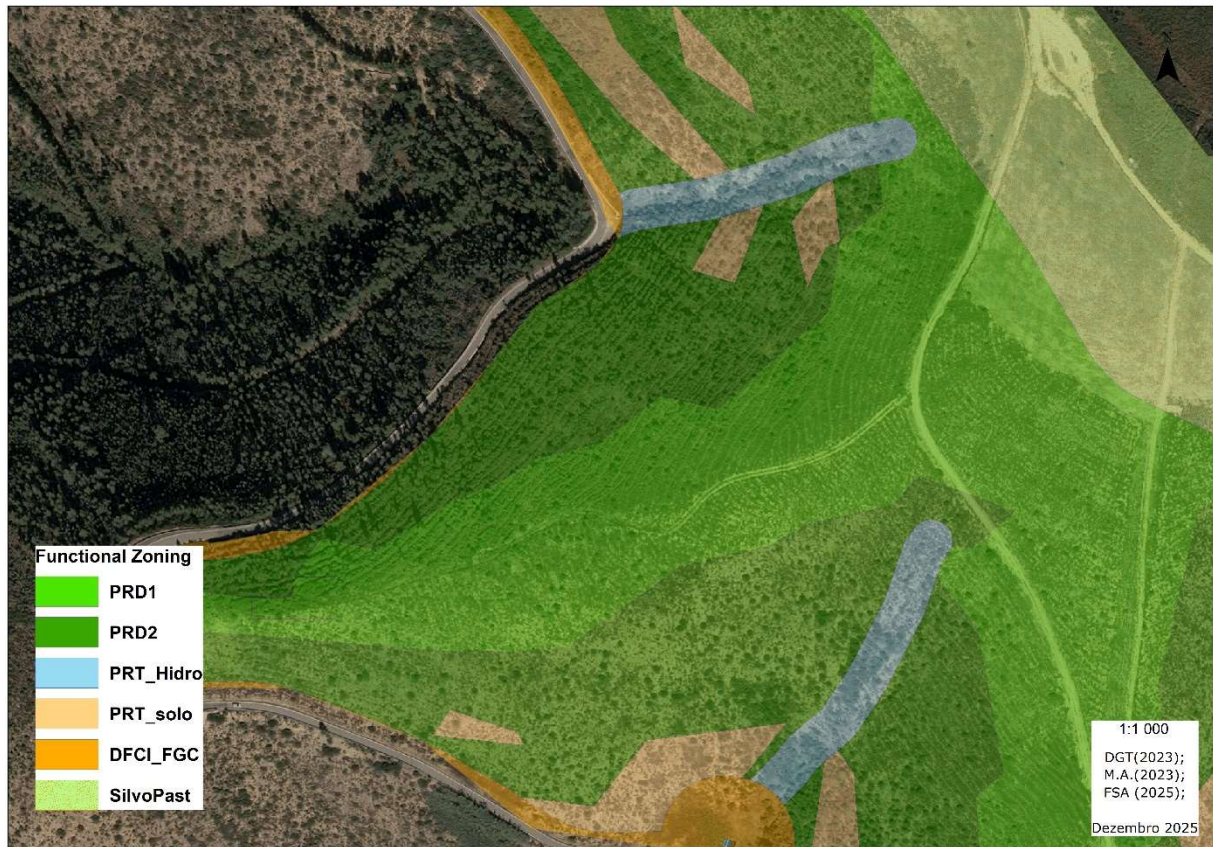
7. Silviculture for resilience: the project's technical design

The technical component of the Serra do Açor Forest Project (FSA) was structured around an innovative, participatory and scientifically grounded Forest Management Plan, designed to integrate technical and scientific expertise with local ecological knowledge. Developed in close collaboration with the Department of Forest Resources at the Coimbra Agriculture School (ESAC), the plan resulted from a comprehensive territorial diagnosis. This process included field visits, land-use history analysis, species adaptability assessments and the development of silvicultural models tailored to the specific edaphoclimatic conditions of the Serra do Açor.

Local communities participated actively in this diagnostic phase, providing invaluable information on the forest species that historically occupied the landscape, identifying areas where they thrived and where they were never present. They also shared their preferences regarding the desired uses of the territory, allowing technical objectives to be aligned with the population's expectations. This synergy between technical expertise and social participation was essential for defining reforestation strategies that are appropriate, resilient and locally legitimised, consolidating the foundation for a multifunctional and territorially rooted forest restoration.

The plan promoted the creation of a multifunctional landscape, where forest production areas coexist with conservation zones aimed at strengthening ecological resilience – such as soil protection, biodiversity preservation and wildfire defence. Approximately 23% of the total area was allocated to ecological protection, covering riparian zones, areas highly susceptible to erosion and habitats with high biodiversity potential. In these spaces, interventions prioritise natural regeneration, soil protection and the creation of ecological corridors. These areas do not exclude sustainable economic uses. The plan envisages compatibility with activities such as beekeeping, mycology, ecotourism and gamekeeping.

Additionally, 6% of the area was reserved for DFCI (Forest Defence Against Wildfires) infrastructures, integrating the primary and secondary fuel management networks of Arganil's Forest Wildfire Defence Plan. A further 12% of the territory was designated as DFCI zones with a silvopastoral focus, where fuel management is partially carried out in partnership with the community-managed heard of native goats belonging to the *compartes* (common land owners) of the *baldios* of Cepos and Casal Novo. This approach promotes the integration of fire protection, extensive livestock production, and the valorisation of traditional agro-silvo-pastoral practices (Pic.9).



Picture 9: Example of Functional zoning, according to the management plan. Note the plantation (Maritime pine * cork oak) along the contour lines integrated with soil protection (PRT_solo, due to slope). Hydric resources protection (PRT_Hidro), fire protection infrastructure (DFCI_FGC, in this case a water tank and buffer area with fuel management) and a extensive grazing area (SilvoPast).

Based on the participatory diagnosis and defined technical criteria, the plan operationalised a reforestation and forest management strategy distributed across 146 intervention units, covering 2,500 hectares, of which 60% were classified as areas with productive potential. Within these areas, 18 distinct silvicultural models were defined, adapted to the territory's ecological and climatic diversity, its Atlantic or Mediterranean exposure, current soil conditions and climate change projections.

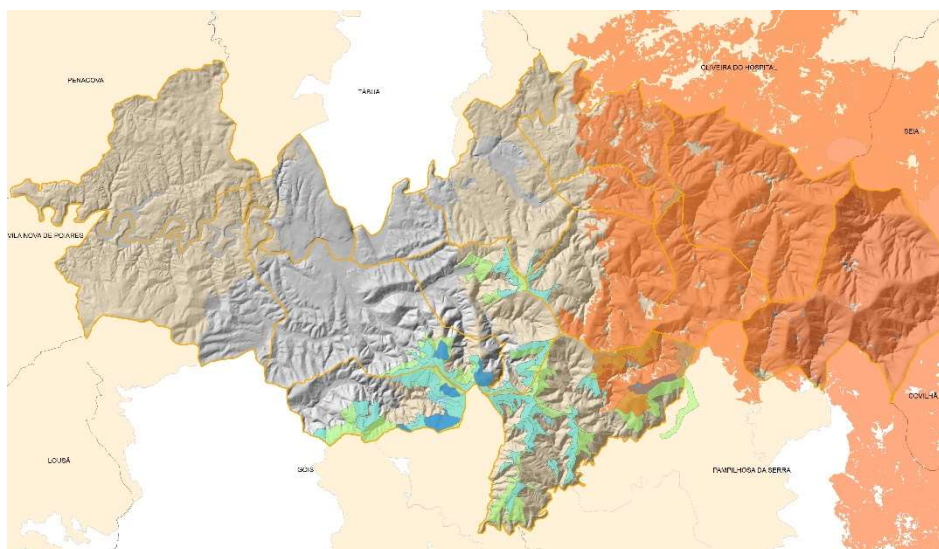
Reforestation is based on the introduction of ten tree species, eight of which are native – including maritime pine, cork oak, sweet chestnut, pedunculate oak, Pyrenean oak, strawberry tree and birch – and two exotic species (Douglas fir and northern red oak), used occasionally for aesthetic or structural purposes. In 90% of the intervened areas, mixed stands were established, organised either in clusters or through stem-by-stem mixtures. In these stands, resinous species serve as ecological facilitators for the development of broadleaves, which will form the forest of the future.

To conserve the soil, ensure ecological stability and safeguard the visual quality of the landscape, afforestation actions were carefully planned to minimise disturbances to the soil and existing vegetation. The adopted model favours the use of natural regeneration, the limitation of soil disturbance – restricted to only 60 hectares involving mechanical intervention – and the active eradication of invasive species, always within an adaptive silviculture framework.

A guiding principle of the project was to ensure that no area under afforestation was left entirely devoid of vegetation at any stage during the intervention, thereby preventing erosion, protecting soil biogeochemical cycles and contributing to the maintenance of landscape integrity. To minimise the visual impact of operations, the boundaries of intervention areas were defined based on the visual forces of the landscape, following the natural contours of the relief and respecting the upper altitudinal limit of afforestation characteristic of the Serra do Açor, ensuring the harmonious integration of new formations into the territory.

8 - THE PERMANENT RISK WE FACE - RURAL FIRE OF PIÓDÃO 2025

Again, in august 2025, fire roamed freely through this mountains, more than 64.000 ha burnt, affecting over 400 ha of the FSA project, including around 100 ha of installed young stands (Pic. 10).



Picture 10: Burnt area from the 2025 fire.

Fire is a natural element in the mediterranean area, and the only way to avoid the destrucion it causes, is to learn how to live with it, increasing the resilience of our forest systems, at landscape scale. Despite

the impact, it provided confirmation of the effectiveness of the ecological model, right species, in the right place.

A few weeks after the fire, the broadleaf species in the affected plots(english oak, pyrenean oak) showed abundant vegetative regrowth indicating a survival rate between 50% and 80% in stands with 3 to 4 years of age. This confirms that species resilience, the strength to regenerate from the roots, and specifically developed and applied silvicultural systems are providing a slow but firm landscape transformation. Instead of the surrounding scenario of post-fire recovery, usually consisting in scrubland and some increasingly fewer scattered pine trees, the post-fire natural regeneration scenario in this affected plots now includes a reasonable density of native broadleaf plants. The adaptative management model, as prescribed, will allow a fast intervention in this areas, already taking place at this moment.

With more growth time and proper management, we will add to the resilience the increased fire resistance of these stands and, consequently, of the Serra do Açor Landscape.



Picture 11: Pyrenean oak, planted in 2023, resprouting from the 2025 fire

"A society truly progresses when someone plants trees even knowing that they will never sit in their shade."

[Greek proverb]



