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PREVENTION ACTION INCREASES
LARGE FIRE RESPONSE PREPAREDNESS

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WP4 – FUEL MANAGEMENT SMART SOLUTIONS TOWARDS FIRE RESILIENT LANDSCAPES

Deliverable 4.2 – Report on wildfire risk management lessons learnt and fuel management smart solutions selection

31 January 2021

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Partnership: Università degli Studi della Tuscia - UNITUS (Coord.), Università degli Studi di Napoli Federico II – UNINA, Centre de Ciència i Tecnologia Forestal de Catalunya - CTFC, Ellinikos Georgikos Organismos - DIMITRA, Instituto Superior de Agronomia – ISA

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1. Objectives and contents

According to the PREVAIL project workplan, *Task 4.2 – Fuel management smart solutions assessment* – has two main objectives:

(1) identify the relevant information about the application of current fuel management programs, through the interviews done to agencies and initiatives previously identified in Task 4.1 in each partner country or region in Italy, Spain, Portugal and Greece (Chapter 3);

(2) select best initiatives identified according to the smart solution definition (Chapter 4).

The survey focusses overall on the agencies, institutions and initiatives, directly or indirectly involved in fuel management projects financed by European Union funds through the Rural Development Program (RDP), LIFE Projects, etc., or by private funds.

For the first objective, interviews to key actors identified in *Deliverable 4.1 – Working paper on cases, agencies and actors identified* to analyze and capitalize gaps and lessons learnt of fuel management programs implemented for wildfire prevention were carried out, collecting data about the cost-effectiveness, types of actions funded, the selection criteria, traceability, etc.

Moreover, a selection of best fuel management initiatives collected in *Deliverable 4.1* was done according to the definition of "**fuel management smart solutions**" defined in PREVAIL project as: **practical measures and initiatives implemented in a sustainable manner, enhancing cost-efficiency, optimizing the synergies and cooperation from a multi-objective perspective, able to capitalize the best existing knowledge and being permanently updated under a lessons learnt approach**. The survey is focused on practical or transferable initiatives. Some of the smart solutions identified have been selected for the PREVAIL project documentary on fuel management and wildfire prevention.

Along this Task, an active participation of each partner collecting national data has been promoted following a common scheme for data analysis. In both cases, common templates have been distributed to undertake the collection (Chapter 2). All information collected is presented in the Annexes.

The interviews allow to know, among others: which are the contributions of the actions to wildfire prevention, which are the limitations of their implementation, the actions funded, etc. The description of initiatives includes type and promoters of the initiatives, phase of the risk management cycle considered, etc.

Normally the collection of information is done at national level. In the case of Spain, according to the decentralized model of competences about wildfire risk management to (most of) the Autonomous Communities, the research is done at regional level in Catalonia. International smart solutions beyond the partnership countries have been included.

2. Methodology

The **gap analysis on fuel management programs and initiatives** was carried out through the selection and interview done by each partner to relevant actors involved in fuel management for wildfire prevention, according to the institutional framework and initiatives/programs identified in *Deliverable 4.1 – Working paper on cases, agencies and actors identified* of its own country/region.

In order to harmonize the data collection and the gap analysis, a common template for the interviews was provided, defining the specific information to be analyzed. The template was organized in three sections as follows (Figure 1):

A first section of *Basic information*:

- Identification number of the initiative and/or institution previously identified in Deliverable 4.1.
- Name of initiative and/or institution.
- Personal data: name of interviewee and email address.

A second section of *General description* of the fuel management program:

- Type of fuel management program: actions linked with EU projects, Local/Regional initiatives, Normative compliance, Rural Development Program (RDP) and/or Others.
- Details: code of RDP measure, reference of the project or initiative, etc.
- Measures and indicators: type of action funded, application/selection criteria, period of applicability, traceability, indicators of cost-effectiveness, administrative records certified, etc.

The third section includes the *Gap analysis* with five sub-sections linked with a specific open question:

- Which are the contributions of the actions to wildfire prevention? (related to achievements).
- Which are the limitations of the actions? (related to gaps/challenges).
- How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management).
- Do you know good initiatives/best practices linked with wildfire prevention and management? Are these initiatives funded by specific programs, or could they be funded? (related to the identification of smart solutions).
- Other comments, questions, and contributions.

Although the identification of initiatives has a particular template, it was considered appropriate to include a question to identify new initiatives that could be considered as a smart solution.

Figure 1. Interview common template to develop a gap analysis related to fuel and wildfire risk management actions

4.2 Fuel management smart solutions assessment* - **INTERVIEW**				
Basic information		ID_INit		ID_INST
Initiative/Solution	**Name**			
Institution	**Name**			
Personal data	Position – Name (email address)			
General description				
Fuel management programs				
☐ EU projects ☐ Local/regional initiatives ☐ Normative compliance ☐ RDP ☐ Other	**Details**			
Measures and indicators				
Gap analysis (open questions)				
Which are the contributions of the actions to wildfire prevention? (related to achievements)				
Which are the limitations of the actions? (related to gaps/challenges)				
How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)				
Do you know good initiatives/best practices linked with wildfire prevention and management? **Are these initiatives funded by specific programs, or could they be funded?** (related to the identification of smart solutions)				
Other questions/comments/contributions				

As regards the **fuel management smart solution selection**, a qualitative analysis of the initiatives collected in Deliverable 4.1 was carried out according to the "smart solution" definition. For that reason, that initiatives identified through the interviews, have been not considered in this analysis (chapter 4), since the information collected through the interviews template is different.

Fuel management smart solution under PREVAIL project is based on the following criteria:

- Practical measures and initiatives implemented in a sustainable manner,
- Enhancing the cost-efficiency ratio,
- Optimizing the synergies and cooperation from a multi-objective perspective,

- Able to capitalize the best existing knowledge and,
- Being permanently updated under a lessons learnt approach.

Initiatives or projects must not necessarily fulfil all the criteria, but should be at least designed/developed according to them.

The template for the **Initiatives** used in Deliverable 4.1 (Figure 2) has three sections.

A first one regarding *Basic information* that includes: identification number; name of the initiative; promoter of the initiative; territorial scope, and; place where is implemented.

A second section including the *General focus* with the DRM cycle phases where 4 categories were defined for the prevention phase together with the preparedness, response and recovery ones, as follow:

- **Active prevention**: Actions directly related to wildfire prevention as firebreaks and fuelbreaks, water points, fuel management in strategic points, silvicultural intervention to increase resistance and resilience to fire disturbance, etc.
- **Passive prevention**: Actions involving fuel removal, through the maintenance of forestry and agriculture activities on the territory, which indirectly affects fuel loads distribution at landscape level. Three subcategories are established:
    - **Forestry production**: Actions related to forest management and forest products mobilization (wood and non-wood forest products – except grasslands-) such as selective and commercial thinning, clear cuttings, coppicing, cork exploitation, forestry trails constructions for wood mobilization, etc.
    - **Maintaining mosaic landscape and grazing**: Actions related to crop lands and mosaic landscape maintenance, and the related farming and grazing activities (including grasslands and complementary grazing of forest understory).
    - **Other societal and structural support to rural development**: Actions of support to rural development as training, extension services, support for business, basic services for the economy and rural population, etc.
- **Preparedness**: Actions related to preparation of the exposed population and services to manage the potential emergencies and wildfire impact.
- **Response**: Actions related to fire suppression and emergency management when a wildfire happens.
- **Recovery**: Actions related to the restoration and recovery of burnt areas.

A third section includes the Description and additional information with regards: Main category; Available language; Short description; Complementary information; Web link, and; Contact.

Figure 2. Common template to identify and describe initiatives and smart solutions towards wildfire resilient landscapes

Initiatives and smart solutions towards fire resilient landscapes				
Basic information			**ID INit_**	
Initiative				
Promoter				
Scope	☐Regional/Sub-regional ☐National ☐EU		**Place**	
General focus (mark as much as necessary)				
Classes into DRM cycle phases	☐**Active prevention**	**Passive prevention** ☐Forestry production ☐Maintaining mosaic landscape and grazing ☐Other societal and structural support to rural development		
	☐**Preparedness**	☐**Response**	☐**Recovery**	
Description and complementary information				
Main category	☐Best practice	☐Field reference guide / training material		
	☐ Mobil app. / portal web	☐ Software / IT / DSSS	☐ Video / Media resource	
Available languages				
Short description				
Complementary information				
Web link				
Contact				

The Annexes from 1 to 5 of this report collect all the interviews done, and the initiatives template that have been selected as a fuel management smart solution, ordered by country.

3. Gap analysis in fuel and wildfire risk management programs

The main objective of the gap analysis is to identify the challenges, constrains and achievements of the wildfire risk management programs implementation through the interviews developed.

The information is organized in three sections:

First, *Interviews description and profile*, with information about the public/private and Institutions/Initiative/Both profiles. The link with the institution or initiative identified in Deliverable 4.1 is done.

Second, the *Type of fuel management program* according to the template classification.

Third, the *Gap analysis*, summarizing the results of the interviews.

A first subchapter includes the results from all the interviews. Finally, a specific and detailed analysis by country is done following the same above-mentioned sections.

3.1 General results

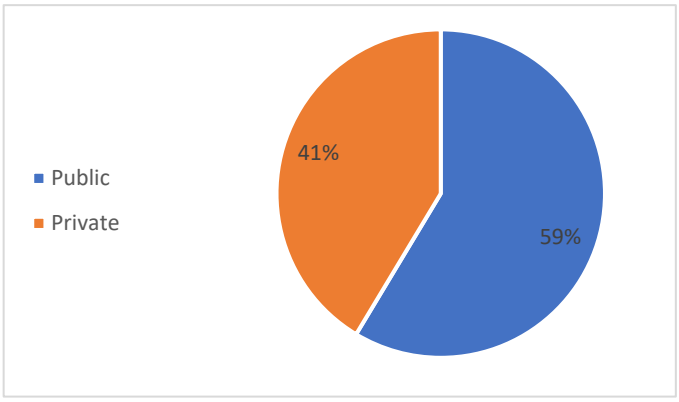
Interviews description and profile

A total of 29 interviews have been done representing different territorial/competences/hierarchical levels of organization according to the actors and initiatives identified in Deliverable 4.1.

In the case of Italy, 6 interviews were collected related to the initiatives identified. For the Catalan (Spain) case, 7 interviews were collected related to specific fuel management actions linked with institutions and initiatives identified. For Portugal, a total of 8 interviews were done, 4 of them related to actors identified, and the other 4 related to initiatives previously identified. Finally, in the case of Greece 8 interviews were collected, 4 of them related to actors identified in Task 4.1, and the other 4 related to new actors and initiatives.

The 59% of the interviews are from public actors or initiatives, while the 41% are private (Graphic 1).

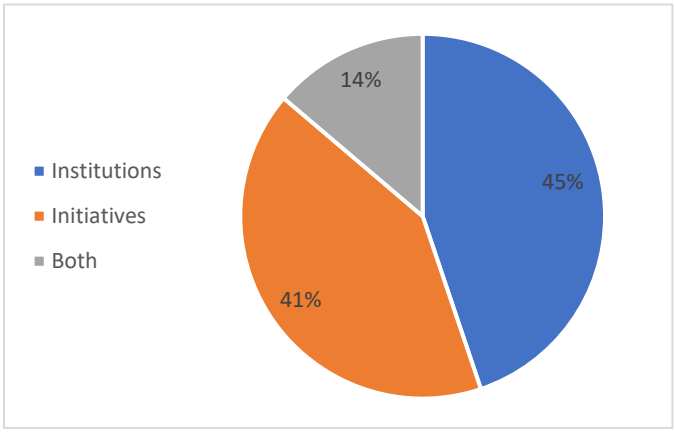
Graphic 1. Representation of private and public institutions/ initiatives in the interviews



From the total of 29 interviews, 13 of them are related to institutions, while 12 are related to initiatives and 4 are related to both (Graphic 2).

The "**institutions**" category is referring to public or private land management agencies that deal with fuel management programs in each partner country or region. On the other hand, the "**initiatives**" category is referring to practical or transferable initiatives related to fuel management and wildfire prevention actions, mainly in Europe.

Graphic 2. Representation of institutions and initiatives in the interviews

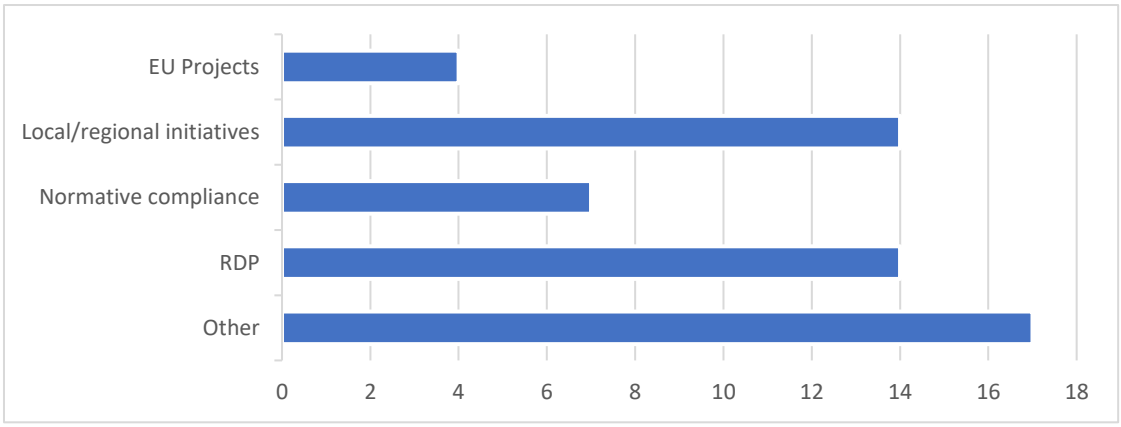


Type of fuel management programs and actions

Most of the interviews are related to fuel management programs linked with *RDP* measures, *Local/regional initiatives* and *Other* actions (45 times marked, 80%). The less represented are *Normative compliance* (7 times marked, 12%) and, *EU projects* (4 times marked, 8%) (Graphic 3).

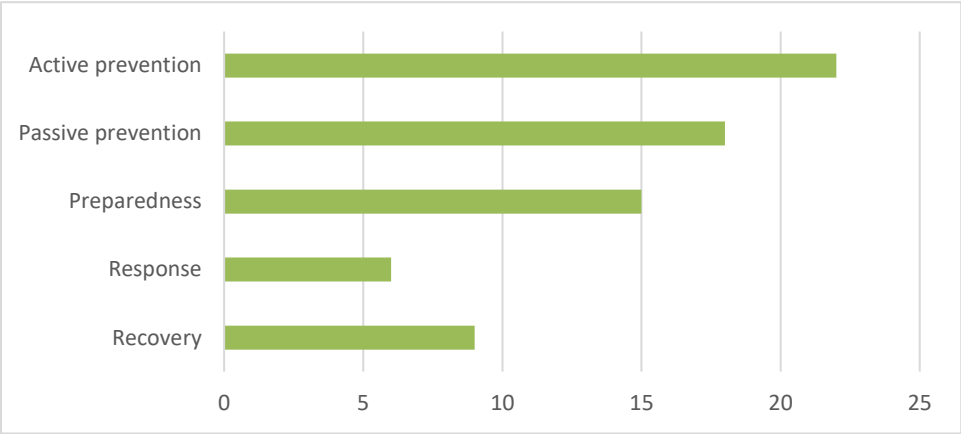
It is important to highlight that it is possible to mark more than one type of fuel management program, since the initiatives or institutions interviewed can contribute or develop to different wildfire risk management aspects.

Graphic 3. Type of fuel management programs and actions covered by the interviews



The interviews cover all the DRM cycle phases, highlighting those related to wildfire prevention through Active and Passive prevention (actions linked to forestry production, fuel management, grazing, etc.). Preparedness is also widely represented in the interviews, while Recovery and Response, respectively, are the phases less analyzed in the gap analysis (Graphic 4).

Graphic 4. Representation of the DRM cycle phases in the interviews



Gap analysis

In this sub-section the analysis is done at general level following the specific questions included in the template.

- *Which are the contributions of the actions to wildfire prevention?*

This question is related to the fuel management programs achievements, and the specific actions related to prevention. At general level, the contributions are mainly linked to fuel reduction (through prescribed burning, silviculture actions, pre-planned wildfire prevention infrastructures, reduction of fuel loads, grazing, etc.), risk awareness (communication actions to society, environmental education, etc.) and non-wood and wood products commercialization in public and private forests.

- *Which are the limitations of the actions?*

This question is related to gaps and challenges. At general level, the limitations are mainly related to insufficient available budget to implement the actions needed (e.g., to cover the territory at risk, to fund all the records, etc.), lack of human resources to cover all actions to be done, non-economic viability of activities (e.g., low market value of resin extraction, grazing, etc.) and excessively bureaucratic processes.

- *How to enhance the contributions of the actions towards wildfire prevention?*

This question is linked to the previous limitations identified. Answers are mainly related to the increase of funds and available budget, the updating of forest management plans, the enhancement of environmental education (risk awareness and communication), fostering the use of forest products and changes in the RDP model, among others.

- *Do you know good initiatives/best practices linked with wildfire prevention and management? Are these initiatives funded by specific programs, or could they be funded?*

This question is related to the finding of new initiatives under the scope of fuel management smart solutions. In this case, almost every interview has proposed some new initiatives directly linked with the Project and Task objective. Some of them were already described in the Deliverable 4.1.

3.2 Description at national/regional level

This section describes the data collected at national level for Italy, Portugal and Greece and the region of Catalonia as a case study of Spain. The analysis of the interviews is following the above-mentioned scheme, identifying and describing (1) the interviews description and profile, (2) the type of fuel management programs and, (3) the gap analysis.

3.2.1 Italy

Interviews description and profile

6 interviews have been done (Table 1) linked to fuel management programs and wildfire risk management actions (Annex 1). Among the interviews, two of them are related to Fire Service training centers, other two are related to forest products, one is related to biodiversity conservation and the last one is related to grazing actions.

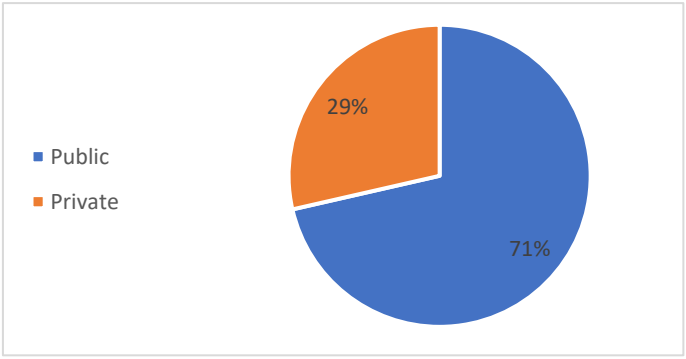
All the interviews are initiatives previously identified in Task 4.1 and described in Deliverable 4.1.

Table 1. Interviews of fuel and wildfire risk management actions in Italy

Name	Institution/Initiative	Identified in Task 4.1	Territory scale
Fire management training centre of Toscana Region	Initiative	Yes	Regional/Sub-Regional
Life Granatha – Growing Avian in Apennine's Tuscany Heathlands	Initiative	Yes	Regional/Sub-Regional
Firefighting training centre of Piemonte Region	Initiative	Yes	Regional/Sub-Regional
Grazing program for fire hazard abatement through "Landa Carsica" business network	Initiative	Yes	Regional/Sub-Regional
Biomass production and fire hazard reduction in Unione Comuni Pratomagno	Initiative	Yes	Regional/Sub-Regional
New business models for innovating the cork sector and contrasting cork oak woodland abandonment	Initiative	Yes	Regional/Sub-Regional

According to Graphic 5, four interviews are related to public initiatives, one as private initiative and one is a public-private since in this case is an EU funded project with private and public bodies in the partnership.

Graphic 5. Representation of private and public initiatives in the interviews in Italy



Type of fuel management programs

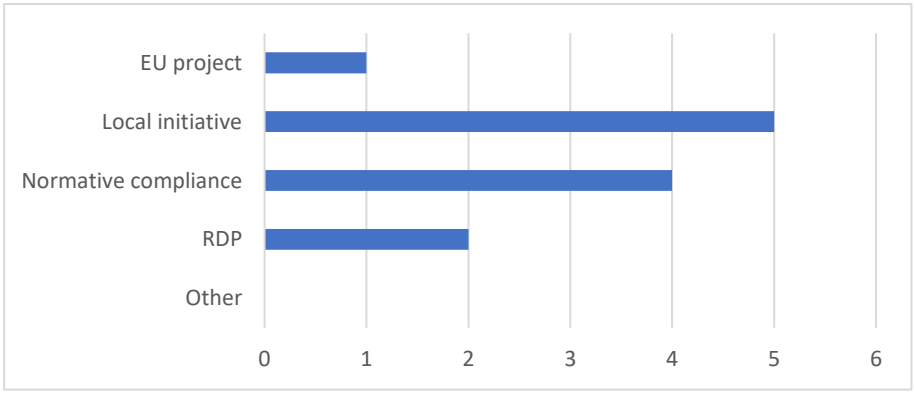
Among the interviews, fuel management program more represented is linked to *Local initiatives,* that was five times marked. Moreover, one initiative is referred to an EU Life project (Graphic 6).

The second category most represented is the *Normative compliance* (related to measures or actions that must be accomplished by law). This category was four times marked, and it is linked with the two firefighting training centres, the EU project and the grazing program.

The RDP measures are also represented in the interviews by the grazing program and the biomass production. These two initiatives are funded in part by RDP measures as 04.03.03 Forest Road Network or 08.03.01 Recovery of forest potential and wildfire prevention.

Finally, there is only one mark for the *EU project* category, related to the "Life Granatha – Growing avian in Apennine's Tuscany Heathlands".

Graphic 6. Distribution of fuel management programs and actions covered by the interviews in Italy

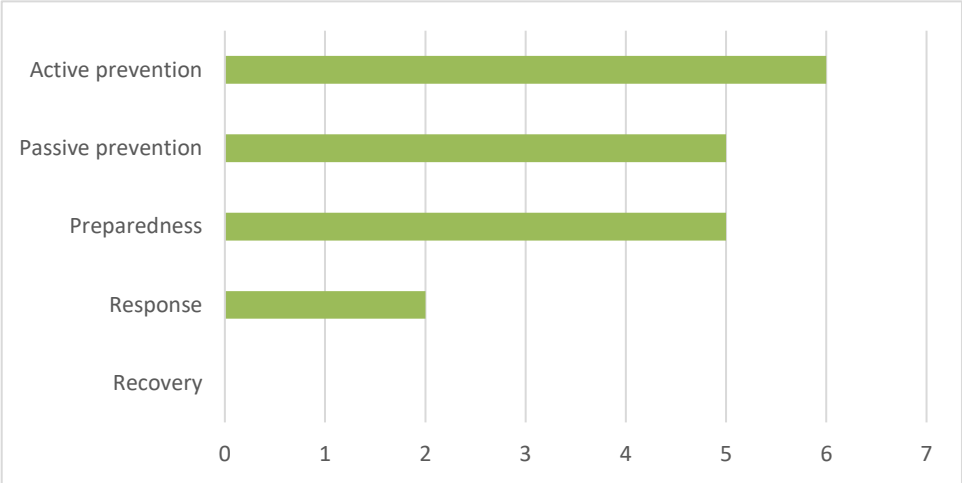


The initiatives interviewed are mainly related to wildfire actions through Active, Passive prevention and Preparedness, while Response is the less represented and there is no reference to Recovery (Graphic 7). Namely, the two firefighting training centres are implementing Active and Passive prevention, Preparedness and Response actions since they are managing fuel mainly by prescribed burning and mechanical treatments to reduce wildfire risk and landscape scale flammability while they are offering training to firefighters.

Regarding Life Granatha and Biomass production initiatives, their actions are directly related to Active and Passive prevention since main objective is wildfire risk reduction through prescribed burning, mechanical treatments, biomass extraction and different silvicultural measures to manage the available fuel, both contributing to the landscape mosaic maintenance.

Finally, the grazing program for wildfire risk reduction through the "Landa Carsica" business network, and new business model innovating cork sector and facing cork oak woodland abandonment initiatives are related to Active, Passive prevention and Preparedness since they are promoting actions related to forestry production and grazing for fuel loads reduction and protection of Wildland Urban Interface in specific landscapes.

Graphic 7. Representation of DRM cycle phases in the interviews in Italy



Gap analysis

- *Which are the contributions of the actions to wildfire prevention?*

The contributions are diverse since the initiatives have different objectives. The main contributions are:

- Wildfire risk reduction through different activities of the territory as grazing, biomass use or cork oak production, contributing to maintain and promote a mosaic landscape less vulnerable to wildfire spread.
- Increase of capabilities, training and knowledge of Fire Service professionals.
- Protection of strategic buildings such as the training centres and Wildland Urban Interface areas.
- Reduction of landscape scale flammability increasing the safety of fuel treatment areas and firefighting operations.

- *Which are the limitations of the actions?*

The main limitations mentioned are:

- The low involvement of private forest owners to contribute with their land to extend the fuel management actions, and to get the corresponding permission to carry out the fuel treatments inside their property,
- the achievement of the economical sustainability of the actions, and
- the lack of human and economic resources to implement all the actions needed.

This last point leads, consequently, force to giving priority to the silvicultural interventions with higher economical returns. Therefore, the possibility of implementing preventive measures in territories with high wildfire risk, but less productive, is limited, generating a vicious circle.

Other less common limitations mentioned, are: the low rates of generational replacement that implicitly could mean a lower attitude in acquiring expertise on new techniques; the lack of communication and awareness actions to explain to society the usefulness of wildfire prevention actions; the uncertain climate variability to implement prescribed burning; physical limits of the territory (high snow precipitations in winter in some fuel treatment areas that makes more difficult the accessibility); and the temporary limitations due to the biodiversity sensitive periods (e.g. avoiding to do the silvicultural actions during the nesting period of protected bird species).

Thus, there are among others, technical limitations to develop the prevention actions (e.g., difficulties of access to the work areas, nesting period of protected species), administrative or legal (e.g., owners' permission), financial (available funds) and social ones (lack of social innovation in rural areas).

- *How to enhance the contributions of the actions towards wildfire prevention?*

The main points raised to enhance wildfire prevention were:

- Increase the investment in economic and human resources, and
- Increase the engagement of landowners by specific regulations addressing: (1) recognition of private owners' contribution to the reduction of landscape flammability through active management, and the consequences on fuel load increases due to the lack of land management and, (2) developing the corresponding incentives for ownership aggregation and collaborative forest management.

There was also highlighting of the need to involve other actors related to land management to promote a more inclusive risk governance, and to increase the integration of fire prevention with nature conservation measures as a way to achieve different objectives in the same action.

- *Do you know good initiatives/best practices linked with wildfire prevention and management? Are these initiatives funded by specific programs, or could they be funded?*

Some of the interviews have indicated the following initiatives (more information in the templates):

- Open2preserve project (already identified and described in Deliverable 4.1).
- La "Foresta Modello" Association, as an initiative that promotes the dissemination of forest sustainable use and management.
- Management plans complementing grazing and wildfire risk reduction in Natura 2000 sites.

3.2.2 Catalonia (NW Spain)

Interviews description and profile

A total of seven interviews linked with fuel management programs and wildfire risk management actions have been done (Table 2) (Annex 2). All interviews except one, are based on institutions and initiatives identified in Deliverable 4.1.

Two of the interviews were done to a different Services of a public institution in charge of promoting forest management and planning in private forest ownership. The first is related to the subsides management for sustainable forest management promotion and how wildfire risk is integrated. The second one discusses how wildfire risk is considered through the forest planning tools.

Two other interviews were addressed to the General Directorate of Forest Ecosystems and Environment Management. One was focused on tasks developed by Wildfire Prevention Service. The second was related to a relevant tool promoted by the General Directorate for wildfire risk management at massif scale level, the so-called Priority Protection Plans for Forest Areas (PPPF, a total of 17 are distributed across Catalonia according to the main large-wooded mountain areas with high risk of large wildfires).

Another interview was linked to the General Directorate of Agriculture and Livestock to discuss the contribution of actions supporting mosaic landscape and livestock to Passive prevention of wildfire risk.

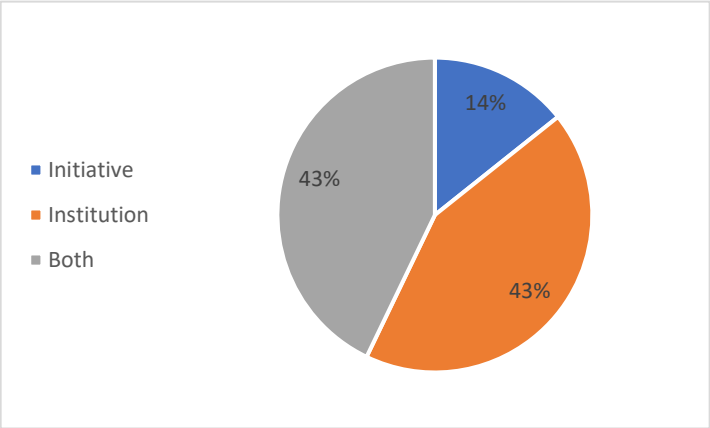
Finally, two more interviews were done to analyze specific initiatives developed in the territory which promote fuel reduction through, on one hand, forest management and biomass production and, the second, by grazing within a collaborative public-private initiative.

Table 2. Interviews of fuel and wildfire risk management actions in Catalonia

Name	Institution/Initiative	Identified in Task 4.1	Territory scale
Forest Ownership Centre (CPF) – Subsides Area	Institution	Yes	Regional/Sub-Regional
Forest Ownership Centre (CPF) – Forest Planning Area	Both	Yes	Regional/Sub-Regional
Priority Protection Plans for Forest Areas (PPPF)	Both	Yes	Regional/Sub-Regional
DG Forest Ecosystems and Environment management – Wildfire Prevention Service	Institution	Yes	Regional/Sub-Regional
DG Agriculture and Livestock – Agrarian Sustainability Service	Institution	Yes	Regional/Sub-Regional
Boscos del Vallès (Valles Forests)	Initiative	Yes	Regional/Sub-Regional
Ramats de Foc (Fire Flocks)	Both	Yes	Regional/Sub-Regional

Three of the interviews are related to institutions while one is related to initiatives, and three of them are related to both (Graphic *8*).

Graphic 8. Representation of institutions and initiatives in the interviews in Catalonia



Type of fuel management programs

Among the interviews, fuel management programs more represented are linked with *RDP* measures and *Other* actions, five and four times respectively marked. On the other hand, *Local initiatives* category was two times marked, while *Normative compliance* is only once represented. *EU funds* is not represented (Graphic ***9***).

RDP measures described are linked to wildfire prevention at direct level: funding wildfire prevention infrastructures or fuel management treatments, and indirectly: such as the promotion of forest planning in private ownerships (which normally indicates and active forest management) or the support to agriculture in marginalized territories.

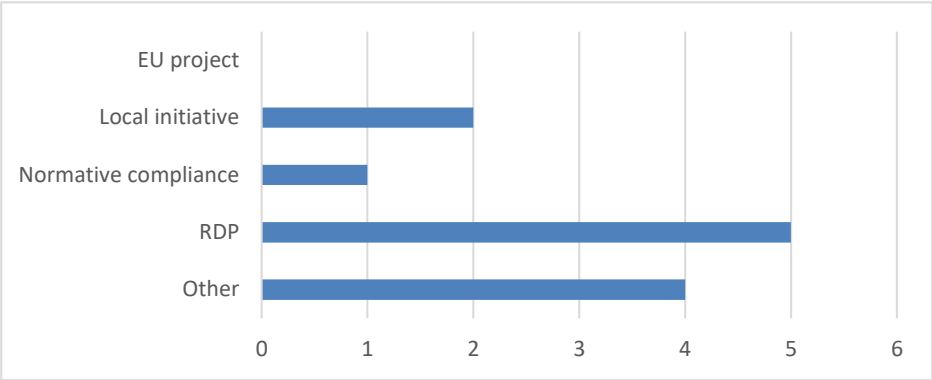
Other fuel management programs identified are mainly related to promotion of landscape mosaic with different means of *RDP* ones and the development of Priority Protection Plans for Forest Areas (PPPF) and implementation (direct investment) of prevention actions planned, and funding of equipment of Forest Defence Associations (ADF[1]).

Two *Local initiatives* are related to the promotion of fuel reduction in specific areas. On one hand, Boscos del Vallès (Valles forest) is developed by the local administration at county level seeking for forest management promotion for wildfire prevention in private forest ownership through biomass production and consumption in the local district heating systems created, to close the circle between bioeconomy, UN Sustainable Development Goals (reduction of emissions) and wildfire risk reduction. Secondly, another initiative, Ramats de Foc (Fire Flocks) is promoted for a Foundation in a collaborative way including Fire and Forest Service, producers and sellers of livestock products from herds contribution to fuel reduction and wildfire prevention, and restaurant and catering sector, with a label to ensure the traceability among the consumers.

Interview related to *Normative compliance* mainly refers to creation and maintenance of prevention perimeter slots around urbanizations located in forest areas, in compliance with the Law 5/2003 of wildfire prevention measures in isolated urbanizations in forest lands, which obligate to create an area of ≥25 meters width without vegetation around the urbanization perimeter.

[1] They are voluntary associations formed by forest owners and neighbours, normally at municipality level, which collaborate in prevention actions (road network maintenance, fuel treatments, education, monitoring and control) and are inserted into the Fire Service in case of emergency.

Graphic 9. Distribution of fuel management programs and actions covered by the interviews in Catalonia



The interviews cover actions linked with Active and Passive prevention, Preparedness and Recovery (Concretely, wildfire risk prevention measures described are linked with Active prevention through reduction of fuel loads or design and development of strategic infrastructures such as water points, the so-called Strategic Management Points (SMP, allocated strategically in the territory according to novel knowledge of potential wildfire behaviour pattern to support fire control and extinction) or fuel reduction in the urbanizations close to forest land. Meanwhile, Passive prevention is represented by the support to forest producers' groups, maintenance of landscape mosaic or promotion of forest planning and management, and grazing.

On the other hand, Preparedness appears one time: support to ADF equipment (which is also linked to Prevention and Response).

Priority Protection Plans for Forest Areas is the one related to Recovery actions, promoting the recovery of forest potential and wildfire prevention after a disturbance (wildfires, droughts, snowfalls, windstorms and biotic damages), and together with Prevention.

There is one action linked with Response related to the ADF equipment.

Graphic 10). Concretely, wildfire risk prevention measures described are linked with Active prevention through reduction of fuel loads or design and development of strategic infrastructures such as water points, the so-called Strategic Management Points (SMP, allocated strategically in the territory according to novel knowledge of potential wildfire behaviour pattern to support fire control and extinction) or fuel reduction in the urbanizations close to forest land. Meanwhile, Passive prevention is represented by the support to forest producers' groups, maintenance of landscape mosaic or promotion of forest planning and management, and grazing.

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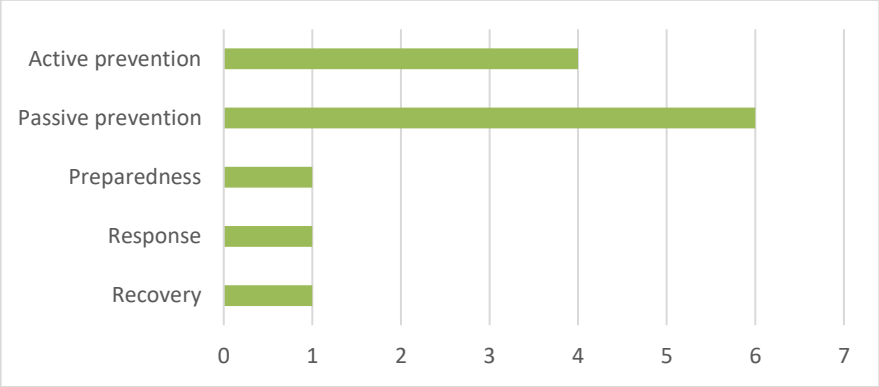
There is one action linked with Response related to the ADF equipment.

Graphic 10. Representation of DRM cycle phases in the interviews in Catalonia



Gap analysis

- *Which are the contributions of the actions to wildfire prevention?*

Main contribution to wildfire prevention described in the interviews is the reduction of fuel load in the territory, specifically in areas with high wildfire risk pre-identified. Fuel reduction is achieved through different actions:

- Fuel reduction in selected areas of Forest Management Plans at property level for fire prevention and suppression.
- Fuel reduction included in PPPF, defined and located by the Fire Service according to potential wildfire patterns to support suppression actions in the case of fire.
- Cleaning and reducing fuels in the perimeter of urbanizations and isolated houses close to forest land, according to the law requirements.
- Maintenance of wildfire prevention infrastructures or actions through agriculture activities in the territory that contribute or maintain the creation of a landscape mosaic more resilient to wildfire risk.

There are other contributions not directly related to reduction of fuel load, but related to the support of response actions:

- The above-mentioned strategic sites for fuel reduction as a suppression facility in the case of fire, planned and implemented in cooperation and according to Fire Service guidelines.
- Equipment and training for Forest Defence Associations to cover wildfire prevention and suppression (as an early response system in the territory and collaborating with Fire Service during the wildfire event).
- Monitor and updated the information about wildfire prevention measures and infrastructures available at municipality level, integrating this data into the fire prevention plans.

- *Which are the limitations of the actions?*

Main limitation stated in most of the interviews is related to the low budget availability to undertake the needed prevention actions identified and cover all the territories at risk. Consequently, most of *RDP* funds are used to support agri-environmental measures related to forest health and management, and according to the criterion, the so-called "productive forests" or forests "under active management" are prioritized indirectly (since they complement the owner private investment, therefore, those properties with more profitability are more feasible to work with limited subsides. On the contrary, properties with low or zero profitability cannot carry out forest management with the small contribution of the subsides). Therefore, such a kind of vicious circle, areas less productive and without management and forest plans, which normally are where wildfire risk is higher, are not receiving the necessary funds to reduce their risk.

Also related to the limitation of budget, there is no capacity to answer to all the requests (currently, for some specific actions only 30% is covered) to carry out co-funded wildfire prevention actions.

Another highlighted limitation is about legal aspects related to the planning tools or capacity to conduct the activities planned. In some cases, excessive bureaucracy to approve and implement a public project is stated. For the of PPPF, main limitation is the legal level of the planning tool, since without enough status they cannot obligate or force private forest owners to carry out the fuel management treatments which needs they permission. This also happen in fire prevention plans. In some areas of high wildfire risk in abandoned forest lands, an added difficulty is the availability to identify the forest owner and contact with them. These operational difficulties are also acting as a chilling effect for the private forest companies to manage the fuel treatments in those areas.

A successful lesson learnt on this is the promotion of join forest management plans in private forests. They are articulated around a common goal, normally wildfire prevention since the actions (or no actions) in the surrounding properties affect globally the risk in the territory. By this way, prevention actions are planned in a more cost-efficient way, the commitment of owners is more easily achieved since the implementation of the planned actions is a condition. They also see that once most owners are convinced and grouped, the engagement of the rest is easier, being able to plan coherent physical units in terms of wildfire risk beyond the administrative limits of the properties.

In the case of PPPF, another limitation identified is linked with the risk governance. Ideally, the territory stakeholders should be proactively involved during the development of the planning process from the initial stages. Nevertheless, public bodies in charge of PPPF development have limited internal capabilities on participatory processes (beyond informative sessions) or limited resource to contract that service and for the mobilisation of stakeholders. Consequently, the opportunity to engage them from the beginning as "part of the solution", promoting risk awareness and a co-shared vision, is underdeveloped.

Regarding fuel reduction around the urbanizations and isolated houses, several constrains are identified. First, available budget is not enough to cover all the requests (prioritization criterion according to fire risk must be applied). Second, normally urbanizations have different issues to solve such us security and basic services that go first, meanwhile wildfire risk reduction is not perceived as a priority. In some cases has been developed and implemented municipality taxes for the perimeter fuel reduction maintenance. Nevertheless, small municipality with low administrative capacity have difficulties to implement them, since some bureaucracy is needed. Third, in case of old urbanizations, the areas into the perimeter can generate servitudes to third parties, adding difficulties to its implementation as the identification and permission of the owners is needed, or they can reclaim a compensation equivalent to the opportunity cost related with the loss of forest production.

Regarding Prevention Plans at Municipality level, main limitation is the little updates of the current plan formats. But at the same time, there exist the obligation to have them operative. Currently, a simpler structure of the plan is being developed to be able to cover all the territory and have them updated properly.

In the case of Fire Flocks initiative, the excessive bureaucracy for cattle management, added to the low price and demand for the products are stated. Normally, the functioning of grazing activities is supported by public subsides (such as the RDP), which means administrative bureaucracy and may happen that farmers do not have enough administrative and technical capabilities to manage the situation. Furthermore, the subsidies have a temporary character, which often means low stability of the activity.

Finally, regarding the agricultural measures, main limitation identified is that the contributions to wildfire prevention are not officially recognised within agri-environmental criterion. Consequently, there are no selection according to risk maps (or other indicators) related to wildfires favouring and motivating prevention actions. On that sense, the only case where fire risk is used as a criterion for forest management subsides is within the Forest Ownership Centre for private forest (RDP measure 08.05.01). In this case, they include the level of risk (low, medium, high) according to a large wildfire risk map done by the same institution within a report about forest management guidelines for fire prevention. Nevertheless, this was scored up to 5 points for a total of 65 points to be funded and was basically used to facilitate the selection between similar grading of different applicants (in 2016 there was a tie with a big number of records). Since this criterion had only 5 from 65 points within the selection and the map is linked with a specific report of the same institution, no conflicts about robustness of the map information appeared.

- *How to enhance the contributions of the actions towards wildfire prevention?*

Most proposals are linked to the above-mentioned limitations identified. For instance, regarding budget availability is stated the need of add new resources to the existing ones addressed to forest management and forest industry, since both components are fundamental for the forest sector. This means to invest more resources coming from the RDP at structural level, increasing the capacity to fund forest land non profitable and where wildfire prevention is a priority and the only motivation for fuel management. On that sense, wildfire risk indicators (e.g., wildfire risk map) should be used within the eligibility criteria for prioritization in the use of public funds.

In terms of fire risk planning, it was highlighted the possibility of enlarging the targeted territories beyond those areas classified as PPPF or, at least, that classifications should be updated according to the increase of wildfire risk according to the land and climate change. In any case, there exist large amount of wooded land in a disseminated landscape out of the massif classification, which has also to be managed. For instance, forest land in contact with wildland urban interface or close and surrounding touristic sites and resorts. They should also be classified as a priority area for wildfire risk reduction.

Related to this last point, a stronger link between the benefits of wildfire risk reduction to those who are taking benefits of it could serve to involve the seconds in the implementation of fuel treatments through taxes or direct investment for instance. Since prevention is offering Civil Protection, biodiversity and forest conservation (and related benefits such us erosion control, carbon fixation or water regulation), economic security among other benefits, they should be recognised and assumed for those who are taking advantage of it. In the frame of the EU Green Infrastructure strategy, this could be linked to the ecosystem service of regulation promoting the need changes in the legal frame aimed at establishing new mechanism for

funding as a public service, under schemes of Ecosystem Services Payment, make people responsible of their own protection, integrating the cost of risk reduction into the urban developments and projects, or similar. That is, to integrate wildfire prevention actions as an ecosystem service since these actions contribute to reduce the possibility to lose some natural values (forest cover, carbon fixation, soil erosion, biodiversity, etc.).

It was also mentioned the need of increase the traceability of risk zones and its infrastructures not only in terms of hazard but also according to the exposed elements and their level of vulnerability, in order to prioritize fuel reduction and distribute the resources in most critical areas. Safety issues but also environmental (e.g., Nature2000 sites, protection function of forest in mountain areas, etc) and economic factors should be considered as well. In parallel, this should be coordinated with the response strategy in the case of wildfire. For instance, in high exposed and vulnerable areas where fuel treatment is not achieved due to not enough resources, evacuation protocols and drills in case of fire must be promoted, as well as insurances plans for recovery. In areas where fire risk has been mitigated, fire behaviour will not overwhelm suppression capacity and safe confinement is feasible and the expected impact of fire to the local economy will be low.

Related to the grazing and related food products, it was mentioned the possibility of boosting innovation with meat products, developing more attractive manufactured products for commercialization and to better develop "sub-products" such as the wool giving more added value to the activity. This should contribute to the economic feasibility and profitability of the activity and to consolidate it.

Finally, some contributions were related to risk communication and governance that could be implemented. On one hand, improving communication actions addressed to the public (explaining the actions done, their contributions to the territory, etc.) but also to private actors who take benefits from wildfire prevention, and urban developers to promote smart fire-wise urban planning. In terms of governance, a better coordination among the institutions and existing tools to implement fuel management programs should be promoted as well as the most cost-efficient way of using the limited available resources.

- *Do you know good initiatives/best practices linked with wildfire prevention and management? Are these initiatives funded by specific programs, or could they be funded?*

Some of the interviews have identified different initiatives and projects as follow (the first three were identified within PREVAIL project in task 4.1 and are described in Deliverable 4.1, see more information in the templates):

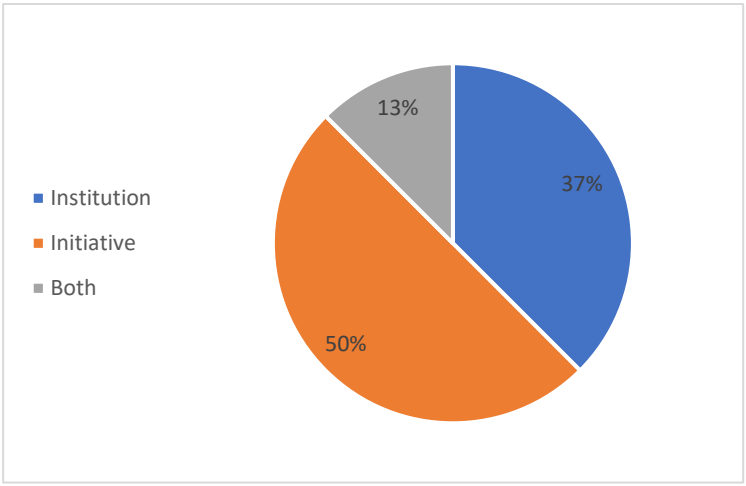
- Quality-Suber, promoting a label for cork products and grouping their commercialization increasing the profitability.
- Action plan of wildfire prevention plan of the municipality of Matadepera, where local farmers and shepherds are integrated into the fuel management of strategic management points.
- Priority Protection Plans for Forest Areas (PPPF) previously explained. that had already been identified in Task 4.1 and described in Deliverable 4.1.
- Life CLIMARK project, that promotes forest management aiming to climate change mitigation through the design of a local market of climatic credits, which could also serve as an additional source of financing.

3.2.3 Portugal

Interviews description and profile

Eight interviews have been done (Table 3) linked with fuel management programs and wildfire risk management actions (Annex 3). Six of them are private initiatives or institutions while two are public. Three interviews were done to institutions, four to initiatives, and one is related to both (Graphic 11). All of them were previously identified in Deliverable 4.1.

Graphic 11. Representation of institutions and initiatives in the interviews in Portugal



Among the institutions interviewed, there is a public institute aimed at defining and implementing national forest policies, providing guidelines and strategies to implement fuel management, forest fire defense plans, fire statistics, etc. This institute works also in all the DRM cycle phases. A second institution is a private cooperative providing wildfire prevention and management services through grazing. Finally, the third is a private company in charge of the national energy network, which also reduces fuel loads under electric lines.

Regarding the four initiatives, there is a private initiative that rents communal land to raise goats and to produce dairy products, in order to maintain the primary firebreaks network. Another private initiative promotes fuel reduction by grazing with semi-wild herbivores in natural reserve Faia Brava in central Portugal. Both are acting in Prevention, Preparedness and Recovery phases. A third one acting in Passive prevention is an initiative related to an Interreg SUDOE project, which tests and develops a method for the implementation of silvo-pastoral mosaics using remote sensing approaches that supports agricultural and forestry activities in forests of Pyrenean oak, which typically have low agricultural value. Finally, a forest management project initiative aims at improving and manage forest lands as a measure for wolf conservation, including wildfire prevention. This forest management is basically promoted by Passive prevention actions, such as the maintenance of mosaic landscape and grazing, and other structural support to rural development.

Finally, there is a private company that is both initiative and institution, which acts in all the DRM cycle phases and provides forest fire prevention and suppression services. This company is related to resin exploitation in *Pinus pinaster* forests in communal land areas.

Table 3. Interviews of fuel and wildfire risk management actions in Portugal

Name	Institution/Initiative	Identified in Task 4.1	Territory scale
Integrated Fire Management S.A. (GIFF)	Both	Yes	Regional/Sub-Regional
Nature and Forest Conservation Institute (ICNF)	Institution	Yes	National and Regional
Flocks of Serra do Açor e Rabadão	Initiative	Yes	Regional/Sub-Regional
Reserva Faia Brava	Initiative	Yes	National
Terra Chã Cooperative	Institution	Yes	Regional/Sub-Regional
SILVPAST Operational Group	Initiative	Yes	National
Forest Management – ACHLI	Initiative	Yes	National
Rede Energética Nacional (REN)	Institution	Yes	National

Type of fuel management programs

Among the interviews, the most represented fuel management program is linked with the *Other* category, which was selected in six interviews (all the interviews except Operational Group SILVPAST and National Energy Network, Graphic 12).

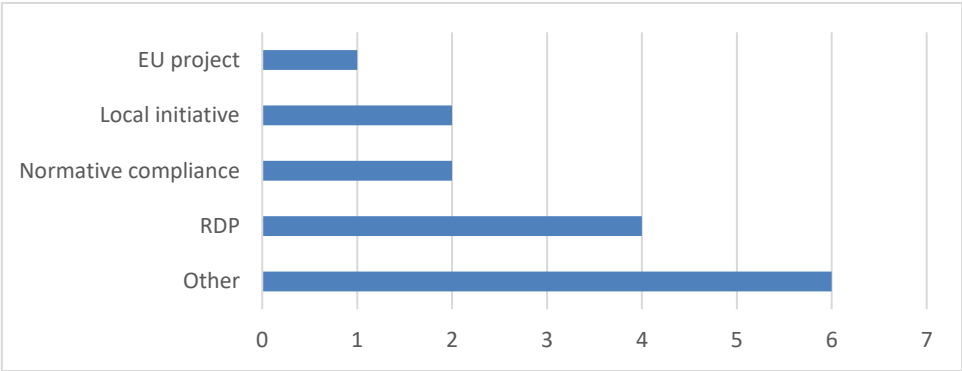
The second category most represented is the *RDP* measures, which is related to the wildfire prevention measures or actions co-funded. This category was four times selected among all interviews and includes (i) the public Nature and Forest Conservation Institute (in charge of managing the calls for public funding), (ii) the private initiative of Serra do Açor e Rabadão flocks, (iii) the private cooperative Terra Chã and (iv) the SILVPAST Operational Group, which are beneficiaries of specific RDP measures.

Local initiative category was selected by the Nature and Forest Conservation Institute and the flock's private initiative Serra do Açor e Rabadão.

Normative compliance was two times marked by (i) the National Energy Network (REN) that is responsible of managing the fuel in the forest areas previously defined in the Municipal Plans for the Defence Against Forest Fires (PMDFCI), and (ii) the Nature and Forest Conservation Institute which is responsible for defining and implementing national forest policies.

Finally, *EU project* category was selected by only one interview: Faia Brava natural reserve, where an EU project was developed.

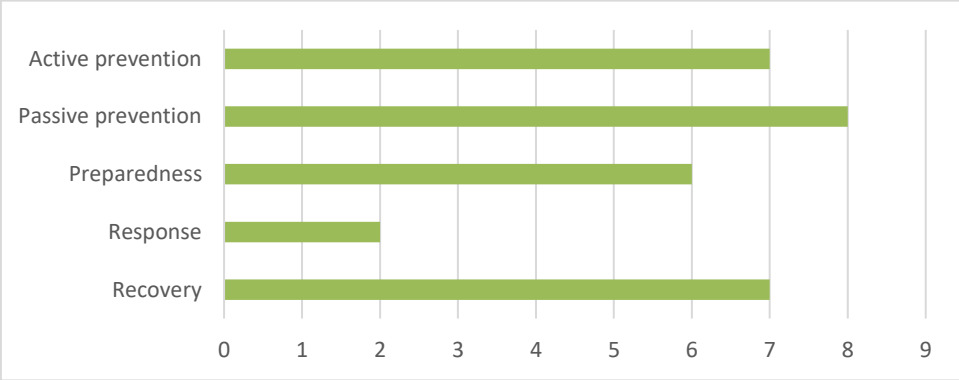
Graphic 12. Distribution of fuel management programs and actions covered by the interviews in Portugal



The eight interviews are mainly related to wildfire prevention through Active and Passive prevention (Graphic 13). Concretively, the public institute of forest and nature conservation and the private company that provides forest management services covers the whole DRM cycle phase.

All the initiatives and institutions interviewed are linked with the Prevention phase. There are also some initiatives linked with Preparedness and Recovery phases.

Graphic 13. Representation of DRM cycle phases in the interviews in Portugal



Gap analysis

- *Which are the contributions of the actions to wildfire prevention?*

The contributions are mainly related to activities directly linked to the objective of mitigating wildfire risk. Moreover, other territorial activities indirectly contribute to the reduction of risk, even if that is not the main objective. The main specific contributions are:

- Support to forest activities (non-wood products) that indirectly contributes to wildfire prevention.
- Promotion of different programs related to wildfire prevention such as: forest sappers, control and technical monitoring of burnings, strategic fuel management land mosaics within forest fires defence network, fuel management by livestock, resin extraction and fuel management according to law requirements.
- Contribution to decrease land abandonment and the corresponding increase in fuels, which indirectly results in less fire risk.
- Fuel reduction treatments by mechanical works or grazing.
- Environmental education actions.
- Experimental areas for reforestation after a fire.
- Cleaning the watercourses as a wildfire prevention infrastructure.
- Combine forest management actions with nature conservation, especially regarding wildlife.

- *Which are the limitations of the actions?*

The limitations are mainly linked with the lack of funds and available budget to do the actions designed. Thus, there is a higher territorial demand than the financial capacity to cover it. Furthermore, it is also identified that there is a lack of human resources to cover the needs (from administrative technicians to forest workers). In this sense, interviewees highlighted that the funds are inadequate, and the payments are not adjusted to the needs, thus, sometimes the calls are not well structured since the payments are reimbursed, which implies a lack of available money in advance.

A second limitation that was highlighted was the excess of bureaucracy to develop prevention actions (both, access to funds and to do forest works). An interesting point mentioned was the specific excess of bureaucracy to implement prescribed burning activities and how consequently the practice is not "attractive".

A third important limitation mentioned was the low business profitability and the low market value of some activities (e.g., grazing, resin and forest extraction, etc.), which makes these practices economically non-feasible. This could be also linked to some terrain conditions (steep slopes, difficult accesses, etc.), which may constrain forest activities and increase the costs of fuel management.

Other less common limitations mentioned were the lack of long-term vision of some local administrations, which do not support some wildfire prevention actions, such as grazing, since there are no short-term results. This is a structural issue linked with "politic timings", which generally influence the territorial model applied (e.g., support to activities with short-term profitability, such as tourism). The difficulties to find people to develop forest work was also a highlighted limitation since aged population is not able to do forest works and younger population, is generally not interested in this kind of work (even if payments are higher than the national minimum salary).

- *How to enhance the contributions of the actions towards wildfire prevention?*

The main points raised were related to:

- Foster and promote forest products and livestock as a natural, local and sustainable production, highlighting the added value that they have for the maintenance of the territory.
- Making changes in the RDP model to better recognise the contribution of some activities to wildfire prevention, including specific criteria of selection.
- Promoting and increasing the revitalization of local economies and the development of marginal territories, either through ecotourism, recreational activities or new business models.
- Including the fuel treated areas that became resilient to wildfire, as a support infrastructure for the Fire Service in case of wildfire (response phase).

An interesting point highlights the possibility to develop schemes of payments for ecosystem services (wildfire prevention service) since some activities on the territory are contributing to decrease wildfire risk while enhancing and managing biodiversity and priority habitats quality.

Finally, a contribution linked with communication and dissemination actions was mentioned: the dissemination of lessons learnt to replicate useful tools and methods.

- *Do you know good initiatives/best practices linked with wildfire prevention and management? Are these initiatives funded by specific programs, or could they be funded?*

Some of the interviewees mentioned the following initiatives (see more information in the templates. The first three initiative have already been identified and described in Deliverable 4.1.):

- National Electric Network fuel breaks under electric lines in agreement with landowners.
- Operational Group SILVPAST: Promoting grazing for wildfire prevention
- Open2preserve project:Promoting forest management for wildfire prevention and biodiversity conservation.
- Rainfed agriculture (olive groves) around the villages and funded by some Portuguese municipalities.
- R&D Project "Alvares: a case of fire resilience": Started after the severe 2017 fire. The main objective of the study was to propose a set of measures for planning and intensifying forest management, aiming at the future "construction" of a landscape in Alvares less vulnerable to fires. The measures proposed were designed lower the frequency of large fires, to create safer parishes and to improve the local economy, particularly forest profitability of private landowners.
- Project MAQQ: Support mechanism for burning debris and scrubland. The objective is to provide technical support to the community and their burning activities.
- Quinta Lógica (Sistelo): Development project for sustainable management of ecosystems and fire prevention. Within the World Biosphere Reserve Gerês-Xurés (UNESCO), located in the parish of Sistelo, municipality of Arcos de Valdevez, this initiative uses a flock of native goats in extensive grazing and invites people, including people living in the city, to get involved in landscape management, to adopt a goat and to follow the life of the herd from a distance or by visiting the herd.
- Terra Maronesa (Alvão) initiative: A practical community that intends to enhance the habitat of the native "Maronesa" bovine breed, based on a holistic and systemic approach. It also aims to enhance the vast food heritage in its different economic, cultural, social, environmental and touristic aspects.
- Rebanho Casal Novo e Cepos (Arganil): Flock of 150 sapper goats that started after the 2017 fires. Funded by a special fund created after the 2017 fires in Portugal (Fundo Recomeçar, Santa Casa da Misericórdia de Lisboa) and partnered by the Escola Superior Agrária de Coimbra (ESAC – Coimbra Agricultural College). Since this initiative is not focused on production, it is very dependent on funding to keep the activity development.
- Rewilding Portugal: Progressive approach to conservation. The main objective is to let nature take care of itself, enabling natural processes to shape land and sea, repair damaged ecosystems and restore degraded landscapes.

3.2.5 Greece

Interviews description and profile

A total of eight interviews have been done in the case of Greece (Table 4) linked with fuel management programs and wildfire risk management actions (Annex 4).

Among the institutions and initiatives interviewed, there are two NGOs and a public Committee promoting Active prevention actions through fuel management treatments in specific areas. The Management Authority of the Natural Park and the Voluntary Action Team acts in Active prevention, Preparedness, Response and Recovery. Finally, the three Decentralized Administrations are developing Active and Passive prevention, Preparedness and Recovery actions.

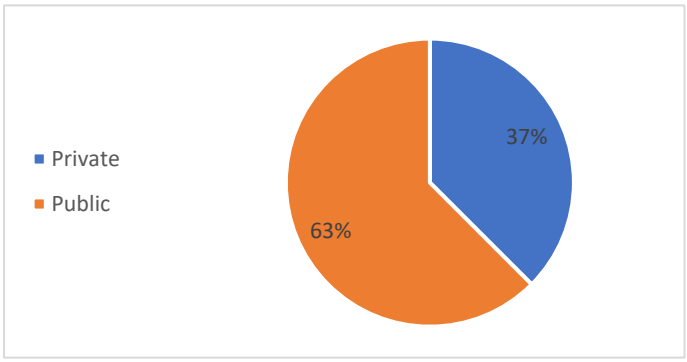
In this case, according to the methodology applied to collect initiatives (see chapter 2, Figure 2) and following the information collected into the Deliverable 4.1, there are no initiatives available for the case of Greece. Only one initiative has been reported through the interviews, but not following the template used during the institution/initiative identification of Task 4.1. Thus, there are no cases selected on the Top 10 and on the documentary since the information available is referred to the interviews.

Table 4. Interviews of fuel and wildfire risk management actions in Greece

Name	Institution/Initiative	Identified in Task 4.1	Territory scale
Chios Voluntary Action Team – Omikron	Institution	Yes	Regional/Sub-Regional
Decentralized Administration Authority of Macedonia and Thrace, Forest Service office (Dasarheio) of Kassandra	Institution	Yes	Regional/Sub-Regional
Decentralized Administration of Attiki, Forest Directorate of Eastern Attiki, Local Forest Service Office of Lavrio	Institution	Yes	Regional/Sub-Regional
Decentralized Administration Authority of Crete, Forest Directorate	Institution	Yes	Regional/Sub-Regional
Management Authority of the National Forest Park of Parnitha	Institution	No	Regional/Sub-Regional
Forest fire prevention actions in Athens outskirts	Initiative	No	Regional/Sub-Regional
Hellenic Society for the Protection of Nature	Institutions	No	Regional/Sub-Regional
Olympia and Bequests Committee	Institution	No	Regional/Sub-Regional

All the interviews are institutions except one initiative. Four of the institutions were previously identified in Deliverable 4.1, while the other three institutions and the initiative are added. Among the interviews, three of them are related to private initiatives or institutions while five are public (Graphic 14).

Graphic 14. Representation of private and public institutions and initiatives in the interviews in Greece



Type of fuel management programs

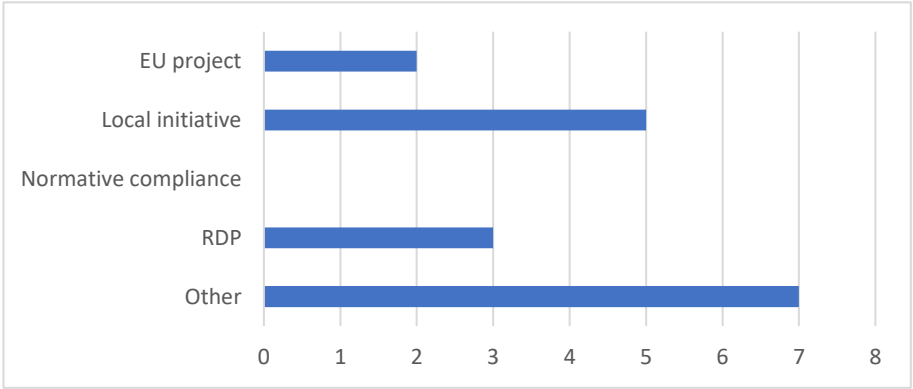
Among the interviews, the program more represented is linked with *Other* fuel management programs category, that was seven times marked. All the interviews, except that one related to the Decentralized Administration Authority of Crete, are related to *Other* category (Graphic 15).

The second category most represented is the *Local initiative*, that was five times marked and is linked with the NGO that works in the island of Kythira, the Authority of the Natural Park, the Voluntary Action Team and the Decentralized Administration of Kassandra.

Third, *RDP* category was three times marked by all the Decentralized Administrations (Kassandra, Lavrio and Crete).

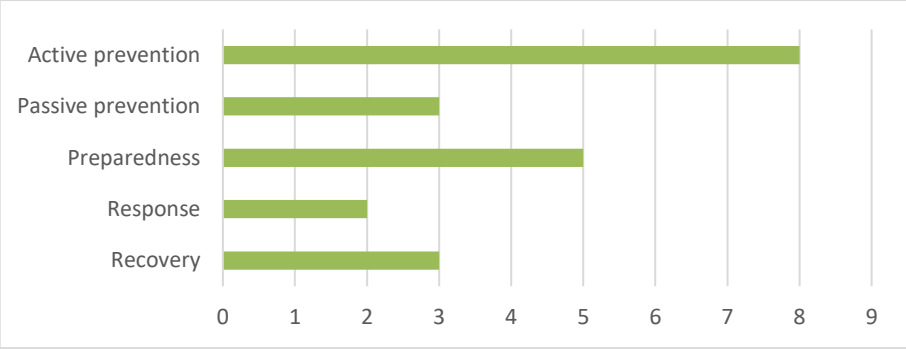
Regarding the *EU project*, was two times marked by the Decentralized Administrations of Kassandra and Lavrio.

Graphic 15. Distribution of fuel management programs and actions covered by the interviews in Greece



All the interviews are related to wildfire prevention through Active prevention (Graphic 16). Then, Preparedness is the second phase most represented and is covered by the Decentralized Administrations (Kassandra, Lavrio and Crete), the Voluntary Team and the National Park Authority. Meanwhile, Passive prevention, Response and Recovery are the DRM phases less represented. In any case, no one interview is representing all the DRM cycle, while three are only covering Active prevention actions.

Graphic 16. Representation of DRM cycle phases in the interviews in Greece



Gap analysis

- *Which are the contributions of the actions to wildfire prevention?*

The general contributions to wildfire prevention are reduction of available fuel load and risk awareness. The main specific contributions mentioned are:

- Development of fuel load treatment actions to reduce fire risk locally.
- Development and maintenance of wildfire prevention infrastructures.
- Recruitment of forest workers to increase the human resources on wildfire prevention.
- Risk awareness through the maintenance of informative posts, informative pamphlets, etc., aiming at the reduction of ignition risk.
- Preparation and implementation of annual Fire Protection Plans that allows to know and coordinate the available fire suppression resources per each municipality.
- Technological support to response.
- Fire protection of public and private forests.
- Reforestation of areas affected by fire.

- *Which are the limitations of the actions?*

The main limitation is related to the available budget to develop the actions in an adequate way. Also, there is the need to increase the human resources to do the wildfire prevention actions.

As a result of it, was highlighted the misguided forest management policy, which focuses on the production of forest (commercial timber). Therefore, that forest lands not producing commercial timber which are at the same time the most vulnerable to fire risk, do not have priority in financing for forest management and protection against fire.

In addition to the lack of adequate economic resources is also mentioned that there are long delays in the financing and in the tender procedures, resulting in the development of actions out of the designed and proper season.

Related to the human resources, it was highlighted the need to have a specialized training in fuel management procedures for the seasonal personnel.

Furthermore, there was a limitation related to the social perception of forest works. In some cases, some stakeholders are against any kind of logging and management work in the forest, since they consider that their interests are affected.

On the other hand, some limitations related to fragmented governmental policies and changes of competences of institutions were also mentioned as a sign of instability to develop and design the actions properly along time.

- *How to enhance the contributions of the actions towards wildfire prevention?*

In the interviews some proposals were raised to enhance wildfire prevention. Main points are related to:

- To design long-term planning based on specific forest fuel maps and hazard, to better guide the annual relevant forest management actions.
- To connect prevention activities with initiatives and guidance from knowledgeable scientists.
- To promote dissemination of knowledge on fire prevention and encouraging social participation to wildfire prevention actions.
- To find other financial resources from public and private sector to ensure the implementation of pre-planned actions.
- To introduce cost-efficiency analysis on the applied measures.
- To promote the cooperation among all responsible services, municipalities or volunteers that have the same objective, avoiding duplicities and increasing efficiency.
- Improving the fire suppression mechanism in order to respond quickly in case of a detected fire.
- Reducing the bureaucratic obstacles and simplifying the procedures for project and employment.
- Promoting prescribed burning as a wildfire prevention action.
- Giving more access priority to the funds to the prevention activities in high forest fire risk areas.
- Updating and preparing regional and local management plans for forest land protection.
- Increasing the available funding for wildfire prevention.
- Investing in and enhancing environmental education.

- *Do you know good initiatives/best practices linked with wildfire prevention and management? Are these initiatives funded by specific programs, or could they be funded?*

Some of the interviews have provide the following initiatives:

- Sensibilization and educational campaign to general public, informing them about prevention measures. This is carried out in coordination and cooperation with the region, the municipality, and other relevant authorities such as the Fire and Forest Services and the OMIKRON Team.
- Specific silvicultural interventions that create fuel breaks in well-chosen locations with parallel appropriate and safe vegetation residues management (fragmentation), is perhaps the best and most immediate management method to reduce wildfire risk. Such actions can be funded both by the state budget (RDP, Green Fund and Regular State Budget) and through European programs (Partnership Agreement for the Development Framework).
- European Forest Fire Monitoring using Information Systems (EFFMIS), that was financed by INTERREC IVC.

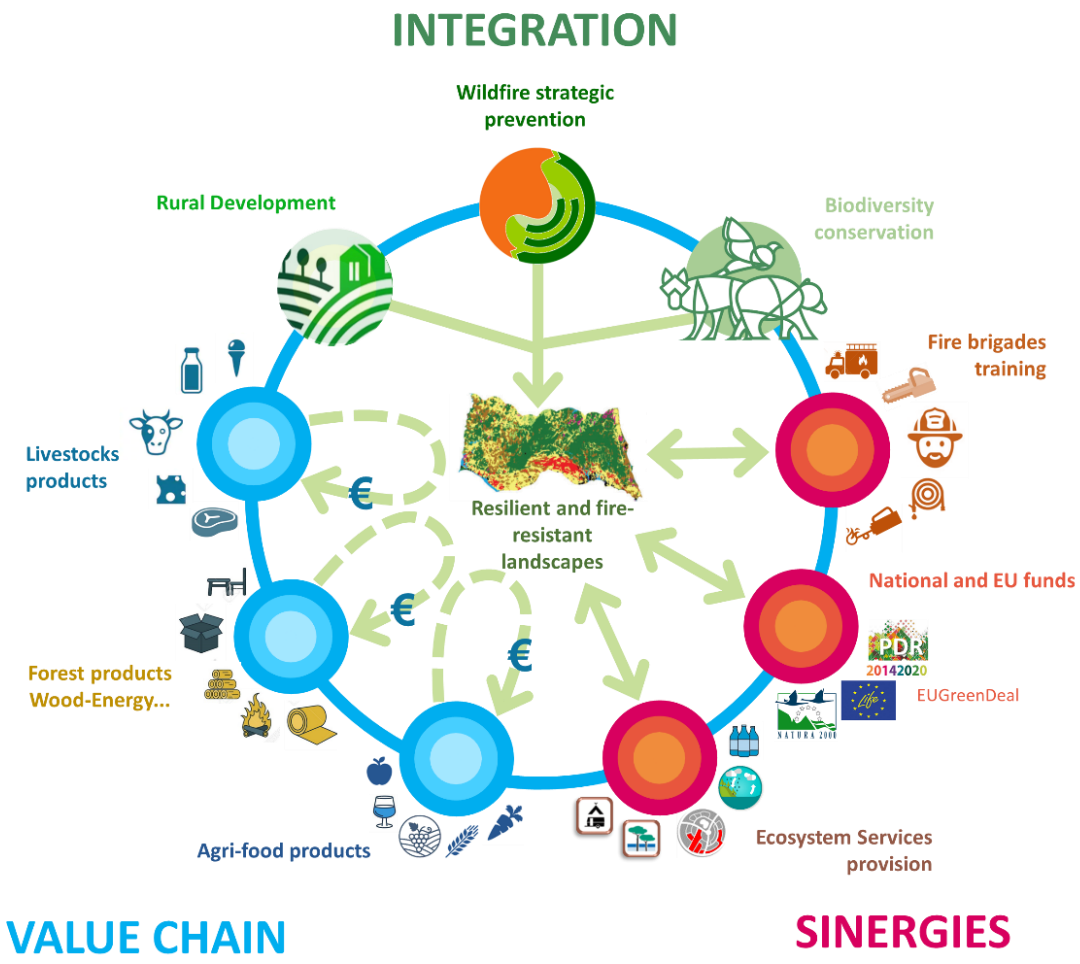
4. Fuel management smart solutions towards fire resilient landscapes

4.1 Defining fuel management smart solution under the PREVAIL Project scope

The initiatives identified and described in *Deliverable 4.1 – Working paper on cases, agencies and actors identified* are the first attempt of **fuel management smart solutions** identification. Within the PREVAIL scope, fuel management smart solutions are defined as practical measures and initiatives implemented in a **sustainable manner**, enhancing **cost-efficiency**, optimizing the **synergies and cooperation** from a multi-objective perspective, able to capitalize the **best existing knowledge** and being permanently updated under a **lessons learnt** approach (Figure 3).

- The **sustainability** is considered ideally in social (acceptability, support or legal soundness), economic (self-financed or as structural investment) and environmental (as proper sustainable development frame as possible) terms.
- **Cost-efficiency** means that to some extent, the cost/benefit ratio or cost-efficiency criteria of the solution has been introduced or considered in its selection, and ideally is followed-up, helping to show the avoided cost of the prevented fires, both in terms of market price and/or environmental and social services.
- The smart solution seeks to optimize the **synergies** among the different DRM cycle phases and the achievement of different objectives or social demands, such as ensuring goods and environmental services provision (landscape beauty, recreation, water provision, wood production, etc.), and the wildfire risk management.
- The smart use of the available resources (usually scarce for so many areas and activities under wildfire risk), normally needs a fluent **cooperation** among the different stakeholders and policies (rural development, bioeconomy, climate change mitigation, spatial and urban planning, etc.) involved, public and/or private ones (e.g., wineries promoting the vineyards as fuel breaks, or the tourist sector assuming partially the costs of the protection activity in front of the fire hazard).
- The initiative should be inspired by the **best existing knowledge** and needs to be based on a consistent policy-science interface where the best and more innovative options are considered. This is perfectly compatible with adapting the empirical knowledge and cultural and traditional management to the current needs.
- The solutions have to be permeable to the **lessons learnt** during their, or other similar initiatives, implementation, integrating not only the achievements but also the failures during their implementation, making them more robust, transferable and, at the same time, sensitive to the local conditions and regional contexts, and taking advantage from other similar experiences.

Figure 3. Smart solutions PREVAIL approach



4.2 Initiatives identified in *Deliverable 4.1 – Working paper on cases, agencies and actors identified*

An integrated analysis of the various initiatives collected across different countries was done.

A total of 32 initiatives have been compiled, including different types of practices, from European projects to strategies at municipality level. According to the diversity of initiatives, different territorial scopes are represented. 18 initiatives at regional/sub-regional level have been identified, 6 at national level, and 8 at international level (Table 5).

Table 5. List of the initiatives related to fuel management smart solutions collected

Initiative	Country	Territorial scope
Training Centre of Toscana	Italy	Regional/Sub-regional
LIFE Granatha	Italy	Regional/Sub-regional
LIFE Elia-Art	International	International
Firefighting training centre of the Piemonte Region	Italy	Regional/Sub-regional
Grazing program for fire hazard abatement through the "Landa Carsica" business network	Italy	Regional/Sub-regional
Biomass production and fire hazard reduction in the Unione Comuni Pratomagno	Italy	Regional/Sub-regional
New Business Models for innovating the cork sector and contrasting cork oak woodland abandonment	Italy	National
LIFE Demogest	Spain	Regional/Sub-regional
Fire flocks program	Spain	Regional/Sub-regional
LIFE Montserrat	Spain	Regional/Sub-regional
Assessment of biomass availability in the municipality of Calonge	Spain	Regional/Sub-regional
GEPRIF Project	Spain	National
Promobiomasse Project	International	International
LIFE Pinassa	Spain	Regional/Sub-regional
Boscos del Vallès (Valles Forest)	Spain	Regional/Sub-regional
Alberapastur Project	International	International
Quality-Suber	Spain	Regional/Sub-regional
Sustainable Forest Management Orientations for Catalonia (ORGEST)	Spain	Regional/Sub-regional
Action areas enlargement of large fires prevention plan of Matadepera municipality	Spain	Regional/Sub-regional
Priority Protection Perimeters for Forest Areas (PPPF)	Spain	Regional/Sub-regional
Cabra serrana nos Baldios da Malcata	Portugal	Regional/Sub-regional
Shephers' School	Portugal	National
Open2preserve Project	International	International
SILVPAST Operational Group	Portugal	National
Forest Management - ACHLI	Portugal	National
Reserva Faia Brava	Portugal	National
Rebanhos da Serra do Açor-Rabadão	Portugal	Regional/Sub-regional
Landscape fire Project	International	International
Resilient forest Project	International	International
LIFETEC Project	International	International
REFOREST Project	International	International
Integrated Fire Prevention Plan - PreFeu initiative Upper Val Susa	Italy	Regional/Sub-regional

4.3 Fuel management smart solutions classification

Having identified a total of 32 initiatives that actually implemented some or all the six criteria of "smart solution" according the PREVAIL definition (see Chapter 4.1), a synthetic framework was developed to assign each initiative with a multi-criterion score of the level of achievement of the smart solution concept (Table 6). The level of implementation of the six criteria (sustainability, cost-efficiency, synergies, cooperation, knowledge and lessons learnt) was scored in a four classes ordinal scale where 0 represents "Not at all", 1 is equal to "Slightly", 2 means "Very" and 3 "Totally".

Based on the total score, all the 32 initiatives were ranked. Table 6 shows the grading achieved by each initiative in each category analysed and the related DRM sub-class.

Table 6. Fuel management smart solutions ordered by score according to smart solution criteria

	Initiative	Sustainability	Cost-efficiency	Synergies	Cooperation	Best existing knowledge	Lessons learnt	TOTAL	DRM sub-classes						
									Active prevention	Passive prev.			Preparedness	Response	Recovery
										Forestry prod.	Mosaic landsc.	Other support			
1	SILVPAST Operational Group	3	2	3	3	2	2	**15**			x	x			
2	Action areas enlargement of large fires prevention plan of Matadepera municipality	3	2	3	3	1	2	**14**	x		x	x	x		
3	LIFE Montserrat	2	3	2	2	3	1	**13**	x		x				
4	Boscos del Vallès (Valles Forest)	3	3	2	2	2	1	**13**	x	x					
5	Open2preserve Project	2	2	3	3	2	1	**13**	x		x	x	x		
6	Grazing program for fire hazard abatement through the "Landa Carsica" business network	3	1	3	3	2	0	**12**	x		x	x	x		
7	Fire flocks program	3	2	3	3	1	0	**12**	x		x	x			
8	Rebanhos da Serra do Açor-Rabadão	3	2	3	3	1	0	**12**	x		x	x	x		x
9	Landscape fire Project	3	1	3	3	2	0	**12**	x		x	x	x		x
10	Firefighting training centre of the Piemonte Region	3	2	3	2	2	0	**12**	x				x	x	
11	LIFE Demorgest	2	2	1	2	3	1	**11**	x	x					
12	Shephers' School	3	0	2	2	3	1	**11**	x		x	x			
13	Resilient forest Project	2	2	2	3	2	0	**11**	x	x	x	x	x		x
14	Integrated Fire Prevention Plan - PreFeu initiative Upper Val Susa	2	2	2	2	3	0	**11**	x	x		x	x	x	
15	LIFE Granatha	3	2	3	1	2	0	**11**	x		x				
16	Biomass production and fire hazard reduction in the Unione Comuni Pratomagno	3	2	2	2	2	0	**11**	x	x			x		
17	GEPRIF Project	2	2	1	1	3	2	**11**	x					x	x

18	Promobiomasse Project	2	1	2	3	3	0	**11**		x				
19	New Business Models for innovating the cork sector and contrasting cork oak woodland abandonment	2	2	3	2	1	0	**10**	x	x			x	
20	Priority Protection Perimeters of Forest Areas (PPPF)	1	2	2	3	2	0	**10**	x		x		x	x
21	Reserva Faia Brava	2	1	2	2	2	1	**10**	x		x	x	x		x
22	Training Centre of Toscana	2	0	3	1	3	1	**10**	x	x		x	x		
23	LIFE Pinassa	2	1	1	2	3	1	**10**	x						
24	Alberapastur Project	2	0	2	3	3	0	**10**			x	x			
25	Quality-Suber	2	1	2	2	3	0	**10**		x					
26	Sustainable Forest Management Orientations for Catalonia (ORGEST)	1	2	2	2	3	0	**10**	x						
27	Cabra serrana nos Baldios da Malcata	2	2	2	2	2	0	**10**	x		x		x		
28	LIFETEC Project	2	0	2	2	4	0	**10**	x				x		
29	REFOREST Project	2	0	2	2	4	0	**10**	x						x
30	LIFE Elia-Art	2	0	3	1	3	0	**9**	x		x				
31	Assessment of biomass availability in the municipality of Calonge	2	1	2	2	2	0	**9**		x					
32	Forest Management - ACHLI	2	0	3	1	3	0	**9**	x		x	x	x		x

Table 7 shows how 18 from 32 initiatives are related to 5/6 smart solutions criteria, while 9 are linked with all the criteria. Finally, 5 initiatives are related to 4/6.

It is possible to observe that the missing criteria on those initiatives with 5 or 4 smart solutions criteria are basically linked with *Lessons learnt* and *Cost-efficiency* (Table 6).

On the other hand, Table 8 shows how the initiatives are distributed according to grading groups, highlighting how most of the initiatives are scored between 9 and 16.

Table 7. Number of smart solution criteria achieved by initiatives

Smart solution criteria[2]	Number of initiatives
6/6	9
5/6	18
4/6	5
3/6	0
2/6	0
1/6	0

[2] Sustainability, Cost-efficiency, Synergies, Cooperation, Best existing knowledge and Lessons learnt.

Table 8. Number of initiatives by grading groups

Grading	Number of initiatives
0 - 8	0
9 – 16	27
17 - 24	5

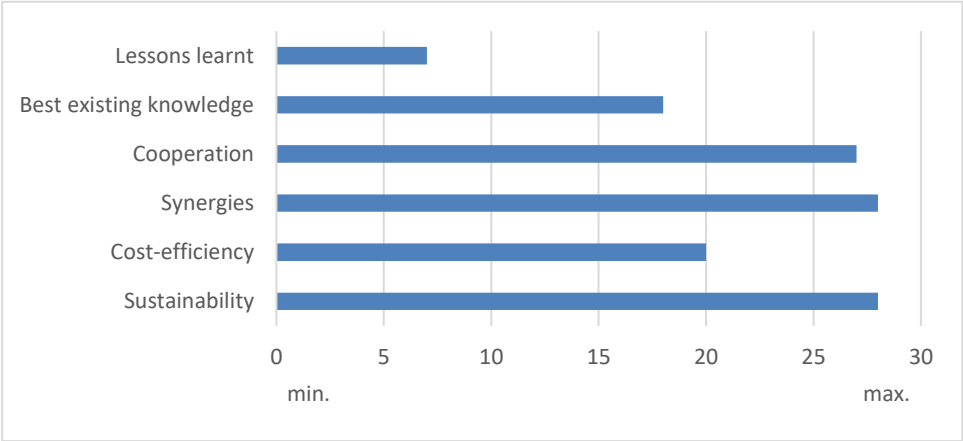
Table 9 shows the 10 initiatives higher grading according to PREVAIL definition (see Chapter 4.1). In the table is possible to see the name and country of the initiative, its territorial scope and their sub-classes into DRM cycle.

Table 9. Top 10 selection of fuel management smart solutions

Initiative	Country	Territorial scope	Classes into DRM cycle
SILVPAST Operational Group	Portugal	National	- Passive prevention: Maintenance of mosaic landscape and grazing, and Other support to rural development
Action areas enlargement of large fires prevention plan of Matadepera municipality	Spain	Regional/Sub-regional	- Active prevention - Passive prevention: Maintenance of mosaic landscape and grazing, and Other support to rural development - Preparedness
LIFE Montserrat	Spain	Regional/Sub-regional	- Active prevention - Passive prevention: Maintenance of mosaic landscape and grazing
Boscos del Vallès (Valles Forests)	Spain	Regional/Sub-regional	- Active prevention - Passive prevention: Forestry production
Open2preserve Project	International	International	- Active prevention - Passive prevention: Maintenance of mosaic landscape and grazing, and Other support to rural development - Preparedness
Grazing program for fire hazard abatement through the “Landa Carsica” business network	Italy	Regional/Sub-regional	- Active prevention - Passive prevention: Maintenance of mosaic landscape and grazing, and Other support to rural development - Preparedness
Fire flocks program	Spain	Regional/Sub-regional	- Passive prevention: Maintenance of mosaic landscape and grazing, and Other support to rural development
Rebanhos da Serra do Açor-Rabadão	Portugal	Regional/Sub-regional	- Active prevention - Passive prevention: Maintenance of mosaic landscape and grazing, and Other support to rural development - Preparedness - Recovery
Landscape fire Project	International	International	- Active prevention - Passive prevention: Maintenance of mosaic landscape and grazing, and Other support to rural development - Preparedness
Firefighting training centre of the Piemonte Region	Italy	Regional/Sub-regional	- Active prevention - Preparedness - Response

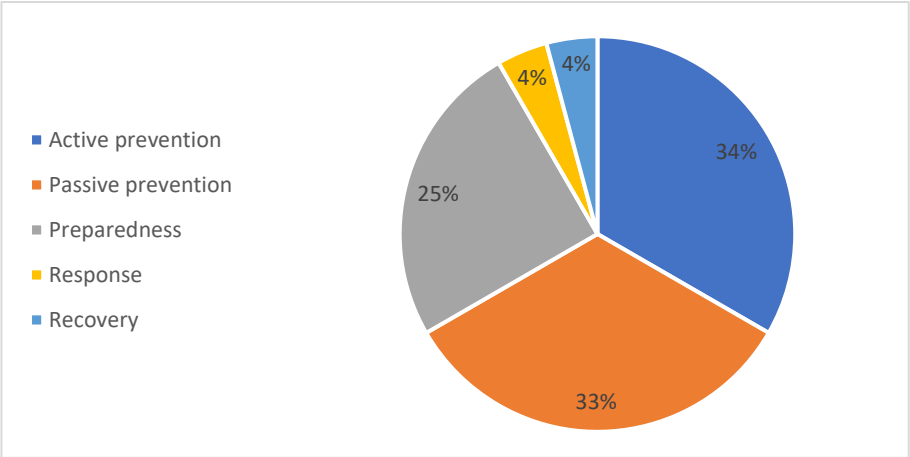
The Graphic 17 highlights how Cooperation, Sustainability and Synergies are the most represented criteria within selected fuel management smart solution initiatives. In parallel, the Lessons learnt process is the less represented. Consequently, some initiatives do not have lessons learnt process, and those that have it, it is at lower level (scored 0 or 1).

Graphic 17. Distribution of smart solution criteria in the initiatives of the Top 10 selection



The selected smart solutions are representing different types of initiative since some of them are EU projects or regional initiatives or are more focused on Response or Prevention. Specifically, the selected smart solutions are representing the whole DRM cycle (Graphic 18) being Active and Passive prevention the phases most represented (67%).

Graphic 18. Distribution of DRM cycle phases among smart solutions Top 10 selection



Active and Passive prevention are part of all the initiatives selected since the decrease of wildfire risk through the reduction of fuel load (by mechanical machines, prescribed burning, grazing or other techniques) is a common objective. In some initiatives it is the central objective (Fire flocks program, LIFE Montserrat, Valles Forests, Open2preserve Project, Fire-fighting training centre of Piomente Region, Action areas enlargement of Matadepera and Landscape Fire Project), and in other initiatives it is a secondary objective (SILVPAST Operational Group and Rebanhos da Serra do Açor- Rabadão).

Then, Preparedness is the second phase most represented (25%) since 6 smart solutions have actions related to the preparation of exposed population and services to manage potential emergencies, as the Fire-fighting Centre of Piemonte Region or the Open2preserve project, including trainings to forest workers.

Finally, Response and Recovery are the less represented, only present in the Fire-fighting Centre of Piemonte Region as a smart solution that participates in Response, and the Rebanhos da Serra do Açor-Rabadão, which includes Recovery actions.

Description of fuel management implemented at Top 10 selected smart solutions

1. SILVPAST Operational Group	TOTAL	Sustainability	Cost-efficiency	Synergies	Cooperation	Best existing knowledge	Lessons learnt
	15	3	2	3	3	2	2

The Operational Group SILVPAST is funded by the European Structural Funds for Investment (FEEI) under Action 1.1 "Operational Groups" of RDP 2020. The promotors bring together companies involved in animal husbandry and forestry, associations of forest producers and of nature conservation, and research teams.

SILVPAST have proposed a silvo-pastoral model supported by planning and management tools developed, which aim to address the current lack of cost-efficient management alternatives in some regions and to promote economic viability through greater multi-functionality and resilience including two target levels of interventions: (1) the farm or property level, where the main actors are the forest owners and managers, and (2) the territorial management level where the main actors are the policy makers, form the local to the national level. This is in coherence with the Cooperation characteristic that is part of PREVAIL smart solution definition.

The main objectives of the smart solution are to test a cost-efficient production process that enables silvo-pastoral activity that guarantees its long-term sustainability; to deliver methods and tools for the replication of proposed processes; to support decision-making, and the evaluation and design of agri-environmental policy; to promote the restoration of a specific forests; to contribute to control the wildfire risk; and to strengthen territorial resilience to environmental and socio-economic changes. This is in coherence with the Synergy, Cost-efficiency and Sustainability characteristics that are part of PREVAIL smart solution definition.

2. Action areas enlargement of large fires prevention plan of Matadepera municipality	**TOTAL**	Sustainability	Cost-efficiency	Synergies	Cooperation	Best existing knowledge	Lessons learnt
	14	3	2	3	3	1	2

This smart solution is promoted by public and private funds, and the stakeholders involved are the Municipality, Forest Owners, the Natural Park Authority, the General Directorate of Environment of the Government of Catalonia and shepherds. This is in coherence with the Cooperation characteristic that is part of PREVAIL smart solution definition.

The project has proposed to enlarge to a supra-municipal scale to improve the efficiency and effectiveness in the emergency management by large forest fires in these areas where wildfire prevention actions were developed. Thus, designing and developing the wildfire prevention infrastructures in a territorial (and no administrative) perspective. This is in coherence with the Cost-efficiency and Lessons learnt characteristics that are part of PREVAIL smart solution definition.

The actions are developed by the recovery of extensive grazing of sheep and goats for the maintenance through a specific contract with the cattle ranchers, which was an opportunity to comply with two objectives at the same time: (1) recovery of the traditional grazing on the territory and (2) maintenance of the infrastructures with less mechanical work (cost-efficient). With these cattle, it is stablished a proximity market line that is selling the product. This is in coherence with the Cost-efficiency, Sustainability and Synergies characteristics that are part of PREVAIL smart solution definition.

3. LIFE Montserrat	**TOTAL**	Sustainability	Cost-efficiency	Synergies	Cooperation	Best existing knowledge	Lessons learnt
	13	2	3	2	2	3	1

LIFE Montserrat is a co-funded EU project promoted by diverse Regional administrations, a Forest Owners association, and a Private foundation.

The main objective of the project is to (1) develop ecosystem-based measures to increase resilience and stability of forest against fires, (2) contribute to biodiversity conservation and improvement in the Montserrat area, with habitats and species of high conservation value included in the Birds and Habitats Directives and (3) conserve the biodiversity by increasing connectivity through the creation of a mosaic of scrub, natural grasslands and forests that will link two Natura 2000 sites. This is in coherence with Synergies and Sustainability characteristics that are part of PREVAIL smart solution definition.

The project presents the grazing and prescribed burning as effective methods to develop wildfire prevention actions. The capacity of the two methods to effectively control fuel load is supported by scientific evidence. This is in coherence with Cost-efficiency, Best existing knowledge and Lessons learnt characteristics that are part of PREVAIL smart solution definition.

4. Boscos del Vallès (Valles Forests)	TOTAL	Sustainability	Cost-efficiency	Synergies	Cooperation	Best existing knowledge	Lessons learnt
	13	3	3	2	2	2	1

The smart solution Valles Forests is a local initiative promoted by a local administration as a public biomass service, and different actors are involved: Sub-regional authority, municipalities, Government f Catalonia, Province Authority of Barcelona, Forest Defence Aggrupation, Forest owners, large consumers of biomass (hospitals, etc.), forest research centres, etc. This is in coherence with Cooperation and Best existing knowledge characteristics of smart solutions PREVAIL definition.

The project is an innovative initiative that brings a new approach to the wildfire prevention. It is based on the structuring of biomass buying-selling market to achieve a good forest management, protecting from fires at the same time, which brings an economic revitalization of the forest sector and the generation of proximity energy. This is in coherence with Synergy and Sustainability characteristics of smart solutions PREVAIL definition.

This is an innovative project in Catalonia because it works with wildfire prevention through biomass valorisation, and also because the dub-regional public authority has created its own competence energy to the different public facilities. This is in coherence with Sustainability and Cost-efficiency characteristics of smart solutions PREVAIL definition.

5. Open2preserve project	TOTAL	Sustainability	Cost-efficiency	Synergies	Cooperation	Best existing knowledge	Lessons learnt
	13	2	2	3	3	2	1

This smart solution is a co-funded EU project promoted by partners from different regions and external experts, managers and researchers who will approach the issue from different points of view. Beneficiary partners add knowledge in scientific and technical fields (technical fire, grazing management, environmental monitoring, IT tools, economic studies, new product development). This is in coherence with Cooperation characteristic.

The main objective of the project is to connect interdisciplinary scientific knowledge with technology and practical operation in order to implement and assess combined techniques that guarantee the preservation of the ecosystem services linked to open spaces with high natural value. This is in coherence with Synergy and Best existing knowledge characteristics.

The project has different regional pilot experiences based on the combination of guided herbivory and initial techniques to reduce fuel through controlled burns. All the experiences seek to offer innovative solutions that guarantee the economic feasibility of the commitment and can serve as an example and training for the execution of similar initiatives at local and regional level. This is in coherence with Sustainability and Cost-efficiency characteristics.

6. Grazing program for fire hazard abatement through the "Landa Carsica" business network	TOTAL	Sustainability	Cost-efficiency	Synergies	Cooperation	Best existing knowledge	Lessons learnt
	12	3	1	3	3	2	0

The smart solution is promoted by the Friuli Venezia Giulia Region, in the north-east Italy where a grazing program was started in 2013 with the aim of reducing the fire hazard in high wildfire risk areas. The program aims at reducing fuel load by grazing in strategic areas while sustaining intervention by activating a value chain of meat products. This is in coherence with Synergy and Sustainability characteristics of smart solution PREVAIL definition.

The program includes the temporary use of private lands for 5 years (after notification to private owners) in those areas previously identified as strategic for fire hazard abatement according to a Regional Law. A business network called "Landa Carsica" between local farmers was created to reach consistent company size in order to gain access to RDP funds. In this way, economical sustainability of the program is guaranteed by gaining access to specific RDP measures. This is in coherence with Cooperation characteristic of smart solution PREVAIL definition.

7. Fire flocks program	TOTAL	Sustainability	Cost-efficiency	Synergies	Cooperation	Best existing knowledge	Lessons learnt
	12	3	2	3	3	1	0

Fire flocks program is a public-private initiative promoted by agents interested in the continuity of silvopastoralism, by aligning their various needs and articulating a production and consumption chain of food products from herds with the added value of decreasing fire risk in woodlands with a strategic role in the propagation of wildfires, as determined by Catalan Fire Service and the Ministry of Agriculture of the Government of Catalonia, who are partners of the program. This is linked with Cooperation and Synergies characteristics of smart solution definition.

The specific added value of this initiative is to strengthen the links between wildfire management services, farmers, local butchers and restaurants. The initiative works in adding value to the products of the participating farmers, through a label that certifies the herds' fire risk management tasks. Customers will thereby know that eating Ramats de Foc products delivers societal benefits; it will also maintain local extensive livestock farming and preserve forests. This is linked with Sustainability and Cost-efficient characteristics of smart solution definition.

8. Rebanhos da Serra do Açor-Rabadão	TOTAL	Sustainability	Cost-efficiency	Synergies	Cooperation	Best existing knowledge	Lessons learnt
	12	3	2	3	3	1	0

This smart solution is a private initiative of a couple that rented a communal land to raise goats and, produce dairy products, in order to maintain the primary firebreaks network, with the ultimate goal of being a living and practical experience of sustainability and integration with the environment. The initiative has a structure based on (1) environment, (2) fire management and (3) forestry production. This is linked with Sustainability and Synergy characteristics of smart solution definition.

It has shown forestry producers profitable options for maintaining the forest and the firebreaks in eucalyptus and conifers plantations. It has also shown the benefits of integrating pastures (irrigated and non-irrigated) to have high quality forestry production.

The academic field is represented in the project by helping to think and define how to improve the agricultural and forest holdings, contributing to the local development. The project also shows to the community a profitable alternative to fuel management mechanical treatments. The interaction with community and the pedagogical perspective is developed through visits, collaboration with municipality and workshops with interested entities and general public as local community. This is in coherence with Cooperation, Best existing Knowledge and Lessons learnt characteristics.

9. Landscape fire Project	TOTAL	Sustainability	Cost-efficiency	Synergies	Cooperation	Best existing knowledge	Lessons learnt
	12	3	1	3	3	2	0

The smart solution is a co-funded EU project promoted by regional authorities, research institutes from Portugal and Spain.

The main objective of the project is to develop and effective procedure for fire prevention in specific regions of Portugal and Spain. The project will carry out a series of pilot actions, based on a methodology successfully implemented in other regions of Spain.

The methodology mentioned combines prescribed fires and grazing techniques to reduce forest fuel, converting fire-prone forests into more resilient areas.

The smart solution will contribute to a range of EU policy and legislation as the forest strategy, roadmap to a resource efficient Europe, circular economy action plan, thematic strategy for soil protection, biodiversity strategy and, habitats and birds Directives.

The initiative is linked with Best existing knowledge, Synergy, Cooperation, Sustainability and Cost-efficiency characteristics of smart solution definition.

10. Firefighting training Centre of the Piemonte Region	TOTAL	Sustainability	Cost-efficiency	Synergies	Cooperation	Best existing knowledge	Lessons learnt
	12	3	2	3	2	2	0

This smart solution is a private-public initiative promoted by Piemonte regional authority, a private enterprise, and a Fire brigades volunteers.

The smart solution facility is a training centre of fire fighters of the Piemonte Region, which was created in 2014 with the aim of training volunteer fire brigades in firefighting and prescribed burning techniques. Recently, the training program used a strategic fuel management site close to the centre to train fire personnel. The strategic area divides two alpine valleys characterized by relatively flammable mixed broadleaved-coniferous forests and consists in a fuel break of 200 m width and 1.5 km length. The site is also grazed, and consequently, prescribed burning treatments implemented for training achieve multiple goals related to active fire prevention and grazing management.

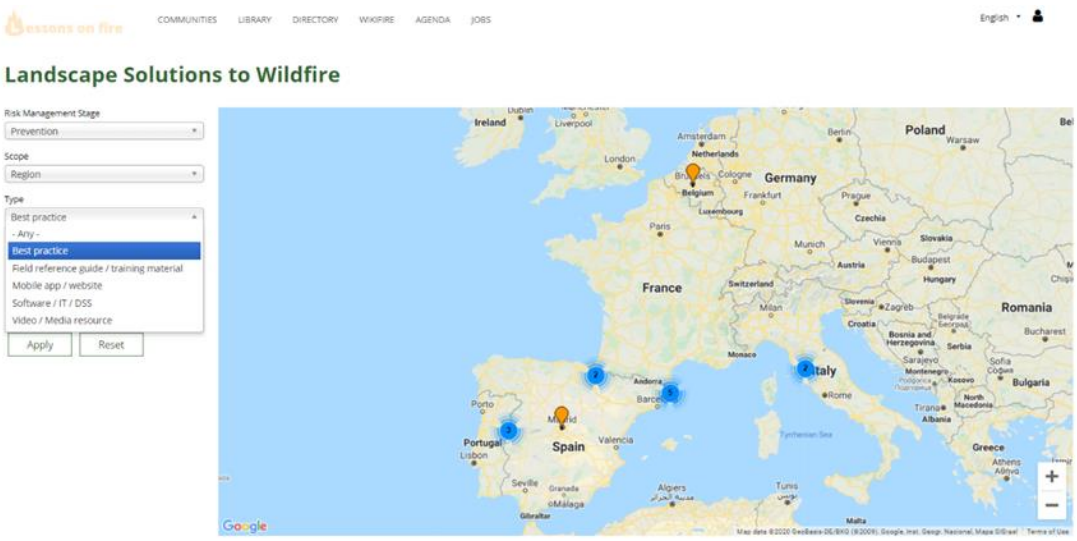
According to this, the program is basically linked with Synergy, Cooperation and Best existing knowledge characteristics of smart solution definition.

4.4 Fuel management smart solutions dissemination

The PREVAIL communication strategy includes some actions to promote “smart solutions”. Among these actions, the fuel management initiatives collected will be disseminated through three different channels, following the objectives of *Work package 6 – Communication*, described in the *Deliverable 6.1 – Communication strategy*.

On one hand, in order to promote the concept of smart-solution proposed in the PREVAIL project and establish a network with other relevant on-going projects dealing with best-practices inventory, and actors interested, the total of initiatives collected (Table 5) will be disseminated through two different online platforms: GoProFor Life Project, and the Lessons on Fire (Figure 4). In both platforms the information about the 32 initiatives collected will be available. Thus, the dissemination does not include a smart solution selection.

Figure 4. Screenshot of the smart solutions section (beta version) in Lessons on Fire platform



On the other hand, in order to communicate the concept of smart-solution for wildfire prevention to a wider audience, some of the smart solutions collected will be included in a documentary showing different experiences in Italy, Portugal and Catalonia (NW Spain) (Table 10).

In this case, the documentary includes a smart solution selection linked with the following criteria:

- Territorial distribution: to represent different territories where wildfire prevention actions are developed (e.g., peri-urban areas, rural and mountainous areas, etc.).
- Type of fuel management action: to represent different experiences and initiatives that promote wildfire prevention actions (e.g., biomass production, grazing, etc.).
- Promoter: to represent both private and public initiatives.

Table 10 shows the experiences collected for the documentary:

Table 10. Cases included on the documentary to promote "smart solutions"

Initiative	Country
LIFE Granatha	Italy
Training Centre of Toscana	Italy
Grazing program for fire hazard abatement through the "Landa Carsica" business network	Italy
Priority Protection Perimeters for Forest Areas (PPPF) with vineyards	Spain
Boscos del Vallès (Valles Forests)	Spain
Fire flocks program	Spain
Forest management - ACHLI	Portugal
Raizes IN (GIFF)	Portugal
Rede Energética Nacional (REN)	Portugal

To know more about the fuel management smart solutions dissemination, see chapter 3.2 of *Deliverable 6.1 – Communication strategy.*

5. Final remarks

- In general terms, the analysis of the interviews shows how current wildfire prevention and fuel management programs and initiatives applied in Italy, Catalonia (NW Spain), Portugal and Greece have common elements and follow a similar scheme of forest and risk management strategies involving:
  - fuel reduction strategically planned (through prescribed burning, logging and thinning, developing prevention infrastructures, reduction of fuel around WUI and isolated buildings and grazing),
  - risk awareness (communication actions to society, environmental education, control of ignitions, etc. Social recognition of forest and fuel management contribution to risk mitigation should be enhanced),
  - non-wood and wood forest products production in public and private forests as well as maintenance of landscape mosaic which contributes to the reduction of fuel loads and fire spread potential.

- Common limitations of the current fuel and wildfire management programs were identified in all countries. They are structural limitations, impeding to cover properly the territorial needs regarding wildfire risk management, as follow:
  - the available budget to implement the actions designed,
  - the lack of human resources and social capital in marginalised rural areas,
  - the non-economic feasibility/profitability of forest/rural activities and,
  - excessive bureaucracy processes to implement the programs, adding operational difficulties such us disfunctions between the request and implementation calendar, delays, complex administrative management linked to subsides use in conflict with low social capital in rural areas, etc.

- According to the interviews, private property is often perceived as a difficulty to implement the wildfire prevention actions since, generally, a specific notification and authorization of the landowner is needed. This may imply longer bureaucratic processes, especially in poor managed forest lands (which commonly are at higher wildfire risk) where forest owners are less active or involved with the property. This makes necessary to develop legal instruments and protocols that facilitate the implementation of prevention actions, at least, as a public interest action.

- Several challenges were identified in terms of risk governance to enhance the fuel management actions towards wildfire prevention as follow:
  - To carry out inclusive risk assessment and planning, involving exposed population and local stakeholders related with the increase (activities in forest lands) and mitigate (agriculture, forestry, etc.) wildfire risk from the initial stages of the planning process. By this way, risk awareness, and collaborative cost-efficient and synergic risk management schemes (even

involving them in sharing the expenses of the risk mitigation measures) may be achieved easily. A related constrain to this point is that in many cases public services do not have the corresponding capabilities in participatory processes or enough resources to cover this. Moreover, in some cases this participation is perceived as something that will delay the planning process, although is highlighted at the same time how ensuring stakeholders engagement facilitates the further implementation of the agreed planned actions.

- Promote join forest management planning to face forest ownership fragmentation, giving more coherence to wildfire risk assessment and planning according to physical criteria versus administrative limits, motivating the engagement of more forest owners and, doing a most efficient use of the limited available resources.
- Promote the coordination and cooperation of all public agencies related with wildfire risk management from a holistic approach, from those participation on Active but also Passive prevention, to those generating/mitigating exposition and vulnerability (e.g., urban planning).
- According to the challenges regarding wildfire risk management at landscape level, promote long-term planning, which do not normally fit into the short-term vision of the policy-cycle.
- Transfer cost of fuel management and wildfire prevention among public agencies dealing with wildfire risk management, for instance:
    - Allocating the cost of implementation of Strategic Management Points for supporting suppression into Fire Service (including the process of Environmental Impact Assessment process), allowing more resources for Forest Service to conduct active forest management at landscape level.
    - Allocating WUI and other critical infrastructures protection to Urban and Territory planning department, which should assume the need of mitigating the risk of the exposed/vulnerable elements into the planning process and along the urban project implementation.
    - Those in charge of the road network should assume the protection of this infrastructures and their adaptation to be used as prevention infrastructure and safety evacuation/confinement facilities.
    - Promote the involvement of private actors in self-protection initiative as a condition to carry out their economic activities in areas at risk, for instance, asking the tourist sector for prevention and preparedness actions to ensure the civil protection of users in case of wildfire.

- Limited budget resources were highlighted in all cases as a very prominent deficiency. During the planning design process, thus, in the territorial diagnosis to wildfire risk management, it normally emerges a prevention management need that it is not possible to cover with the available budget resources. Consequently, it is necessary to prioritize the actions to be developed, and significant portion of actions needed are never implemented (generating frustration among risk planners). It has been stated the need of mobilising additional funds should be created.

- On that sense, it has been stated how normally forest policy support the existing active forest management, which normally in the Mediterranean works in the most profitable lands which less wildfire risk. On the contrary, most of high risk abandoned forest lands do not have access to RDP measures. For this reason, new mechanisms and additional resources should be created to be able to carry out fuel treatments in those forest lands without commercial opportunities.

- As a new source of incomes, the recognition and identification of the wildfire prevention actions as an ecosystem service (regulation) could help to develop schemes of Payment for Ecosystem Services, and to highlight the importance of risk management to preserve the forests, as a way to maintain their basic ecosystem services (biodiversity, soil erosion, water availability, carbon fixation, protection of multi-risk situations as avalanche or floods, etc.). This ecosystem service should be actively promoted and incudes into the Civil Protection policies, as an indispensable tool to ensure resilient and resistant landscapes able to protect people and infrastructures in front of the wildfire impacts.

- Following the above mentioned, Passive prevention actions where the fire prevention results as an environmental service due to the positive contribution of these activities on the fuel removal, or maintaining the economy, infrastructures, and societal development in remote rural areas, are essential to have a resilient territory. Thus, initiatives and policies that promotes the development of rural areas to counteract depopulation are also related and contributing the wildfire risk reduction.

- It was highlighted how some specific wildfire prevention measures (e.g., prescribed burning) although well-defined, tested and justified at scientific level, require enabling conditions e.g., to overcome current barriers (bureaucracy burdens, lack of professional competencies to do it, etc.) that do not make it an operational practice.

- The initiatives have been scored following (1) their Sustainability in social, environmental and economic terms; (2) their Cost-efficiency criteria that helps to show the avoided costs of prevented fires; (3) their Synergies among the different DRM cycle phases; (4) their Cooperation among different stakeholders; (5) their integration of the Best existing knowledge and; (6) their integration of Lessons learnt during its implementation. According to this, initiatives related to Prevention and Preparedness actions are the most represented as a fuel and wildfire management smart solutions, where Cooperation, Synergy and Sustainability principles are the most covered. In parallel, Cost-efficiency, Best existing knowledge and Lessons learnt criteria are the less represented (Graphic 17).

- These top 10 smart solutions show how EU projects have a contribution in providing innovation and transferability among regions under a common challenge. The variety of smart solutions also indicates the wide range of proposals related to wildfire risk management, which is consistent with the complexity, cross-sectoral and spatial and temporal extension of the phenomenon.

ANNEXES

Annex 1. Interviews related to initiatives/institutions from Italy

4.2 Fuel management smart solutions assessment - **INTERVIEW**					
Basic information		ID_INit		ID_INST	1
Initiative/Solution	Fire Management training centre of the Toscana Region				
Institution	Regione Toscana / D.R.E.am Italia				
Personal data	Not publishable				
General description					
Fuel management programs					
☐ EU projects ☒ Local/regional initiatives ☒ Normative compliance ☐ RDP ☐ Other	**Details** Regional budget of the fire management system invested in prescribed burning and tactical fire training of fire-fighters of the Regione Toscana LR 39/2000 – Legge Forestale della regione Toscana LR 11/2018 - Disposizioni in materia di gestione attiva del bosco e di prevenzione degli incendi boschivi. Modifiche alla l.r. 39/2000				
Measures and indicators					
Measures: fuel management by prescribed burning and mechanical treatments (variable retention; mastication) for a buffer of 100 m around the training centre and along fuel breaks in strategic areas to increase fire-fighting security and effectiveness in the surrounding highly flammable Mediterranean pine forests. Interventions goals are to train fire-fighters of the Regione Toscana to fire use techniques (prescribed burning; tactical fire) and to the use of machinery for fuel removal in forested areas, while reducing fire hazard at wildland-urban interface of the training centre with the forest. Interventions integrate criteria related to habitat conservation (e.g., 4030, target avian species) and criteria related to local wood market of biomass for energy and heat production. **Indicators:** the project adopts training and fuel reduction indicators. Training indicators are: number of courses carried out; number of trained personnel; evaluation of learning; number of prescribed burning intervention planned and carried out in the Toscana Region. Fuel reduction indicators are assessed at the stand scale only: i) shrub cover and height reduction; ii) mortality of the overstory.					
Gap analysis (open questions)					
Which are the contributions of the actions to wildfire prevention? (related to achievements)					
Interventions carried out at the training centre contribute to fire prevention in three different ways: 1. Prescribed burning and mastication interventions are carried within the frame of the "Regione Toscana fire-fighting training program" thus contributing to increase expertise among fire professionals. In addition the training centre often host national and international meetings representing a model on how to plan and implement fuel management for fire hazard reduction. 2. Reduce fire risk at the wildland urban interface of the training centre protecting a strategic asset of the fire management system of the Regione Toscana. 3. Reduce landscape scale flammability by biomass removal along fuel breaks in the are increasing fire-fighting operation security and effectiveness in the area.					

Which are the limitations of the actions? (related to gaps/challenges)
Limitations to the training program and related fuel management interventions is mainly due to structural limits of fire professional employment in the Toscana Region with a personnel population (workers; technicians) which is gradually aging with low rates of generational change. In addition, aged fire-fighters generally might have lower attitude in acquiring expertise on firing techniques since for large part of their career in the fire management system they have not trusted firing techniques in fire prevention and fire fighting since this has been a general assumptions up to recent times.
How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)
An increased investment in new and young fire personnel into the forest and fire management system to be trained according to new concepts of integrated fire management relying on fuel management and fire uses as a major strategy to mitigate wildfire impacts in changing landscape and climate.
Do you know good initiatives/best practices linked with wildfire prevention and management? Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)
Other questions/comments/contributions

4.2 Fuel management smart solutions assessment - **INTERVIEW**					
Basic information		ID_INit		ID_INST	2
Initiative/Solution	Life Granatha "GRowing AviaN in Apennine's Tuscany HeathlAnds" (Life_15_NAT/IT/000837)				
Institution	D.R.E.Am Italia				
Personal data	Not publishable				
General description					
Fuel management programs					
☒ EU projects ☐ Local/regional initiatives ☒ Normative compliance ☐ RDP ☐ Other	**Details** EU Life Program - Life Granatha (Life_15_NAT/IT/000837) Nature 2000 regulation: i.e. fuel management impact assessment on target species				
Measures and indicators					
Measures: fuel management by mechanical treatments and prescribed burning which spatial distribution accounts for both strategic fire hazard reduction, intervention costs abatement and habitat conservation for avian species included in EU Directive 2009/147 EC. Interventions goals are to reduce flammable fuels along fuel breaks and in blocks, restore habitat for a number of target avian species by reducing tree encroachment and increasing shrubland structural diversity at both the stand and landscape scale, extract valuable material for the production of bio-brooms destined to Urban cleaning services. **Indicators:** the project adopts fuel reduction, ecological and economical indicators. Fuel reduction indicators are assessed at both stand and landscape scale: i) stand: shrub cover and height reduction; ii) landscape: percentage of area treated; iii) width of fuel breaks. Ecological indicators: i) abundance on *Carabidae* insects; ii) tree basal area reduction; iii) abundance of avian target species; iv) land use dynamics and landscape heterogeneity metrics. Economical indicators: i) biomass to be destined to broom production; ii) number of brooms produced; iii) number of brooms placed on the market.					

Gap analysis (open questions)
Which are the contributions of the actions to wildfire prevention? (related to achievements)
Interventions carried out in LifeGranatha contribute to fire prevention in three different ways: 4. Reduce landscape scale flammability by biomass removal in strategic areas increasing fire-fighting operation security and effectiveness in the area; 5. Prescribed burning interventions are carried out in collaboration with the "Regione Toscana prescribed burning training program" thus contributing to increase expertise among fire professionals; 6. The value chain of bio-brooms production increases economical interest on the area with indirect effect on land control and care with positive cascading effects on wildfire prevention.
Which are the limitations of the actions? (related to gaps/challenges)
The major challenges are: 1. Involve private owners and convince them to contribute with their land to extend the management program to a critical surface meaningful for wildfire prevention and habitat conservation; 2. To achieve economical sustainability of broom production by correct marketing actions 3. Communicating the use of prescribed burning for fire prevention and habitat conservation 4. To implement the prescribed burning plan because of uncertain climate variability
How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)
Increased involvement of land owners by specific regulations addressing a number of aspects: i) recognition of private owners responsibility in increasing landscape flammability as a consequence of mismanagement; ii) incentives for land aggregation and collaborative management; iii) initial additional incentives for starting and maintaining the production of bio-brooms.
Do you know good initiatives/best practices linked with wildfire prevention and management? **Are these initiatives funded by specific programs, or could it be funded?** (related to the identification of smart solutions)
Open2preserve – MODELO DE GESTIÓN SOSTENIBLE PARA LA PRESERVACION DE ESPACIOS ABIERTOS DE MONTAÑA Web site: https://interreg-sudoe.eu/prt/projetos/os-projectos-aprovados/183-modelo-de-gestion-sostenible-para-la-preservacion-de-espacios-abiertos-de-montana
Other questions/comments/contributions

***4.2 Fuel management smart solutions assessment* - INTERVIEW**					
Basic information		ID_INit		ID_INST	3
Initiative/Solution	Fire Fighting training centre of the Piemonte Region				
Institution	Regione Piemonte / Formont				
Personal data	Not publishable				
General description					
Fuel management programs					
	Details				

☐ EU projects ☒ Local/regional initiatives ☒ Normative compliance ☐ RDP ☐ Other	Regional Law 15/2018 "Norme di attuazione della legge 21 novembre 2000, n. 353 (Legge quadro in materia di incendi boschivi)" on the fire management system in the Piemonte Region attributes to the Fire Fighting Volunteer Corp specific roles in the prevention and fire fighting operations (art. 3), including the implementation of prescribed burning projects or plans for fire hazard reduction in the Region. It defines also the training standards and budget for financing the training of volunteers at the Peveragno training centre.

Measures and indicators

Measures: fuel management by prescribed burning along a fuel break in a strategic area between two large alpine valleys to increase fire-fighting security and effectiveness in stopping wildfires moving from one valley to the other. Interventions goals are to train volunteers fire-fighters of the Regione Piemonte to fire use techniques (prescribed burning; tactical fire) while reducing fire hazard. Burn interventions have benefits also for pastoral activity in the area, since the fuelbreak is used to move cows from the valley to mountain pastures in summer, and for touristic activities since in winter the area is used for sky activities that need low shrub and tree encroachment.

Indicators: training and fuel reduction indicators are used. Training indicators are: number of courses carried out; number of trained personnel; evaluation of learning. Fuel reduction indicators are measured at the stand scale only by assessing grass and shrub cover reduction.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

The strategic area divides two alpine valleys characterized by relatively flammable mixed broadleaved-coniferous forests, and consists in a fuel break 200 m large and 1.5 km long. The fuelbreak has suitable characteristics to increase fire-fighting security and effectiveness. The training program increase fire use knowledge among fire-fighting volunteers in the Region improving the suppression capacity with tactical fires.

Which are the limitations of the actions? (related to gaps/challenges)

There is at 1500 m above sea level, consequently in years with high snow precipitations the prescribed burning training is limited and consequently also the fuel reduction. Moreover, since fire personnel is not professional but volunteer the flexibility required for carrying out prescribed burning is somehow limited.

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

Involving other actors of the fire management systems in the training program: fire-brigades of the "Vigili del Fuoco" corp; Carabinieri Forestali forest police; forestry professionals that are responsible of designing and planning prescribed burning; agencies responsible for nature conservation.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

Other questions/comments/contributions

4.2 Fuel management smart solutions assessment – **INTERVIEW**					
Basic information		ID_INit		ID_INST	4
Initiative/Solution	**Grazing program for fire hazard abatement through the "Landa Carsica" business network**				
Institution	Friuli Venezia Giulia Region				

Personal data	Not publishable

General description

Fuel management programs

☐ EU projects ☒ Local/regional initiatives ☒ Normative compliance ☒ RDP ☐ Other	**Details** - LN 353/2000 "Legge-quadro in materia di incendi boschivi"; - LR 17/2019 "Disposizioni per la difesa dei boschi dagli incendi"; - DPR 357/1997 "Regolamento recante attuazione della direttiva 92/43/CEE relativa alla conservazione degli habitat naturali e seminaturali, nonché della flora e della fauna selvatiche" as integrated and modified by the DPR 120/2003 "Regolamento recante modifiche ed integrazioni al decreto del Presidente della Repubblica 8 settembre 1997, n. 357, concernente attuazione della direttiva 92/43/CEE relativa alla conservazione degli habitat naturali e seminaturali, nonché della flora e della fauna selvatiche"; - 2014-2020 RDP Program of Friuli Venezia Giulia Region.

Measures and indicators

Measures: The pilot project was held in Montefalcone municipality (Friuli Venezia Giulia), where the landscape is dominated by the so-called "Landa Carsica", i.e. a combination of sparse trees and semi-arid meadows on calcareous soils. This vegetation type was the result of grazing activities over the centuries. However, this territory has been progressively abandoned since 1950s, thus allowing the colonization of fire-prone scrubs. The initiative consists in the temporary use by the regional authority of private lands, after notification to land owners, in the high fire risk areas identified by the regional law for forest protection from fires (LR 17/2019). The management of these private lands is entrusted to farmers, who can make the cattle graze for free for 5 years. In any case, the owners preserve all their rights on their piece of land. The economic sustainability of grazing over such unfertile lands is ensured by:

1. the establishment of the "Landa Carsica" business network;
2. the activation of the following Measures of Rural Development Program (RDP) 2014-2020:
    a. 4.4.1. "*Investimenti non produttivi connessi con la conservazione e la tutela dell'ambiente*" to restore the "landa carsica" habitat and landscape;
    b. 11.1.1. "*Conversione all'agricoltura biologica*" to adopt the organic farming method;
    c. 10.1.8. "*Razze animali in via di estinzione*" to preserve the "grigio alpina" cattle breed, whose population is facing a dramatic decrease.

Moreover, a second initiative started on the fire-exposed site of "Monte Sabotino", province of Gorizia, Friuli Venezia Giulia. The management of abandoned lands was entrusted to a non-profit association, which raises sheeps in educational farms. RDP Measure 4.4.1. "*Investimenti non produttivi connessi con la conservazione e la tutela dell'ambiente*" was activated to fund the scrub clearing and restore the productivity of the pastures.

Indicators: a monitoring program for fire occurrence in the selected area was activated with the aim of verifying, in the medium period, if grazing has an effect on fire regime and severity. A collaboration with Trieste University started in order to assess if grazing activity can restore the typical vegetation of the "Carso triestino e goriziano" Natura 2000 site. Indeed, scrub colonization is supposed to cause both a loss of biodiversity and a perturbation of the vegetation associations of the protected site.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

Before including habitat conservation and economic issues, the Program was conceived as a tool to reduce fire risk through grazing. This is still its main objective. Beneficial effects of grazing on biodiversity have been highlighted thanks to the partnership with Trieste University. This additional effect is also strategic, since the entire territory is under a Natura 2000 site. Also, the opportunity to access RDP Measures thanks to the institution of the business network ensures the long-term economic sustainability of the project. Finally, it has to be pointed out that the entire project reached the strategic goal of reducing fire risk in exposed landscapes at zero cost for the public administration. Fire prevention actions can therefore have cross-sectoral beneficial effects on economic, nature conservation and policy issues.

Which are the limitations of the actions? (related to gaps/challenges)

Some problems with landowners who were simply notified of the temporary use of their land, without the possibility of opposing this. Even if their lands were mostly abandoned, land owners were worried that the Region expropriated their land. In fact, the Region, according to national law procedures, acquired private lands only for the specified time period that is thought to be necessary to restore the "landa carsica" vegetation through grazing, i.e. 5 years. However, during this period, owners still preserve their rights on the land. Some protests came from hunting associations as well, because of the limitations to hunting (by law) that rose as a consequence of the fences establishment during the initiative. Finally, the latest regional law on forest fires (LR 17/2019) adapts the temporary expropriation procedure to the national requirements, thus making the future renewal of the authorization for the occupation of private lands more difficult.
How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)
Do you know good initiatives/best practices linked with wildfire prevention and management? **Are these initiatives funded by specific programs, or could it be funded?** (related to the identification of smart solutions)
Other questions/comments/contributions
The aim of the project was to comply with regional forest fires law that obliges the Regional Authority to implement preventive actions within fire risk zones. To this point, the goal has been reached with no additional costs for the public authority, which is a smart result, too.

***4.2 Fuel management smart solutions assessment* - INTERVIEW**					
Basic information		**ID_INit**	-	**ID_INST**	5
Initiative/Solution	**Biomass production and fire hazard reduction in Unione Comuni Pratomagno**				
Institution	Unione Comuni Pratomagno				
Personal data	Not publishable				
General competences					
Fuel management programs					
☐ EU projects ☒ Local/regional initiatives ☐ Normative compliance ☒ RDP ☐ Other	**Details** L.R. 11/2018 related to forest fire management introduces fire prevention plans for a number of territories, including the Pratomagno area. RDP 14-20 measures: - 04.03.03 Forest road network - 08.03.01 Recovery of forest potential and wildfire prevention - PIF – Integrated Value Chain Planning (Piani Integrati di Filiera): https://www.regione.toscana.it/-/progetti-integrati-di-filiera-pif- Life program for habitat conservation				
Measures and indicators					

Measures: prevention in coniferous plantations is carried by variable retention measures aiming at changing the forest structure and flammability while extracting biomass to be chopped and used in the central heating system installed by the Unione Comuni in 2007. Silvicultural measures follow criteria related to both fire hazard reduction (i.e., increasing vertical and horizontal heterogeneity; favouring stable groups of trees; crown pruning and quality pruning; removing hazardous surface fuels; phytosanitary treatment; understory prescribed burning) and biomass extraction. The chopping transformation is carried out by local private enterprises. The priority areas where to extract the biomass are defined by the Fire Prevention Plan that follows to the standards set by the regional law 11/2018 and identify strategic points analysing historical and potential fire behaviour, stand vulnerability and experts opinions.

A number of complementary actions for fire prevention are implemented in the area such as: i) maintenance of the road network and bio-engineering to limit soil erosion along roads to improve forest management sustainability and fire-fighting effectiveness; ii) water point maintenance; iii) clear cutting and thinning of fuel debris (in case of wildfire, snowfall, windstorms) are implemented also to reduce fire hazard and limit biotic damage; iv) grazing; v) habitat conservation measures remving high shrub loads to create open habitats for birds.

Indicators: quantity of energy produced in a year; quantity of biomass extracted and transformed into chips; number of hectares treated with silvicultural interventions aiming at decreasing fire hazard.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

Most of the measures mentioned are directly linked with wildfire prevention.

Which are the limitations of the actions? (related to gaps/challenges)

The personnel of the forest office is few relatively to the amount of land to be managed. Similarly, the forest workers are in a lower number to what is needed to implement forestry interventions in the area. Consequently, priority is given to silvicultural interventions with higher economical returns limiting the possibility implement preventive measures at the adequate scale to change markedly fire hazard. Other difficulties include the high fragmentation of the public land and the lack of effective tool to involve private owners in the management plan of the area.

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

Higher integration of fire prevention with nature conservation measures. Wood transformation in chips should be a cost to internalize by purchasing a wood chipper.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

Foresta Modello – Tony Ventre, Jacopo Battaglini:
http://www.forestamodellomontagnefiorentine.org/64/it/lanostrafm.html

Other comments/contributions

There is no cost-efficient analysis for the measures applied

***4.2 Fuel management smart solutions assessment* - INTERVIEW**					
Basic information		ID_INit		ID_INST	6
Initiative/Solution	**New Business Models for innovating the cork sector and contrasting cork oak woodland abandonment**				
Institution	Syfar enterprise				
Personal data	Not publishable				
General description					

Fuel management programs	
☐ EU projects ☒ Local/regional initiatives ☐ Normative compliance ☐ RDP ☐ Other	**Details** It is a private initiative of a cork processing enterprise (Syfar Srl) which also owns cork oak woodlands. No additional or external funds were activated in this project. Every expense was supported by the enterprise.

Measures and indicators

Measures: Cork oak plantations are progressively being abandoned in Sicily as well as in other Italian regions because of the low profitability of cork extraction. Their subsequent invasion by shrubs and forest species leads to the built-up of fire-vulnerable ecosystems. The project was carried out by a cork processing enterprise (Syfar Srl) based in the municipality of Acquedolci, Sicily, which was interested in reducing fire hazard and restoring the potential for cork production in one of its abandoned plantations and to process local raw material inside their own factory. The selected site was located close to the protected area of "Riserva Naturale Orientata Bosco della Ficuzza" and was not far from two *Natura 2000* sites.
The project was conceived by Syfar Srl and the University of Palermo and it aims to provide the restoration activity an economic sustainability. In fact, restoring the economic potential of abandoned cork oak plantations is very unprofitable. The objective of management is to generate a stable structure for producing high quality cork with vigorous trees and promoting regeneration; the management strategy combines the cork production with fire preventions. The practices for the recovery were selective thinning, removing disease trees, scrubs management and the selective cutting of other trees (e.g. ash and other oaks). The main objective was achieved by converting a waste material (clearing residues obtained from the restoration of abandoned cork oak woodlands) into a marketable product. In fact, firewood from cutting tree species other than cork oak was obtained, together with wood chips from shrubs and branches clearing. Wood chips have been re-used inside the factory to produce thermic energy for heating the buildings.

Indicators: several results have been achieved: (i) the reduction of fire risk by removing part of the shrubs (which has to be monitored); (ii) the reactivation of the production potential of the stand; (iii) the production of firewood and wood chips; (iv) the plantation of new cork trees to improve recruitment and the accelerated woodland restoration, by increasing tree density of the cork oak stand.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

The restoration of the productivity of cork oak stands contributes to the creation of a mosaic landscape, where forest and shrubland are interspersed with managed areas with lower canopy density, and of vertical fuel discontinuity. Such a landscape can slow down both the spread rate of wildfires and their intensity, thus giving firefighters an opportunity to stop them.

Which are the limitations of the actions? (related to gaps/challenges)

If the proposed techniques are done under appropriate weather conditions by specialized workers (e.g. avoiding the nesting period of protected bird species) there are no negative impacts on the habitat conservation (unpublished results from the University of Palermo).This is a distinctive result since the cork oak stand is close to a protected area and two *Natura 2000* sites.
For the future implementation of the project to other contexts, since the abandonment of cork oak stands is increrasing all-over Italy, it will be crucial to find ways to ensure that the private companies who carry out the restoration operations will benefit from the stands for a consistent period of time after the cork oak returns to be productive.

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

Extending the business model to other areas.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

There are some Natura 2000 sites in Sicily which are managed by “Legambiente” association. The management plans for these sites were developed by Prof. Tommaso La Mantia from the University of Palermo. In one case, the management plan proposed to implement a complementary grazing in the forest understory of a reforestation to control the accumulation of fuel, in order to prevent forest fires in the protected *Natura 2000* site.

Other questions/comments/contributions

This case study will be considered also in the EU funded project “Incredible – Innovation networks for Corks, Resins and Edibles”.

A number of studies on this project were carried out and are listed here after:

- Tedesco D.N. (2018). Nuove tecniche per la gestione dei sistemi agroforestali con la Sughera in Sicilia. Master Thesis, University of Palermo. Supervisor: Prof. La Mantia Tommaso
- Alfonso F. (2018). La conservazione delle sugherete attraverso la valorizzazione delle funzioni ecosistemiche. Master Thesis, University of Palermo. Supervisor: Prof. La Mantia Tommaso
- Sala G., Sdringola P., Tedesco D., Alfonso F., La Mantia T. (2020). New Business Models for innovating the cork sector and contrasting cork oak woodland abandonment.

Annex 2. Interviews related to initiatives/institutions from Catalonia (NW Spain)

<table>
<tr><td colspan="5">4.2 Fuel management smart solutions assessment - INTERVIEW</td></tr>
<tr><td>Basic information</td><td>ID_INit</td><td></td><td>ID_INST</td><td>2</td></tr>
<tr><td>Initiative/Solution</td><td colspan="4"></td></tr>
<tr><td>Institution</td><td colspan="4">The Forest Ownership Centre (CPF)</td></tr>
<tr><td>Personal data</td><td colspan="4">Not publishable</td></tr>
<tr><td colspan="5">General competences</td></tr>
<tr><td colspan="5">Fuel management programs</td></tr>
<tr><td colspan="2">☐ EU projects
☐ Local/regional initiatives
☐ Normative compliance
☒ RDP
☐ Other</td><td colspan="3">Details
RDP 14-20 measures:
- 04.03.03 Forest road network
- 08.05.01 Silvicultural treatments
- 08.05.02 Forest Management Plans
- 08.03.01 Recovery of forest potential and wildfire prevention
- 09.00.01 Creation of forest producers’ groups</td></tr>
<tr><td colspan="5">Measures and indicators</td></tr>
</table>

04.03.03 Forest road network

- Actions funded: Construction of necessary roads for sustainable forest management; Arrangement of roads for sustainable forest management; Specific actions and construction of bio-engineering to the forest road network.

- Selection criteria: density of road network inside the property; type of road (according the level: main road, secondary road, tertiary road, etc.); the "new" road has to serve for one action included in the Forest technical plan of the property; not more than 25.000€ by record. No specific criteria regarding to fire risk.

- Follow-up: all the actions (linked with criteria) are digitized (GIS), also according the administrative procedure of the record.

08.05.01 Silvicultural treatments

- Actions funded: different silvicultural treatments: thinning of a young pole wood, thinning, selective cutting, sucker cutback, crown pruning and quality pruning, clearing of undergrowth, peel the cork of low quality, phytosanitary treatment for peeling of bark from cork tree, skyline logging and peel the cork and burned virgin cork.

- Selection criteria: % of area under wildfire risk inside the property (according a CPF's specific Large fire risk map); type of forest actions (some of them has more punctuation); sustainable certification of the forest; forest included in a Forest technical plan of the property; forest included in a disadvantaged zone; forest inside Nature 2000 protected areas network. A specific criterion regarding to fire risk exist (the first) with a weight of a maximum of 5 points over 65.

- Follow-up: the same as previous.

08.05.02 Forest Management Plans

- Actions funded: writing and review of different types of forest plans: Technical (more than 25ha) and Simple (less than 25ha) Management Plans at individual forest ownership, and Join Management Plans (grouping different forest owners plots).

- Selection criteria: revision of existing plans is prioritized; plans with longest periods of action (could be from 15 to 30 years). No specific criteria regarding fire risk.

- Follow-up: same as 04.03.03.

08.03.01 Recovery of forest potential and wildfire prevention

- Actions funded: clear cutting and thinning of affected forest and management of fuel debris (in case of wildfire and drought, snowfall, windstorms, and biotic damage); plantations for restoration in areas with no natural regeneration; forest management for wildfire prevention (fuel reduction in the management unit and fuel debris treatments around the roads and inside the action plot); infrastructures for wildfire prevention (includes construction and maintenance of strategic forest roads, water points, defence lines, specific actions and construction of bio-engineering, creation of strategic low fuel load areas and complementary areas of wildfire prevention through grazing, the equivalent to the Strategic Management Points – PEGs used by the Fire Service).

- Selection criteria: for the vegetation affected by natural and biotic damage, the action area has to be inside of the damage perimeter (previously defined by the call); % of area under wildfire risk inside the property (according a CPF's specific Large fire risk map); actions developed in protection forests; forests inside Nature 2000 protected areas network.

- Follow-up: the same as 04.03.03.

09.00.01 Creation of forest producers' groups

- Actions funded: expenses related to the achievement of the business plan presented.

- Selection criteria: the business has to be a PIME (medium or little business); volume of forest product mobilized; more than 10 partners; workplaces generated; innovative degree of the initiative; active investment for the development of new processes and products. No specific criteria regarding to fire risk.

- Follow-up: No specific system.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

Most of the measures mentioned are not directly linked with wildfire prevention, since the main objective of the institution is the promotion of the sustainable forest management in private ownership (a specific Wildfire Prevention Service exist into the same government, see ID INST_7).
The unique measure directly related to wildfire prevention is the 08.03.01, that is linked, basically, with the construction and maintenance of prevention infrastructure (active prevention), except the prevention through grazing (passive prevention).
The other measures can be indirectly related to wildfire prevention: in the case of measure 08.05.01, during the interview is stated how different fuel treatments have served to contain the spread of fire.
In the case of measure 08.05.02, the fire service UT-GRAF (ID_INST 7) collaborates with the location of the silvicultural treatments at forest unit level into the Forest Management Plans to act also, as a wildfire prevention infrastructure.
Also is indirectly recognised that the main common objective that motivates the collaboration of the forest owners in a Join Forest Management Plan is the wildfire prevention.
Regarding the measure 04.03.03 within the type of roads, main roads are the most promoted, which can be considered indirectly a fire prevention measure since are the roads more used by firefighters, especially when they are linked with the PEGs).
Regarding the measure 09.00.01, it can be considered that the promotion of forest business and forest products mobilisation is directly related with the fuel management.

Which are the limitations of the actions? (related to gaps/challenges)

Normally, according the available budget, the main focus on forest management, in general (with a prioritisation of forest products mobilisation), and the number of applications, the actions co-founded are limited to the so called productive forest or forest under active management. In consequence, those areas less productive and without management which normally are those where the fire risk is higher, do not benefit from it.

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

Additional resources should be planned to prioritize fire prevention within the same program of forest subsides to private ownerships.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

Quality-Suber (ID INit_11) is a good initiative related to measure 09.00.01.
CPF is also participating in Life CLIMARK project: forest management promotion to climate change mitigation through the design of a local market of climatic credits (ID INit_10)

Other comments/contributions

The selection criteria within the forest subsides program could be changed: at the request of governing body of CPF (formed by 4 representatives of forest owners, and 5 representatives of public administration), the changes proposed goes to the Monitoring Committee of RDP, and if the changes are approved, they are applied.
Why to change the criteria? As an example, in 2016, in measure 08.05.01 there was a tie with a big number of records. This was a clear problem to solve the call. In that case, the change of criteria was to include a number with two decimals in the points criteria, to avoid possible ties.

There is no cost-efficient analysis for the measures applied.

For instance, the Large fire risk map criterion was introduced in measure 08.05.01 to help the selection between similar punctuations of different applicants. Since has 5 of 65 points within the selection and the map is linked with a specific tool of the same institution to support the forest management (ORGEST, Guidelines for Sustainable Forest Management (ID INit_12)), no conflict about the robustness of the risk map information has appear.

4.2 Fuel management smart solutions assessment - **INTERVIEW**				
Basic information	ID_INit		ID_INST	2
Initiative/Solution				
Institution	**The Forest Ownership Centre (CPF)**			
Personal data	Not publishable			

General competences

Fuel management programs

☐ EU projects ☐ Local/regional initiatives ☐ Normative compliance ☒ RDP ☐ Other	**Details** RDP 14-20 measures: - 08.05.02 Forest Management Plans

Measures and indicators

08.05.02 Forest Management Plans

Actions funded: writing and review of different types of forest plans: Technical (more than 25ha) and Simple (less than 25ha) Management Plans at individual forest ownership, and Join Management Plans (grouping different forest owners plots).

These Plans are defined in 3 laws (Law 6/1988, forest of Catalonia, Law 7/1999, of Forest Ownership Centre and Law ARP/122/2017, of Forest Management Plans regulation)

The interview put a special attention to the Join Management Plans, where the wildfire prevention is not the main objective, but normally is included through the identification of the Strategic Management Points (PEGs in Catalan) in the design of the plans.

These Plans are formed from different phases:

- Creation or existence of an Association with a statute, that could be an initiative from the forest owners, the municipality or both. The Province Authorities can be also part of the Associations (case of Barcelona Province authority ID_INST 9). Each association is different than the others, related to their lead.
- Surface of the Plan: could be at administrative level (e.g. one municipality or a group of it) or a part of a municipality/ies. The maximum is based on 3.000-5.000 Ha to have coherence with the application at plot level.
- Forest Coherence Request: this phase is defined in the Fund regulatory base, and includes a document with a territorial diagnosis of the surface to manage, and other fields defined in the regulatory base. This document is fundamental for the resolution of the Aids.
- Resolution of the Aids
- Writing of the Plan: this includes the formal constitution of the table of actors (governance process), where forest owners, technician, Fire Service, municipality, relevant person of the territory (could be ADF (ID_INST 10)), province authority and natural area protected (if any) are included. In this phase, a report from Fire Service and Territory and Sustainability Department is mandatory, according they are agree with the forest actions designed in the Plan.

Finally, the implementation of the Plan is not necessary to do it aggreged.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

The measure mentioned is not directly linked with wildfire prevention, since the main objective of the institution is the promotion of the sustainable forest management in private ownership (a specific Wildfire Prevention Service exist into the same government, see ID INST_7).
As mentioned previously, the Join Management Plans are indirectly linked with wildfire prevention since the Strategic Management Points (identified by the Fire Service ID_INST 7) are included with the location of the silvicultural treatments at forest unit level into the Forest Management Plans to act also, as a wildfire prevention infrastructure.
In that sense, the main advantage is to design and plan jointly (through different forest owners but in the same plan) the Strategic Points, also with the contribution of Fire Service and Ministry of Territory and Sustainability through an official report.

Which are the limitations of the actions? (related to gaps/challenges)
The main limitation is the available budget. If the budget were high, the percentage of demand covered would be highest (now only 20-30% is covered). Thus, some actions are not carried out for lack of aids. Also with more aids could be possible to have a better traceability of the actions carried out on the territory.
How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)
Modify the RDP bases to stablish in a clear and structural manner the priority of wildfire prevention contribution to forest actions, to make more possible the balance between forest production and wildfire prevention. The possible modification of the bases is linked with the available budget. If the resources are highest, more actions could be founded. Otherwise, the wildfire indicators (e.g. wildfire risk map) could be included on the eligibility criteria. Improving the communication of the actions. Communicating these contributions to society to value it.
Do you know good initiatives/best practices linked with wildfire prevention and management? **Are these initiatives funded by specific programs, or could it be funded?** (related to the identification of smart solutions)
A project promoted by Matadepera ADF (ID_INST 10) called Action areas enlargement of large fires prevention plan of Matadepera municipality (ID_INit 13) is a good example of a wildfire prevention action promoting mosaic landscape and a product commercialized.
Other comments/contributions
The selection criteria within the forest subsides program could be changed: at the request of governing body of CPF (formed by 4 representatives of forest owners, and 5 representatives of public administration), the changes proposed goes to the Monitoring Committee of RDP, and if the changes are approved, they are applied. Why to change the criteria? As an example, in 2016, in measure 08.05.01 there was a tie with a big number of records. This was a clear problem to solve the call. In that case, the change of criteria was to include a number with two decimals in the points criteria, to avoid possible ties. There is no cost-efficient analysis for the measures applied. For instance, the Large fire risk map criterion was introduced in measure 08.05.01 to help the selection between similar punctuations of different applicants. Since has 5 of 65 points within the selection and the map is linked with a specific tool of the same institution to support the forest management (ORGEST, Guidelines for Sustainable Forest Management (ID INit_12)), no conflict about the robustness of the risk map information has appear.

***4.2 Fuel management smart solutions assessment* - INTERVIEW**					
Basic information		ID_INit	26	ID_INST	1
Initiative/Solution	**Priority Protection Perimeters for Forest Areas (PPPF)**				
Institution	**Section of Forest and Forest Resources of Tarragona – Ministry of Agriculture**				
Personal data	Not publishable				
General competences					
Fuel management programs					
☐ EU projects ☐ Local/regional initiatives ☐ Normative compliance ☒ RDP ☒ Other	**Details** Other: Planning and design of the Priority Protection Perimeters. RDP 14-20 measures: - 08.03.01 Maintenance of fuel load by grazing				

Measures and indicators

Planning and design of the Priority Protection Perimeters for Forest Areas (PPPF)

The PPP are the reference unit of wildfire risk management. The minimum scale is 500ha since the main objective is to plan the necessary measures in those areas that constitutes a sufficiently broad unit of action (massif level), defining and identifying the strategic prevention infrastructures for the whole area (designed in a project of wildfire prevention infrastructures). Each PPP has its own Prevention Project.

The Project is written by the Ministry of Agriculture with the collaboration of the Fire Service, and it is participated by the main territorial actors included in the area of action (Municipalities (ID Inst_9), Forest Defense Associations (ID Inst_10), etc.)

The Section manages mainly these actions related to wildfire prevention infrastructures. One of them is:

08.03.01 Maintenance of fuel load by grazing

This measure normally is based on that areas (previously identified by cartography) with a low fuel load that are created and it is necessary to maintain. It is possible to make the first intervention by mechanical treatments, and then do the maintenance by grazing.

The traceability is done by the difference between the initial and final surface of action. This serves also to certify the action and the corresponding fund.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

Related to PPP, this is an integrative instrument that allows to plan the strategical infrastructures for wildfire prevention in that territories with capacity to host a large fire. The action scale (massif level) carries implicit a coordination between different administrative and territorial levels (in one PPP could be different municipalities, associations, consortiums, public authorities, etc.).
Regarding the RDP measures, serves to guarantee the maintenance of the wildfire prevention infrastructures through the activities from the territory.

Which are the limitations of the actions? (related to gaps/challenges)

Regarding the PPP, the main limitation is the legal range of the instrument, since currently it is not possible to force the actions designed. This is totally linked with the need of owner's authorization to do the prevention action in private forests, and, in addition, sometimes occurs that it is not possible to know the forest owner to inform him. In that cases, it is important to highlight that the project is recognised as a "general interest" project, that allows to make these necessary prevention actions, without the expressly confirmation if necessary.
Other limitation identified is the need of a territorial "dynamizer" that unifies and represents common interest of different associations, municipalities, etc., when the representation of territorial actors is expected in the writing process of the Project. The role of a "dynamizer" could be useful to make easier the participation process.

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

Enlarging the planning in those areas that have a high wildfire risk but are not constituted as a massif. Thus, with a review of PPP and wildfire risk zones. This could serve to apply basic prevention actions in those territories where wildfire risk is high, there are Wildland Urban Interface and touristic areas, and there is no forest management tradition.
Otherwise, reinforcing the legal aspects and the application of the law, to have a robust legal framework base, could serve also to enhance the application of wildfire prevention actions.
Other important point could be to integrate the contribution of wildfire prevention as a environmental service, as a recognition.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

The Priority Protection Perimeters (ID_Init 26) where some vineyards have been used as a wildfire prevention infrastructure.

Other comments/contributions

4.2 Fuel management smart solutions assessment - **INTERVIEW**				
Basic information	ID_INit		ID_INST	1
Initiative/Solution				
Institution	**Wildfire Prevention Service – GD Forest Ecosystems and Environment management**			
Personal data	Not publishable			

General competences

Fuel management programs

☐ EU projects ☐ Local/regional initiatives ☒ Normative compliance ☐ RDP ☒ Other	**Details** - Prevention perimeter strip for urbanizations (normative compliance) - Maintenance of ADF material (ID_Inst 10) - Municipal wildfire prevention plans

Measures and indicators

Prevention perimeter strip for urbanizations

According the Law 5/2003, of wildfire prevention measures in isolated urbanizations in forest lands, it is mandatory to create a strip of 25m width without vegetation around the urbanization perimeter. Complying with this normative, the administration gives economical support to the urbanizations/municipalities to do it effective.

Some urbanizations could have an annual fee about 10/12€ per building to cover the realization and maintenance of the strip, thus as a municipal service.

The criteria to stablish the grating of the aid is based on:

- Wildfire hazard map: to stablish which urbanizations are in a forest land
- Digitalization of strip design
- Buffer of 1km around it

These criteria stablish values to prioritize the urbanizations according wildfire risk and forest land.

Maintenance of ADF material

This measure covers the costs of car insurances or other strategical material to develop the forest actions done by ADFs.

The traceability of this measure is based on a randomly selection of a record to check if this aid has been used for that objective (to identify possible fraud).

Municipal wildfire prevention plans

This task is based on the harmonization and standardization of the plan's contents. Currently, these plans are outdated and are needing an update according the law.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

Related to perimetral strips, the measure is directly related to reduce the hazard of wildfire impacting in these urban structures in forest lands with high wildfire risk. Thus, endowing of wildfire prevention infrastructures in these territories.
Related to ADF, the measure is directly related to ensure the material capacity of ADF to cover the wildfire prevention and response actions in the territory.
Related to Prevention Plans, to have it updated and useful allows to have a updated information about wildfire prevention measures and infrastructures available per each municipality.

Which are the limitations of the actions? (related to gaps/challenges)

Regarding the perimetral strips, the available budget was less during the last years (initially was of 1 million €, and now is 500.000€). And currently, with the available budget there are more records in the waiting list than executed. Normally the urbanizations have different issues to solve (security, basic services, etc.) where the wildfire risk is not the first one. Consequently, wildfire prevention it is not perceived as a priority for the citizens. Furthermore, the possibility to stablish an annual fee to cover economically this need, is a good option, also to show/express that wildfire prevention is a basic service to cover. But to stablish it, it is necessary some bureaucracy that could not have these "little municipalities" without a big administrative capacity. This perimetral strips, in cases of old urbanizations, sometimes generates servitudes to third persons, and this could be a problem to get the permissions, etc. Regarding the ADF, some limitations are related to the definition of tasks association. Some ADF are covering also Civil Protection actions, when the main objective is the response in forest lands. The insurances only covers the actions in forest lands. Regarding the Prevention Plans, the main limitation is the outdated plans and the need to find new plan's structures more simples and useful.
How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)
Through the better coordination with other institutions and instruments.
Do you know good initiatives/best practices linked with wildfire prevention and management? **Are these initiatives funded by specific programs, or could it be funded?** (related to the identification of smart solutions)
Other comments/contributions

***4.2 Fuel management smart solutions assessment* - INTERVIEW**					
Basic information		**ID_INit**		**ID_INST**	5
Initiative/Solution					
Institution	**Aids to Agrarian Sustainability Service – GD Agriculture and Livestock**				
Personal data	Not publishable				
General competences					
Fuel management programs					
☐ EU projects ☐ Local/regional initiatives ☐ Normative compliance ☒ RDP ☒ Other	**Details** - Green architecture and Eco-schemes - Agri-environmental measures - Ecological Livestock (RDP) - Support to disfavoured territories (RDP) - Agricultural insurances - Other measures related to wildfire prevention				
Measures and indicators					

Green architecture and Eco-schemes It is a new approach to apply to work in a holistic manner, searching the development and maintenance of "green architecture", related to the agri-forest mosaic, as a basic structure of the territory. The "eco-schemes" concept is related to greening the CAP measures, and is in progress, and is linked with the Agri-environmental measures. These measures are annual aids that can be directly required by the farmers. **Support to disfavoured territories (RDP)** This measure wants to compensate these territorial difficulties to develop agriculture and livestock in disfavoured territories (e.g. mountain areas). **Agricultural insurances** The main objective of the agricultural insurances is to cover the possible looses of the production. A cause of these looses could be the wildfires.
Gap analysis (open questions)
Which are the contributions of the actions to wildfire prevention? (related to achievements)
The contribution of all measures described are the indirect prevention of wildfire through the maintenance of mosaic landscape and the discontinuity of forest lands. There is a promotion of agricultural activities indirectly related to these measures (vineyards, extensive livestock, ecological agriculture, maintenance of mosaic in mountain areas, etc.).
Which are the limitations of the actions? (related to gaps/challenges)
The main limitation is that these contributions to wildfire prevention are not officially recognised. Consequently, there are not criteria regarding wildfire risk maps, or other indicators related to wildfires.
How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)
Stablishing criteria of selection related to the wildfire risk of the territory where the measure will be implemented. A possibility is to recognise it through the "top-up" stablished in the eco-schemes.
Do you know good initiatives/best practices linked with wildfire prevention and management? Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)
Other comments/contributions

***4.2 Fuel management smart solutions assessment* - INTERVIEW**					
Basic information		ID_INit	10	ID_INST	
Initiative/Solution	**Boscos del Vallès (Valles Forests)**				
Institution	**Sub-Regional Authority of Vallès Occidental Territory (Consell Comarcal del Vallès Occidental)**				
Personal data	Not publishable				
General competences					
Fuel management programs					
	Details				

☐ EU projects ☒ Local/regional initiatives ☐ Normative compliance ☐ RDP ☐ Other	It is a sub-regional initiative co-funded by the Government of Catalonia and the Province Authority of Barcelona.

Measures and indicators

The traceability is based on the wood origin and the quality control of woodchips. Till 2018, the project has had a total budget of 2.100.000€.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

One of the main objectives of the initiative is the development of forest management actions for wildfire prevention with the aim to complete wildfire prevention infrastructures already developed in the county during last years (forest accesses, water points, etc.). It is also foreseen to act directly in the reduction of forest fuel in public forests, and indirectly in private forests through the biomass production.
The initiative includes the development of a biomass public service, which collect the forest fuel of private forests as a woodchip to use it in the biomass boiler to produce energy. Currently, there are 2 big boilers which gives energy to the county central hospital (with the expected power generation of 7.350.000kWh/year) and the sports facilities of the Autonomous University of Barcelona (with the expected power generation of 1.565.750 kWh/year). The initiative was activated in 2018 with these two boilers, with the aim to enlarge the biomass service with more user and boilers.
Other important contribution to wildfire prevention is that inside the project is expected and designed the environmental education contribution though risk awareness and communication actions, mainly in schools.

Which are the limitations of the actions? (related to gaps/challenges)

During the development of the initiative, one of the main limitations was the excess of bureaucracy to approve and be effective the project. The initial idea was to use the public funds to generate demand through the public authority to act as a connection between different stakeholders involved (forest owners, producer of biomass, etc.) in the initiative.
To accelerate the development of the project and to have available the public funds (which has a specific temporary to use it), the proposal was to generate a public biomass service. In this way, the main limitations were solved and the ability to make the initiative effective was ensured.
On the other hand, during the development of the initiative, the forest sector identified the project as a threat, since they interpretate it as an unfair competition. By this way, the public authority started different informative sessions and governance actions to enhance the coordination between the sector, the stakeholders and the public promoter.
Finally, there is no current traceability to identify the properties that are in high wildfire risk zones, thus, those properties that should be priorities to act.

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

Enhancing the traceability of wildfire risk zones and the properties where to develop fuel reduction actions. This should imply to act in more forest areas (hectares) of the county.
The wildfire prevention contribution of the initiative would be highest if there would be more energy demand.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

Other comments/contributions

Vallès Occidental county is a peri-urban territory with a high density of population, including urban sprawl, a high industry sector and a high forest surface percentage (60%). The 80% of the forest is private, little managed and planned, with a little productivity and with high wildfire risk.
Past events occurred in the county that affects the forest cover:
- Large wildfire in 2003 with 4.600 ha burned.
- Windstorms in 2008, 2009 and 2014.
- Snowfall in 2010.

4.2 Fuel management smart solutions assessment - **INTERVIEW**					
Basic information		ID_INit	4	ID_INST	11
Initiative/Solution	**Ramats de foc (Fire flocks)**				
Institution	**Pau Costa Foundation**				
Personal data	Not publishable				

General competences

Fuel management programs

☐ EU projects ☒ Local/regional initiatives ☐ Normative compliance ☒ RDP ☐ Other	**Details** The initiative collects private agents interested in the continuity of silvopastoralism in the NE of Catalonia (Girona) and the public authority in charge of wildfires issues (Firefighters of Catalonia). It is a public-private initiative.

Measures and indicators

The initiative has different traceability processes. As some of the fuel treatment actions through grazing is funded by the RDP measures, the traceability is basically based on the RDP record, which includes a traceability procedure itself.
Alternatively, for those treatments not included on RDP, the promoter is working in a traceability template for both cases (included on RDP and not included).
On the other hand, the commercialization process has (implicitly) a traceability through the sale follow-up (comparing the number of sales before and after the "Ramats de foc" brand).
To observe the initiative evolution, it is also useful the number of hectares managed, the number of farmers adhered, the number of commercial establishments, etc.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

The main contribution is related to the possibility to add commercial value to those products which are contributing to the wildfire prevention, and their recognition as an essential activity to reduce the wildfire risk in a territory.
It is important to consider that the fuel management done by grazing is developed in critical wildfire risk zones, according the firefighter's criteria. Thus, there is a resources optimization since grazing is not a very extended activity.

Which are the limitations of the actions? (related to gaps/challenges)

One of the main limitations mentioned was the excess of bureaucracy for the cattle management. This, added to the low price and consume of sheep, are not a well point of departure.
On the other hand, often there is a difficulty to localize the forest owners to ask him the permission to develop grazing in their property.
The development of the grazing activity normally is very linked to the public aids (as RDP), thus, it is linked to administrative conditions (not all farmers have the technical capacity to manage administrative records) and temporality, which often means low stability of the activity.

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

Boost innovation with the meat product, as promoting gastronomic workshops to create new attractive products. That is, development of product elaboration to do it more attractive for their commercialization.
On the other hand, to work and better develop the "sub-product" as the wool. This would contribute to the economic viability of the activity (economic sustainability) to consolidate it. This could also imply the creation of a unique distribution platform, which would contribute to the economic sustainability.
Other contributions could be related to the territory of actions. That is, including the wildfire prevention perimetral areas of the urbanizations (which in Catalonia are mandatory in some cases) as a territory to manage through grazing.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

Other comments/contributions

Annex 3. Interviews related to initiatives/institutions from Portugal

4.2 Fuel management smart solutions assessment - INTERVIEW				
Basic information	**ID_INit**		**ID_INST**	2
Initiative/Solution				
Institution	**GIFF - Gestão Integrada e Fomento Florestal, Lda**			
Personal data	Not publishable			
General description				
Fuel management programs				
☐ EU projects ☐ Local/regional initiatives ☐ Normative compliance ☐ RDP ☒ Other	**Details** Advisory and provision of services in community forest lands and for municipalities. (RDP only for a previous R&D project to fine-tune the method for resin extraction). Concerning the resin extraction activity, there were no available funding calls to apply for at the time. Nowadays, the only RDP funding for resin extraction concerns equipment tools acquisition, which is very cheap in this activity and does not worth the application and follow-up efforts.			
Measures and indicators				
There were no mandatory indicators. Indicators were only used to monitor internal activities as a company routine and no report was done externally. Fuel management was not reported because it was considered a secondary activity. Measures used were related with the workers productivity (e.g., number of resin renewables per month per person).				
Gap analysis (open questions)				
Which are the contributions of the actions to wildfire prevention? (related to achievements)				
- The peak of the fire season matches the peak of resin extraction season. Keeping an active resin extraction activity promotes territorial enhancement (passive prevention) and constant surveillance (active prevention). - Concerning active prevention, there were 2 cases of fires spotted by the resin workers, which also helped in the firefighting. Social pressure from local community prevented further fire occurrences inside the resin extraction properties, which confirms the importance of local community integration within forest management activities. Firefighters showed an extra motivation to fight these fires along with members of the local community, because they felt resin workers need this territory to earn money and it was not a "no-man's land".				
Which are the limitations of the actions? (related to gaps/challenges)				
- Financial: Resin extraction is not a profitable activity within the current model, because the economic value of resin is very low. This value depends on the value of petroleum, as they both share similar markets. (Resin market is based on rosin by-products, and petroleum produces similar by-products). It is only profitable as a secondary activity if integrated in the forest management activities.				
How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)				

Profitably will not increase. Others tried mechanization (see R&D SustForest – Interreg SUDOE) but results showed it is not worth it, because of the simplicity and low cost of the equipment. Therefore, ways to keep the activity going include:

- EU policies that will foster the use of pine resin as a natural product for the production of rosin by-products intended for human use (e.g. cosmetics), instead of using oil by-products; related industries should also foster the use of pine resin increasing the valorization of this natural product.
- To link resin extraction with rural development and foster this link by promoting the economic activity of non-wood products in the forest areas and by fighting depopulation in rural areas.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

- Rainfed agriculture (olive groves) around the villages. Funded by some municipalities in Portugal.
- Silvopastoral activities. There are very interesting initiates, though quite difficult to maintain and have sustainability.
- REN (National Electricity Network) established firebreaks under electric lines in agreement with the landowners, giving them the opportunity to change the forest stand type (less taller species) or other productive species like strawberry tree (Arbutus unedo) or olive groves, instead of full thinning.

Other comments/contributions

4.2 Fuel management smart solutions assessment - INTERVIEW				
Basic information	**ID_INit**		**ID_INST**	1
Initiative/Solution				
Institution	**ICNF - Instituto da Conservação da Natureza e Florestas, Portuguese Institute for Nature Conservation and Forests**			
Personal data	Not publishable			
General competences				
Fuel management programs				
☐ EU projects ☒ Local/regional initiatives ☒ Normative compliance ☒ RDP ☒ Other	**Details** ICNF designs and opens the calls for public funding to be distributed among the applicant projects (RDP: PRODER and PDR2020, measure 8.1.3., for private owners; and PO-SEUR for public entities; Fundo Florestal Permanente)			
Measures and indicators				
There is no Planning Dept. within the Fire Division, so there are few measures and indicators for efficiency and efficacy. The sole known measure is the number of applicants per each open call. Within each call there are specific indicators, which are inspected and validated after implemented by the entity/private owner who received the funding.				
Gap analysis (open questions)				
Which are the contributions of the actions to wildfire prevention? (related to achievements)				

- ICNF is the link between public institutions and people in the territory, as knowledge provider and fund allocator.
- Management of the Forest Sappers Program – Sapadores florestais (active and passive prevention).
- Management of the National Program for burning debris and scrubland (control and technical monitoring of burnings, mostly using a mobile app - https://fogos.icnf.pt/InfoQueimasQueimadas/).
- Planning, promoting and executing strategic fuel management land mosaics (i.e., the identification of the areas in the field where fuel management effort most reward its effectiveness) within the forest fires defense network.
- Planning, promoting and executing the three levels of the forest fires defense network (primary, secondary, tertiary)
    - Primary network: fuel management according to law requirements. ICNF is in charge of its implementation in the field, either by using internal personnel, or by contracting external services. ICNF also promotes its implementation by providing manuals of good practices and technical normative to the community, and by developing technical training seminars. These areas are treated together with municipalities and many times with private owners;
    - Secondary network: fuel management according to law requirements. Owners are in charge of performing it in their forest properties. ICNF is obliged by law to implement it on its own forest property;
    - Tertiary network: fuel management in fire belts and access paths for firefighting vehicles. ICNF is obliged by law to implement it on its own forest property.
- Planning, promoting and monitoring the national call for "Conducting fuel management with livestock husbandry - Prevention of forest fires (Sapper Goats)" projects (fuel management and active prevention).
- Planning, promoting and monitoring the national call for "Resin Extraction" projects (fuel management and active prevention).

Which are the limitations of the actions? (related to gaps/challenges)

- Lack of funds and money. Example: It was necessary to select just a part from the already designed and complete primary fuel management network (called "structuring network"), in order to implement it as soon as possible, especially after the 2017 fires in Portugal. The rest of the network, though very important, was left for second and third priorities.
- Bureaucracy of the prescribed burning activities. The cost and paper work required to plan and perform prescribed burning actions has lead people into (legal) burnings instead of prescribed burnings.
- Lack of people applying to the calls (resin extraction call had no appliers, for example).
- Lack of ICNF human resources (HR) and a vast area to manage. Lack of specialized HR in areas that need development (lack of rural extension, lack of experts in livestock husbandry).
- Lack of forest economic viability.

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

To foster the use of forest products, which will increase the demand. To foster forest economic viability, in order to encourage private owners to invest in their properties and actively manage them.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

- REN (National Electricity Network) defined firebreaks under electric lines in agreement with the landowners, giving them the opportunity to change the stand type (less taller species) instead of full thinning.

- R&D Project "Alvares: A case of fire resilience" https://www.alvares-fogo.com/, which started after the 2017 fire. The main objective of the study was to propose a set of measures for planning and intensifying forest management, aiming at the future construction of a landscape in Alvares that is less vulnerable to fires. The measures proposed were designed to have a lower frequency of large fires, to be a safer parish, and to improve the local economy, particularly forest profitability of private owners.
    - Partners: CEF/ISA, IGOT, IDL and CITAB (all are research centers) + ZIF Ribeira Sinhel and ICNF (public entities) + Forest Association + Altri and Navigator (private companies).
    - Funded by *O observador*, a Portuguese national newspaper.

- Project MAQQ (support mechanism for burning debris and scrubland). Promoted by the ICNF. The objective is to provide technical support to the community in their burning activities.

Other comments/contributions

ICNF sometimes has partnerships with external entities, which help to design the forest fires primary network.
ICNF does not pursue profitability.

4.2 Fuel management smart solutions assessment - INTERVIEW					
Basic information		ID_INit	27	ID_INST	
Initiative/Solution	**Rebanhos da Serra do Açor e Rabadão (Flocks of Serra do Açor e Rabadão)**				
Institution					
Personal data	Not publishable				

General competences

Fuel management programs

	Details
☐ EU projects ☒ Local/regional initiatives ☐ Normative compliance ☒ RDP ☒ Other	- Private investment - RDP measure for "Conducting fuel management with livestock husbandry - Prevention of forest fires (Sapper Goats)" (after the installation of the project). - Partnership with ICNF to manage fuel in areas of the forest fires defense primary network, i.e., ICNF pays per work performed (it is not a funding; it is a private provision of services to ICNF).

Measures and indicators

Total area managed (payment per hectare), vegetation height (above 30 cm), and other requirements of the calls (for both RDP measure - sapper goats and ICNF partnership).

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

- The use of abandoned agricultural parcels, many of them with shrubs, to grow pastures and forage is solving the land abandonment issue and decreasing fire risk at the same time.
- Performing fuel management in the whole area using the sapper goats and mechanical means.

Which are the limitations of the actions? (related to gaps/challenges)

- The small scale, which does not allow for business profitability recurring only to this activity. To grow in scale will mean to increase the number of animals in the flock and to increase the fuel management area.
- Funds are short and payments are not adjusted to the needs. The call for sapper goats is not well structured, because payments are actually reimburses, which implies to have money available in advance and hampers private landowners to establish their own businesses.
- Lack of long-term vision from the municipalities. They are more concerned with short-term results and do not support these kind of initiatives as they should. Their support would make these initiatives to grow in scale and become sustainable and profitable.
- Communication problems with ICNF.
- Difficulties in finding people to work. Aged population is not able to work in the forest, and younger population is not interested in this kind of job (even if payments are higher than the national minimum salary).

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

- Building relevant partnerships in order to grow in scale (for example, with entities available to fund the establishment of new flocks in the area) through a cooperative business model. This would allow for more managed land, meaning more fire prevention.
- Improve and boost hunting recreational activities in the area, which will also lead to more fuel management.
- Increase tourism attractions, which will increase land profitability and local economic activity, as well as fuel management activities, as less land will be abandoned.
- Changes in the RDP model. Its current model, and funds they provide, are not interesting nor useful.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

- Quinta Lógica (Sistelo): https://quintalogica.com/. Local development project for sustainable management of ecosystems and fire prevention. Within the World Biosphere Reserve Gerês-Xurés (UNESCO), in the parish of Sistelo, municipality of Arcos de Valdevez, it counts with a flock of native goats, in extensive grazing and invites people, even living in the city, to get involved in the landscape management, adopting a goat and following the life of the herd, from a distance or visiting the herd.
- Terra Maronesa (Alvão): https://terramaronesa.pt/. It is a practical community that intends to enhance the habitat of the native "Maronesa" bovine breed, based on a holistic and systemic approach. It also aims to enhance the vast food heritage in its different economic, cultural, social, environmental and touristic aspects.
- Rebanho Casal Novo e Cepos (Arganil): flock of 150 sapper goats that started after the 2017 fires. Funded by a special fund created after the 2017 fires in Portugal (Fundo Recomeçar, Santa Casa da Misericórdia de Lisboa) and partnered by the Escola Superior Agrária de Coimbra (ESAC – Coimbra Agricultural College). This initiative was not focused on production, consequently it is very dependent on funding to keep the activity going.

Other comments/contributions

- The silvopastoral business at a small case (such as this one) is not profitable yet. The only way to keep the business running is to combine the silvopastoral activity with silvicultural services payed by private entities, and carried out in areas outside our working area. Rebanhos da Serra do Açor e Rabadão is following that path, performing forestry work for forest companies, community lands, and private owners, while trying to fully establish and to grow in scale.
- According to Rebanhos do Açor accounting; managing fuels mechanically is at least 5 times more expensive for ICNF than using sapper goats.
- Rebanhos do Açor showed to be fully available to share knowledge and lessons learnt with new private owners interested in starting their own similar businesses.

4.2 Fuel management smart solutions assessment - INTERVIEW					
Basic information		**ID_INit**	**17**	**ID_INST**	
Initiative/Solution	**Reserva Faia Brava**				
Institution					
Personal data	Not publishable				
General competences					
Fuel management programs					
☒ EU projects ☐ Local/regional initiatives ☐ Normative compliance ☐ RDP ☒ Other	**Details** - LIFE preparatory Project GRAZELIFE. - Funding for land acquisitions by MAVA foundation. https://mava-foundation.org/. - Quotas payed by ATNatureza members.				
Measures and indicators					
Vegetation indicators (vegetation structure, composition, and density) in abandoned areas are compared to the same vegetation indicators in managed areas. There is some historical data indicators on cleanings and thinning but it is not possible to go back many years because data was not recorded since the beginning.					
Gap analysis (open questions)					
Which are the contributions of the actions to wildfire prevention? (related to achievements)					

- Fuel management in two steps: first, fuel management with machinery, followed by fuel management using animals (wild horses and cows).
- Pedestrian trails, guided visits and environmental education actions, keeping people in the area (passive prevention).
- Annual fire surveillance campaigns using staff, volunteers or contracted personnel, according to budget.
- Pruning interventions investment.
- Experimental areas of reforestation after fire, aiming to rebuilt the forest.

Which are the limitations of the actions? (related to gaps/challenges)

- Shortage of money and high needs for maintenance.
- Low market value of the horses.
- Lack of staff.
- Public funds are short. Faia Brava Reserve is very dependent on funding for nature conservation, most of the times not related to fire prevention.

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

- To revitalize the local economy and ecotourism (passive prevention), through synergies with local entities.
- To have greater intervention capacity, i.e., greater funding, to enable more and better management.
- To review the funding criteria indicators of the Portuguese paying agencies (e.g., IFAP) in order to adjust them to these kind of activities. For example, in Faia Brava it is beneficial to manage fuel (e.g. shrubs) with selective clearing instead of full clearing. However, the requirements of the calls force to execute full clearing to receive the payments.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

- Operational Group SILVPAST (GOSILVPAST) – Cost-efficient implementation of silvopastoral mosaics of Quercus pyrenaica: https://www.terraprima.pt/en/projecto/23. To test and develop a method for the implementation of silvopastoral mosaics, using remote sensing approaches that supports agricultural and forestry activities in areas of Pyrenean oak, which typically have low agricultural value. They use semi wild horses in extensive pastoral systems. They will try to demonstrate that in fact initiatives do not often have to follow the requirements of the calls, that there may be some adjustment, or creation of some new measures and indicators.
- Open2Preserve: https://interiordoavesso.pt/interior-do-avesso/cavalos-garranos-na-prevencao-de-incendios-florestais-investigacao-utad/. Fuel management using horses in Serra do Gerês and, consequently, for the prevention of fires; also aiming to implement a sustainable strategy from the socioeconomic point of view, in partnership with Universidade de Trás-os-Montes e Alto Douro (UTAD – University of Trás-os-Montes e Alto Douro).
- Rewilding Portugal – Progressive approach to conservation. Let nature take care of itself, enabling natural processes to shape land and sea, repair damaged ecosystems and restore degraded landscapes. It is very interesting though very recent and with no results to show so far.
- Rebanhos da Serra do Açor e Rabadão.

Other comments/contributions

- This activity is not profitable, nor is ATNatureza's mission to be profitable.
- The fire surveillance campaigns showed very positive results, having decreased the fire frequency in the area.

4.2 Fuel management smart solutions assessment - INTERVIEW					
Basic information		**ID_INit**		**ID_INST**	12
Initiative/Solution					
Institution	Cooperativa Terra Chã				
Personal data	Not publishable				
General competences					
Fuel management programs					

☐ EU projects ☐ Local/regional initiatives ☐ Normative compliance ☒ RDP ☒ Other	**Details** - PRODER. Measure 1.1., and support to indigenous breeds. - Portuguese paying agency (IFAP): funding for beekeepers call (PAN: National Apiculture Program). - Funding from Vodafone Company (multinational telecommunications company) for the establishment of the flock, in 2009.

Measures and indicators

Did not specify any.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

- To ensure that the flock has an important role in the community, namely in environmental terms;
- Promoting touristic activities in the trails of the protected area of the Natural Park (Natura2000) (passive prevention);
- Using sapper goats to manage fuel in otherwise abandoned lands. Particular emphasis in areas around the town;
- Rehabilitation of 2 small water sources for the flocks use;
- Production practices (silviculture and apiculture) compatible with the maintenance and enhancement of the landscape and the protection of the environment.

Which are the limitations of the actions? (related to gaps/challenges)

- The biggest limitation has to do with funding institutions, namely IFAP. Currently, the lack of payments is compromising the business development. Payments are do each 3 months and the entity reimburses the amount already paid by Cooperativa Terra Chã, which causes many financial constraints. One year ago, the funding was given in advance, which was more manageable. In addition, the court's decision on a case filled by Cooperativa Terra Chã against IFAP is still pending; hence, all funding from other calls is blocked until a decision is reached. As so, Cooperativa Terra Chã is now very short on money to proceed with regular activities.
- According to the current market laws, flocks are not economically viable. Cooperativa sells lambs in Portuguese territory but cannot make a profit of it.

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

- To promote the Terra Chã Natur brand of local products, to become more well-known and maybe attract investment to improve the businesses and enlarge the flock.
- To increase the revitalization of local economies and the development of marginal territories.
- To review and increase the amount of funding given by ICNF to manage fuel in the primary network.
- To speed up the evaluation process of the ICNF calls for funding (e.g., Cooperativa Terra Chã has applied to the call "Conducting fuel management with livestock husbandry - Prevention of forest fires (Sapper Goats)" in 2018 and is still waiting for the results of the call.
- To develop payments for ecosystem services (maybe from the state budget for forest fire prevention), since flocks in this territory are contributing to decrease fire risk and also to enhance and manage biodiversity of Natura2000' priority habitats. Not an allowance, but a payed service.
- To increase funding for agriculture production.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

- Quinta Lógica (Sistelo): https://quintalogica.com/. Local development project for sustainable management of ecosystems and fire prevention. Within the World Biosphere Reserve Gerês-Xurés (UNESCO), in the parish of Sistelo, municipality of Arcos de Valdevez, it counts with a flock of native goats, in extensive grazing and invites people, even living in the city, to get involved in the landscape management, adopting a goat and following the life of the herd, from a distance or visiting the herd.
- Rebanhos da Serra do Açor e Rabadão.

Other comments/contributions

- Silvopastoral activity is currently not profitable, and it will hardly be in the future. Cooperativa Terra Chã is only profitable because it has other sectors of activity to compensate (restaurant, accommodation, apiculture, and tourism activities such as guided tours).
- Before the existence of the flock, people would burn shrubland to decrease fire risk, and would probably produce more fires. Currently people understand that the flock is taking care of fuel management and there is no need for such type of fire around the town. Since the flock was created, there was not any fire.
- Cooperativa Terra Chã applied to a LIFE call, to fund the creation of strategic management and economically viable business models, in partnership with many other silvopastoral businesses around Portugal that are also struggling. Nevertheless, that application was not approved.

4.2 Fuel management smart solutions assessment - INTERVIEW					
Basic information		**ID_INit**	15	**ID_INST**	
Initiative/Solution	**SILVPAST Operational Group - "Cost-efficient implementation of silvopastoral mosaics of Quercus pyrenaica"**				
Institution					
Personal data	Not publishable				
General competences					
Fuel management programs					
☐ EU projects ☐ Local/regional initiatives ☐ Normative compliance ☒ RDP ☐ Other	**Details** - PRODER				
Measures and indicators					
Measure 1.1. Cows and wild horses are using GPS collars to monitor their activity such as, which places they prefer. In situ monitoring, also using drones, to keep track of vegetation structure and composition, vertical and horizontal vegetation profile, biodiversity, birds, soils, etc. Satellite imagery monitoring to record NDVI changes with time.					
Gap analysis (open questions)					
Which are the contributions of the actions to wildfire prevention? (related to achievements)					
- To reduce fuel and to create more forage in the Quercus pyrenaica forest for the animals, helping landowners to spare money in animal feed in the summer. - To increase vertical discontinuity through fuel management using cows and horses.					
Which are the limitations of the actions? (related to gaps/challenges)					
- Concerning the project: financial constraints because of excess of bureaucracy. PRODER forms and reports required are very difficult to follow if a partner is not acquainted nor works with a project office to ask for assistance in these issues. This is what is happening with SILVPAST, whose activities are being developed with the funds of other ongoing R&D projects for the same 2 pilot areas. It is also very difficult to pass through the reimbursement process, which discourages the partners to invest in advance, thus compromising the development of the project. - Concerning the objectives of the project: need for mechanical fuel management in dense vegetation areas as a previous fuel treatment. Cows cannot manage these dense areas by themselves.					
How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)					

- To disseminate lessons learned and to replicate useful tools created in the project in other areas.
- To better manage the grazing regime (number of animals, species, etc.) and adjust it to different areas.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

- ATNatureza (Associação Transumância e Natureza)
- Rewilding Portugal

Both manage landscape using herbivorous.

Other comments/contributions

4.2 Fuel management smart solutions assessment - INTERVIEW					
Basic information		**ID_INit**	**16**	**ID_INST**	
Initiative/Solution	**Forest management for conservation of the Iberian wolf habitat - ACHLI**				
Institution					
Personal data	Not publishable				

General description

Fuel management programs

	Details
☐ EU projects ☐ Local/regional initiatives ☐ Normative compliance ☐ RDP ☒ Other	ACHLI is the Associação de Conservação do Habitat do Lobo Ibérico (Association for the Conservation of the Iberian wolf habitat). 100% private capital, from 3 sources: - Associativism; - Provision of forest management monitoring services; - Compensatory payments by the windfarms to the "Wolf Fund" (this is the most related with forest management for conservation). ACHLI does not apply to public fund calls (e.g., fuel management), because compensatory measures are not legally allowed to be funded by public institutions. The "Wolf Fund" is an autonomous fund, managed by ACHLI. It was created to manage the capital generated by the mandatory compensatory measures arising from the windfarms environmental impact assessments (EIA). The EIA works as a preventive instrument of environmental policy, whose purpose is to collect information, identify and forecast the environmental effects of certain projects, as well as the identification and proposal of measures that prevent, minimize or compensate for these effects.

Measures and indicators

- ACHLI has partnerships with the baldios (common lands), in the sense that they allow ACHLI to plan and implement measures for the conservation of the Iberian wolf habitat in their common lands. These measures include fuel management to prevent forest fires. Fuel management activities are monitored by ACHLI.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

- Fuel management in oak stands by cutting and clearing shrubs, to increase resilience to forest fires. They use exclusively mechanical and manual treatments, followed by the bio-masticator when appropriated.
- Afforestation using native hardwoods, which are more resilient to fire.
- Cleaning of watercourses (this action already showed positive results, since one past fire event did not go beyond the watercourse that was cleaned)
- Direct sowing for feeding game species along the powerlines. Although powerlines belong to REN, the land is still managed by the common landowners.
- ACHLI tries to implement useful measures not only for habitat conservation, but also for land owners. For example, the shrubs that are cleared are not removed but are instead given to landowners to be later used as fodder; Shrub clearing in areas identified by land owners as useful areas for cattle grazing (without the clearings cattle cannot enter the areas because shrubs are too dense).

Which are the limitations of the actions? (related to gaps/challenges)

- Previous forest fires: areas affected by several fires are harder to manage. In the present, the biggest problem is to control plants belonging to Genisteae genus, which are very frequent after fires and very expensive to eradicate.
- Conflicts with the landowners of the common lands related with management and the distribution of the public subsidies for cattle. Producers do not want to change land use because they will most likely lose subsidies.

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

- Coordination among plans and projects for fire prevention and fire management (and among the responsible entities included in those plans and projects) within the same communal region.
- Better interaction and communication between ACHLI projects, municipalities and ICNF (Portuguese Institute for Nature Conservation and Forests)

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

- Rewilding Portugal
- Montis
- Municipality of Paredes de Coura
- Quercus
- Palombar Association

Other comments/contributions

- ACHLI purpose is conservation, therefore profitability is not an objective at short or long term. Their projects are developed in order to last 15 to 20 years and the income goes to the common lands management (baldio).
- ACHLI does not manage production forest, they just work with native oak stands.
- ACHLI has 14 ongoing projects with a total of 700 hectares within 13 common lands.
- ACHLI has a partnership with Montis in S. Pedro do Sul, in which Montis provides the land and ACHLI plans and implements conservation measures.

4.2 Fuel management smart solutions assessment - INTERVIEW				
Basic information	ID_INit		ID_INST	5
Initiative/Solution				
Institution	**Rede Energética Nacional (REN)**			
Personal data	Not publishable			
General description				
Fuel management programs				
	Details			

☐ EU projects ☐ Local/regional initiatives ☒ Normative compliance ☐ RDP ☐ Other	For entities like REN, there is no funding for the execution of a secondary network, nor for afforestation. Investment is 100% from the company.

Measures and indicators

- Strategic and tactical planning each 10 years: definition of priorities in electric lines and parishes.
- Operational planning: identification of the areas to be converted into more resilient areas to fires.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

- To manage vegetation in the easements of electricity transmission lines.
- To define a successful model to manage these easements differently, in order to serve as fire breaks even without intervention.
- To increase biodiversity.
- Good risk management. LIDAR scanning every year.
- REN is promoting a network of green infrastructures through the reforestation with native species.

Which are the limitations of the actions? (related to gaps/challenges)

- The rugged terrain sometimes puts workers at risk. In that case the conversion of landscape is not performed.
- The great number of hectares of cork and oak forest. Complying with the law, the distance between trees should be at least 4 m.
- Reduced number of service providers with technical and safety capacity for the execution of the planned interventions.
- Low productivity (ha/day) motivated by the massive use of moto-manual means.
- Growing demand for this type of services due to the 2017 fires, which caused a supply break.
- Unattainable goals, namely fuel management criteria defined by law, such as distance between trees, and maximum vegetation height.
- Rigid period (until May 31) to perform fuel management.

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

- Continuing the reconversions to more resilient areas to fire.
- REN's infrastructures become more resilient after forest reconversions. Therefore, these easements located at reconverted areas should be used in the fire-fighting phase and can be mapped and inserted in the firefighter's decision support system (e.g. plans).

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

Other comments/contributions

- REN has a protocol with Quercus. Quercus analyses each vegetation reconversion project and discusses the best species for each area.

Annex 4. Interviews related to initiatives/institutions from Greece

4.2 Fuel management smart solutions assessment - **INTERVIEW**				
Basic information	ID_INit		ID_INST	6
Initiative/Solution				
Institution	**Chios Voluntary Action Team - OMIKRON**			
Personal data	Not publishable			
General description				
Fuel management programs				
☐ EU projects ☒ Local/regional initiatives ☐ Normative compliance ☐ RDP ☒ Other	**Details** OMIKRON, being a volunteer group, plans and performs fire prevention activities on the island of Chios with a plan it develops (informing the local authorities). These activities include forest fuel management, population sensitization and education, fire prevention patrols and initial attack firefighting interventions. Small funding is received from the General Secretariat of Civil Protection (OMIKRON is a registered volunteer group with the GSCP). Support is offered by private donors and the Municipality of Chios in the form of fuel (for patrolling, chainsaws, etc.), uniforms, tools, etc.			
Measures and indicators				
Fuel management in the form of shrub removal and pruning of the lower branches of trees started around 2000. Following a large and destructive fire in 2012, fuel management for the development of fuelbreaks, started being applied in a more systematic way, in selected areas, in agreement with the Local Forest Service Office. The vegetation management work, in addition to shrub removal and tree pruning also involves improving access to forest roads (where they have been blocked by vegetation growth, etc.). The team of volunteers who work in fuel management (15 -20 persons) has treated about 2 ha along roads in the last 4 years. Most of the work has been done in the peri-urban forest of the cities of towns of Chios and Vrontado. Regarding performance of these works, the relatively limited area treated and the changing conditions on the island that affect fire risk and its distribution (the island is one of the most affected places in Greece from immigrant influx from Turkey, changing the number of people on the island, their distribution and the conditions of living), do not allow any safe conclusions. Recent major fires on the island were the fire of 18 August 2012 which burned over 11000 ha, and two fires in 2016 (24-26 July 2016 and 26 August 2016). The forest fire problem in Chios is persistent and often involves precious agricultural lands.				
Gap analysis (open questions)				
Which are the contributions of the actions to wildfire prevention? (related to achievements)				
The activities carried out by OMIKRON in Chios island clearly contribute to forest fire prevention. Given the limited treated area, it is not surprising that so far there have been no documented fires that stopped on the fuelbreaks that have been created. The most important contribution has to do with sensitization of the public to the issue of forest fires. Furthermore, they constitute a procedure of learning-by-example.				
Which are the limitations of the actions? (related to gaps/challenges)				

The effectiveness of the work of OMIKRON could be enhanced if there would be some support from the authorities that would allow an increase in the number of people involved and the days they can devote in carrying out the activities. OMIKRON believes that, for example, more support from the municipality could increase the number of people willing to be involved. One example of needed support is the need for a good quality/high capacity wood chipper that would allow chipping the logging residues. Currently, they have to burn the residues so productivity is affected negatively by the required man-hours and the effort to find appropriate weather conditions.
How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)
It would be important to win the true and in-depth interest of the local municipality in order to increase participation of volunteers. Good cooperation with the authorities can increase effectiveness by reducing bureaucratic obstacles. The head of the Local Forest Service office, fortunately, is quite positive and supportive to the activities of OMIKRON. Thus, the Team faces no obstacles regarding the areas they treat: they only need to inform the Local Forest Service Office. A recent activity that OMIKRON tries for the first time is prescribed burning for fuel reduction. The practice is not promoted in Greece. Starting a fire is illegal within the fire season. However, outside of the fire season, in the fall of 2019, OMIKRON was able to try prescribed burning for fuel reduction over an area of 0.5 ha for the first time, without conflict with the authorities. The burn, which has had an experimental and experience-building character, was carried out by 15 volunteers. A formal proposal for a research & demonstration project on fuel management, including prescribed burning, is being developed at this time, hoping it will be a significant contribution to forest fire prevention on the island and a blueprint for the country.
Do you know good initiatives/best practices linked with wildfire prevention and management? Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)
An important initiative that can make a difference in wildfire prevention is a campaign to sensitize and educate the public on prevention measures, that would be carried out in coordination and cooperation by the region, the municipality, the relevant operational authorities (Fire Service, Forest Service), and OMIKRON. This should take place before the start of the fire season.
Other questions/comments/contributions

4.2 Fuel management smart solutions assessment - **INTERVIEW**				
Basic information	ID_INit		ID_INST	8
Initiative/Solution				
Institution	**Decentralized Administration Authority of Macedonia and Thrace, Forest Service Office (Dasarheio) of Kassandra**			
Personal data	Not publishable			
General description				
Fuel management programs				
	Details			

☒ EU projects ☒ Local/regional initiatives ☐ Normative compliance ☒ RDP ☒ Other	**Rural Development Programme (RDP) 2014-2020, Measure 8, sub-measure 8.3: "Prevention of forest damage due to forest fires, natural disasters and catastrophic events"** - Maintenance – improvement of fire lookouts - Construction of closed type water tanks - Safe management of logging residues (chipping) **Public Investments Program (National Funds)** - Forest road network maintenance **"Green Fund" (It belongs to the Ministry of Environment and Energy) (National Funds)** - Forest road network maintenance - Safe logging waste management (fragmentation) **Regular State Budget (Regional Level)** - Forest road network maintenance - Safe management of logging residues (chipping) **Programme of Public Benefit Character (OAED – Organization for the Employment of the WorkForce)** - Forest management interventions (including forest fuels) **Forest Loggers' Cooperatives** - Unplanned contingency salvage logging due to natural disasters **Local scale non-public forest management** - Protection and multi-objective management of the forest estate of Stavronikita with 10-year time frame. - Application of silvicultural measures for the fire protection of the municipal forest of the settlement of Siviri, of the community of Kassandreia
Measures and indicators	

1. **Maintenance of the Forest Road Network for fire protection of the public forests of the area of responsibility of the Forest Service Office of Kassandra.**

It is carried out on an annual basis and includes the lease of machinery (loader, grader) for the removal of debris, improvement of the road surface and cleaning of the ditches of 550 km of forest road network, and clearing of 99 ha of firebreaks. It is financed by various sources: Regular State Budget, Public Investments Program, "Green Fund". The budget of the study prepared annually by the Forest Service Office of Kassandra reaches 330,000 euros but the total annual funding does not exceed 70.000 euros.

2. **Cultivation interventions in coniferous forests, for Fire Protection of Public Forests in the area of responsibility of the Forest Service of Kassandra, through the Public Benefit Programme of OAED.**

The work was carried out by seasonal workers as part of the community service program, mainly in the form of 50-70m wide fuelbreaks in wildland-urban interface (WUI) areas on both sides of the forest road network, in order to minimize the risk of starting fires. The work included: pruning of all the trees of the overstory to a height of 3 meters, removal of broken trees and dead woody material lying on the ground and removal of understory vegetation, excluding however well-developed individual shrubs and trees (or clubs of them) generally over 15 years old. These individuals or clubs were pruned to a height of 1.5 m in order to become in the future part of the overstory. Logging of standing tall trees was not included in these interventions, because the seasonal workers that carried out the action did not have the appropriate experience and qualifications. Pruning and shrub cutting was followed by the collection of logging residues. The wood products of sizes > 8-10 cm in diameter were given to the local community as firewood, while the rest were converted to chips using a wood chipper and were re-distributed on the forest floor or were burned.

According to the statistical data of our Service, the crews managed an average of 0,5 ha per day. The activity lasted 16 months and took place both during and after the end of the fire season. The salary cost of the participants in the program was covered by OAED (Total annual gross salary for the employees of our Service approximately 210.000 euros (33 employees (27 workers, 4 scientific staff, 2 administrative employees)). The cost of personal protection equipment (PPE) for three workers was covered by "Green Fund" funds (Total cost for the employees of our Service about 2.500 euros). The cost of the required tools and equipment for the execution of the planned works, as well as the cost for fuel, lubricants and for supply of spare parts, repair-maintenance of the personnel transport vehicles and the mechanical equipment used, etc. was covered by funds of the "Green Fund" and the Regular State Budget (Total annual cost for our Service 7.000 euros). The transportation of personnel from the headquarters of the Forest Service Office to and from the respective work areas was done by a bus of the Fire Service and by the vehicles of our Service.

3. **Protection and multi-objective management of the private forest estate of Stavronikita (Prefecture of Chalkidiki) with a 10-year time frame**

This management is being implemented on a yearly basis (from November to March) for the last 10 years in the private forest "Stavronikita" with an area of 400 ha in in the area "Sani" of Kassandra. Activities are done in accordance with an approved study for the protection and multi-objective management of the forest. Forest/fuel management works are carried out in the form of 70 m wide fuelbreaks on either side of the forest road network of the estate. The work is Implemented by the owner of the forest (who also own a large hotel unit in the forest by the coast) under the supervision of the Local Forest Authority (the Forest Service Office of Kassandra). The methodology and standards of the work are the same as described in (2) above, with the difference that the logging residues are not chipped but are burned exclusively. The cost of implementation is borne exclusively by the forest owner and reaches an average of 75,000 euros per year, while each year they manage an average of 8-10 ha.

4. **Execution of forestry operations for the fire protection of the municipal forest of the settlement of Siviri, community of Kassandreia (SIVIRI MUNICIPAL FOREST).**

It will be implemented this year for the first time by the Municipality of Kassandra and will include works as described in case (2) above. The project will be auctioned with a budget of 50.000 euros. It is planned to treat 5.5 ha of municipal forest. According to the approved study, the action is not expected to be repeated in the coming years.

5. Fragmentation of accumulated fuel from the Public Forests and the infrastructure of the forest road network within the area of responsibility of the Kassandra Forest Service.

Due to the work of the crews of the community service program but also due to severe weather conditions (heavy rainfall, storms, and gusty winds) that often affect the area of Kassandra, breaking and uprooting large numbers of Aleppo pine (*Pinus halepensis*) trees, significant quantities of wood residues and timber slash are produced. These are collected by the workers and are gathered in piles on the side of the road or in gaps in the forest. Because this biomass dries out over time, it pauses a significant fire ignition risk. Thus, there is an urgent for proper and safe management. The action taken chipping of all this wood material with a diameter of up to 10 cm, using a wood chipper and re-distribution of the chips in the forest. This work also includes transfer of the wood chipper to the points along the roads where the wood residues have been piled up on the roadside. In 2019, the Forest Service Office of Kassandra crushed more than 5,500 (stacked) cubic meters of wood residue from forest management works at a total cost of 23,000 euros. Funding was covered by the "Green Fund" and the Regular State Budget.
For this specific action, our Service has submitted an application for support to the RDP 2014-2020, Measure 8, sub-measure 8.3: "Prevention of forest damage due to forest fires, natural disasters and catastrophic events", for a total budget of 60,000 euros in order to meet the needs of our Service for two (2) years.

6. Logging work in the context of emergency harvesting due to natural disasters (FORESTRY COOPERATIVES)

The estimated timber amount to be harvested is leased directly to Forest Workers' Cooperatives, according to article 134 of the Legislative Decree 86/69. In this way, the Cooperative produces and sells the products, paying a fee to the "Central Fund of Agriculture, Livestock Production and Forests" in accordance with the current annual list of forest product pricing.

The procedure involves removing only the uprooted, broken, burnt and diseased (by illnesses or insects) dominant trees, following the issuance of a relevant emergency decision by the Service. The tree branches are pruned inside the forest, using a chainsaw, then the trunks are removed with the use of tractors, while their branches remain inside the forest. This procedure does not burden the state budget. In the last two years, 10,730 cubic meters of round timber and 2,600 cubic meters of firewood were produced in the Kassandra region were sold for commercial purposes by the Cooperatives.

7. Construction of two (2) closed type water tanks for fire protection of the Public Forests of the Municipality of Kassandra, Chalkidiki Perfecture

For this specific action, our Service has submitted an application for support to the RDP 2014-2020, Measure 8, sub-measure 8.3: "Prevention of forest damage due to forest fires, natural disasters and catastrophic events". The total requested budget is 72,755.65 euros.

8. Maintenance work on permanent fire lookouts

The subject of the project is to carry out maintenance and to improve monitoring systems in the two permanent heavily-built fire lookouts of the Kassandra peninsula, in the Municipality of Kassandra, in the Prefecture of Chalkidiki, These are basic infrastructures in the design and coordination of forest fire prevention and suppression. The purpose of the project is to ensure the adequacy and safety of the buildings of the lookouts in order to equip them with special fire detection, camera-based systems, in order to achieve timely warning of the involved Agencies.

In recent years, the technology of remote detection of fires in forest areas has been further developed. Current technology allows the detection of fires in just 3 minutes from their start and at distances of up to 13 kilometers during day-time. These systems are intended for early warning against fires or illegal burning and emissions.

For this specific action, our Service has submitted an application for support to RDP 2014-2020, Measure 8, sub-measure 8.3: "Prevention of forest damage due to forest fires, natural disasters and catastrophic events", for a total budget of 103,000 euros.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

All the above actions have a direct contribution to the fire protection of Public and Non-public forests in the area of responsibility of the Forest Service Office of Kassandra. This, of course, must be scientifically proven by determining the degree of contribution of each action separately to fire protection. Probably less direct effect on fire protection bear the logging works of the Forestry Cooperatives that are primarily related to the sustainable management of forests and the production of forest products.
The peninsula of Kassandra, which has a total area of 33,370 ha, has suffered three major historic fires in recent history:

- The fire of June 21-23, 1977 which burned 1,153 ha of Aleppo pine forest, 660 ha of agricultural lands and 33 ha of olive groves.
- The fire of July 21-29, 1981 which burned 1,450 ha of Aleppo pine forest and 700 ha of agricultural fields and olive groves, and
- The fire of August 21-29, 2006 which burned approximately 5,000 ha.

All other fires in the last 15 years were much smaller (generally less that 20 ha). According to these data it can be claimed that the effort devoted to fire prevention is producing significant results.

Which are the limitations of the actions? (related to gaps/challenges)

- Limited funding resulting in limited area that can be managed yearly.
- Misguided national forest management policy. It focuses on the production of forest products (commercial timber) with the result that forest ecosystems not producing commercial timber while at the same time being the most vulnerable to forest fires, do not have priority in financing for management aiming to forest fire protection.
- Long delays in the financing but also in the tender procedures of the project. As a result prevention activities are often carried out within or even after the end of the fire season.
- Inadequate number of forest staff employees, which results in inadequate overseeing of forest management activities.
- Lack of specialized training in fuel management procedures.
  Seasonal staff (public benefit program- OAED) come from sensitive social groups (disabled, increased average age, no previous relevant experience) and it is difficult to meet, to a large extent, the increased skills that a forest worker should have. The program presented some problems in its implementation that should be foreseen in the future, including ensuring the movement of workers from the headquarters of the service to and from the respective work areas in forest complexes.
- Reaction of the residents of the area but also groups of beekeepers and resin collectors against any kind of logging and cultivation work in the forest as they consider, each for their own reasons, that their interests are affected (eg locals want to log by themselves dead or broken trees to meet their firewood needs).

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

- Increase of funding.
- Priority should be given to high forest fire risk areas.
- Training of stakeholders in matters of management and decision-making for the optimal use of available resources in priority areas (WUI areas, fuelbreaks along on both sides of the forest road network).
- Simplification of auction procedures for projects and for employment.
- Use of modern technology for faster and more accurate collection of field data (use of drone)
- Awareness of the local authorities and the Church for utilization of their forest property which in most cases remains completely abandoned.
- Informing citizens - especially those involved in agro-forestry operations or living in WUI areas - for the need to be involved in fuel management actions within the limits of their property.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

Silvicultural interventions - in the sense of creating fuelbreaks in well-chosen locations with parallel appropriate and safe residue management (fragmentation), is perhaps the best and most immediate management method to reduce the risk of forest fires. Such actions can be funded both by the state budget (RDP, “Green Fund”, Regural State Budget) and through European programs (Partnership Agreement for the Development Framework) 2014-2020).
Fire prevention costs 28 times less and brings better results than fire suppression.

Other questions/comments/contributions

4.2 Fuel management smart solutions assessment - **INTERVIEW**					
Basic information		ID_INit		ID_INST	8
Initiative/Solution					
Institution	**Decentralized Administration of Attiki, Forest Directorate of Eastern Attiki, Local Forest Service Office of Lavrio**				
Personal data	Not publishable				
General description					
Fuel management programs					
☒ EU projects ☐ Local/regional initiatives ☐ Normative compliance ☒ RDP ☒ Other	**Details** RDP 2014-2020 measures (submitted, under evaluation): 08.03.01_1 Forest Fuel management for fire hazard reduction 08.03.01_1 Supply and establishment of an innovative tracing and monitoring system of forest fires along with a setting a GPS tracking system to fire patrol vehicles - 18-months period Employment program launched by the Greek Manpower Employment Organization (OAED) under the tittle “Community Service Program for forest fire prevention” - “Green Fund” (It belongs to the Ministry of Environment and Energy) (National Funds). Forest road network maintenance				
Measures and indicators					

08.03.01_1 Forest Fuel management for fire hazard reduction
- Call for proposal (under evaluation)
- Actions funded: forest fuel management treatment in order to reduce fire hazard along the forest road network through selective cutting, crown pruning, clearing of undergrowth, dead forest wood removal, firebreaks maintenance.
- Selection criteria: Attica region is considered by law as a high wild fire risk area; much of the forest lies inside the Natura 2000 protected areas network; existence of an updated Forest Fire Prevention Plan.
- Follow-up: it is the first time that our department has applied for such a programme and there is no experience so far.

08.03.01_1 Supply and establishment of an innovative tracing and monitoring system of forest fires along with installing a GPS tracking system for fire patrol vehicles

- Actions to be funded: supply all the necessary equipment (surveillance cameras, weather data station, fire risk announcement signs, all the necessary hardware and software, GPS tracking system to fire patrol vehicles
- Selection criteria: Attica region is considered by law as a high wild fire risk area; much of the forest lies inside the Natura 2000 protected areas network; existence of an updated Forest Fire Prevention Plan.
- Follow-up: no previous experience/knowledge

- 18 months Employment program launched by the Greek Manpower Employment Organization under the tittle "Community Service Program for forest fire prevention"
The aforementioned programme had two main goals:

a) To offer employment to people with special emphasis on the population groups most severely affected by unemployment
b) Introduce forest fire prevention actions mainly in forest fuel management

The work was carried out by seasonal workers as part of the community service program, mainly in the form of creation of 50-70m wide fuelbreaks in wildland-urban interface (WUI) areas on both sides of the forest road network, in order to minimize the risk of starting fires. The work included pruning of trees to a height of 3 meters, removal of broken trees and dead woody material lying on the ground and removal of understory vegetation, excluding however well-developed individual shrubs and trees (or clubs of them) generally over 15 years old. These individuals or clubs were pruned to a height of 1.5 m in order to become in the future part of the overstory. Logging of standing tall trees was not included in these interventions in the beginning, because most of the seasonal workers did not have the appropriate experience and qualifications, however 4 workers had previous experience (after been interviewed) and carried out the logging of standing trees when it was necessary. Personal protection equipment was provided. Pruning and shrub cutting was followed by the collection and disposal of logging residues. The wood products of sizes > 8-10 cm in diameter were given to the local community as firewood, while the rest were collected by the municipality authorities and converted to chips using a wood chipper or were burned.

According to the statistical data of our Service, the crews managed a total area of 15,0 ha. The activity lasted 16 months and took place both during and after the end of the fire season, however due to mismanagement and delays in buying the mechanical equipment and personal protection equipment, for a period of four (4) months the workers remained inactive. The salary cost of the participants in the program was covered by OAED (Total annual gross salary for the employees of our Service approximately 580.000 euros (46 employees (40 workers, 2 scientific staff, 4 administrative employees)). The cost of personal protection equipment (PPE) for three workers was covered by "Green Fund" funds (Total cost for the employees of our Service about 2.500 euros). The cost of the required tools and equipment for the execution of the planned works, as well as the cost for fuel, lubricants and for supply of spare parts, repair-maintenance of the personnel transport vehicles and the mechanical equipment used, etc. was covered by funds of the "Green Fund" and the Regular State Budget (Total annual cost for our Service 6.000 euros). The transportation of personnel from the headquarters of the Forest Service Office to and from the respective work areas was done by the mini-bus of our Service and a bigger one offered by the municipality of Lavrio.

Maintenance of the Forest Road Network for fire protection of the public forests of the area of responsibility of the Forest Service Office of Lavrio.

It is carried out on an annual basis and includes the lease of machinery (loader, grader) for the removal of debris, improvement of the road surface and cleaning of the ditches of 20 km of forest road network, and clearing of 2,5 ha of firebreaks. It is financed by various sources: mainly by the "Green Fund". The budget of the study prepared annually by the Forest Service Office of Lavrio reaches 83.000 euros but the total annual funding does not exceed 20.000 euros.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

All the aforementioned measures are directly linked with wildfire prevention, since the main objective of Greek Forest Service are to implement measures and actions on Forest Fire Prevention and reducing fire hazard. In addition, the lack of forest personnel and the poor funding from the Regular State Budget, lead us to apply to the RDP.

As far as the Employment program launched by the Greek Manpower Employment Organization under the tittle "Community Service Program for forest fire prevention" concerns, although it had positive impacts to forest fire prevention actions, there is no guarantee that it will run again. It was a programme that even though was roughly planned, gave the opportunity to the local forest service office to act fast and in a short term to train unskilled and aged workers in field work.

Which are the limitations of the actions? (related to gaps/challenges)

- Since it is the first time that the Local Forest Service Office of Lavrio was encouraged by the General Directorate of Forests and Forest Environment to apply to RDP, there is no previous experience. Assuming a positive evaluation of our proposal to the RDP, we'll face a serious challenge in order to apply the foreseen measures effectively due to the inadequate forest personnel in the Forest Service Office of Lavrio.
- The "Community Service Program for forest fire prevention" was a positive programme but part of a fragmented governmental policy.
- Limited funding results in limited area that can be managed yearly.
- Misguided national forest management policy. It focuses on the production of forest products (commercial timber) with the result that forest ecosystems not producing commercial timber while at the same time being the most vulnerable to forest fires, do not have priority in financing for management aiming to forest fire protection.
- Long delays in the financing but also in the tender procedures of the project. As a result prevention activities are often carried out within or even after the end of the fire season.
- Inadequate number of forest staff employees, which results in inadequate overseeing of forest management activities.
- Seasonal staff (public benefit program- OAED) come from sensitive social groups (disabled, increased average age, no previous relevant experience) and it is difficult to meet, to a large extent, the increased skills that a forest worker should have. The program presented some problems in its implementation that should be foreseen in the future, including preparatory planning to avoid delays such as those that occurred initially with the above mentioned program. Such preparations would include timely availability of tools and PPE, and arranging in time for the transportation of workers from the headquarters of the service to and from the respective work areas in forest complexes.

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

- Increase of funding in fire prevention
- We strongly support a yearly Community Service Program for forest fire prevention (8 months programme) as it used to be in the past, where the local forest service offices were able to hire skilled workers to be employed in field work.
- Simplification of auction procedures for projects and for employment.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

Other questions/comments/contributions

There was no cost-efficiency analysis and evaluation for the "Community Service Program for forest fire prevention"

4.2 Fuel management smart solutions assessment – **INTERVIEW**					
Basic information		ID_INit		ID_INST	
Initiative/Solution					
Institution	**Management Authority of the National Forest Park of Parnitha**				

Personal data	Not publishable

General competences

Fuel management programs

☐ EU projects ☒ Local/regional initiatives ☐ Normative compliance ☐ RDP ☒ Other	**Details** - Donations from private companies - Annual funding from the "Greek Casino Company", which operates the "Casino of Parnitha" within the National Forest Park area, as reciprocal fees

Measures and indicators

Regarding forest fires, the Management Authority of the National Forest Park of Parnitha, mainly applies prevention and pre-suppression measures.

Prevention measures

- Road maintanance: Maintance and reconstruction of necessary roads for sustainable forest management.

- Vegetation treatment: Removal of understory vegetation and pruning of branches up to a height of 3m along the main roads to a width of 25 meters on both sides of the road. The length of the roads treated is about 15 km.

- Preparation and implementation of an annual Fire Protection Plan. The plan includes and describes all the fire suppression resources and equipment that can be made available by each local municipality, the local Forest Service Office (dasarheio) and the volunteer organisations which are active for the protection of Mount Parnitha and its forest. The plan describes the way and the areas, where each of the above can be active. Each team has a specific role (e.g. patrol , surveillance from fire lookouts, etc.) on specific time periods during the 24-hour period. In this way, an effective distribution of human resources is achieved. There are no hard data on the effectiveness of the plan, but all the involved municipalities and organisations agree that this practice solved the problem of unnecessary simultaneous mobilization of many different partners, that often resulted, in the past, in misunderstandings, dangerous traffic jams, frustration, etc..

Pre- suppression measures

- Detection and reporting of forest fires

Fire Detection network: In the public forest of Tatoi, at the base of the mountain, where there is a dense pine forest, a network of fire detectors has been set up as a pilot. 8 poles, 4 m tall, have been placed along the forest road (about 5km) and fire detectors (sensors) have been placed on the top. The network consists of: a. a central computer b. software program that connect the computer with the receiver c. program that project to the computer the topographic plan with the locations of the receivers d. UPS for uninterrupted system operation e. receiver and antenna for receiving signals. The fire detectors only send fire alarms when they detects a real flame in the space that they cover. There is special software installed in the detector that allows it to distinguish the flame of a "lighter" from that of a real fire. The fire alarm is immediately transmitted to the office manager with a sound on the computer, so he/she can see on the computer screen the exact starting point of the fire. At the same time, it is possible to notify the personnel by SMS to their mobile phone, about the exact location of the fire. The system, from the moment it detects the fire, monitors its evolution and when the fire goes out, it sends a report that the fire has been extinguished. The sensors are also equipped with an anti-theft system that can detect potential thieves who might try to climb the fence around the towers to steal them. The system immediately reports to the operations center which detector in the area has a problem with theft. There is an automatic daily testing on each detector that informs about the situation of the detector (if it works or not). If a Fire Detector stops working, the entire fire detection system does not collapse, but continues to operate with the rest of the stations on the network. Detectors work and provide information on adverse weather conditions. After the system has been implemented, the patrols on the region have been reduced. Also, we try to find money so as to expand it to other areas.

- GPS localization network system on light fire trucks (4X4 semi-trucks). The light fire trucks that the staff the Management Authority and the volunteering organisations possess, are equipped with a GPS system. Their position is being reported to a computer at headquarters where the office manager can see on the screen the dispersion of these light fire trucks at any moment. The distance between their positions can be easily calculated. Also, the time needed to traverse a distance is calculated. In an emergency case, the office manager saves time (that is valuable on such a situation) and takes decisions faster. We estimate that after implementation of the capability for the office manager to immediately locate the fire trucks closest to each starting fire, the intervention time has been reduced by about 15 minutes, which is a significant improvement in such cases.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

The role of the Management Authority is not directly the protection from fire but the management of the forest species and ecotypes. Thus, its activities above can be considered as auxiliary, but they do contribute: - To the improved condition of the road network, that is used by firefighting trucks - To the reduction of fuel along roads, where more people move mostly by cars (in Parnitha, according to a previous study from the local Forest Service Office, there about 1.000.000 visitors per year). These areas along the roads are at higher risk of fire starts due to the carelessness of visitors (e.g. cigarettes). - To the reduction of the time needed for first intervention on starting fires. It is known that a fire must me attacked at its "birth".
Which are the limitations of the actions? (related to gaps/challenges)
The limitations are related to the fact that certain measures must be applied on a small scale and be proven before they can be adopted more broadly (e.g. fire detection network). This creates an awkward and hesitant climate on private funding, as donors do not seem willing to spend money on trials.
How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)
Some motivations must be given from state so as the private sector can invest on pilot actions.
Do you know good initiatives/best practices linked with wildfire prevention and management? **Are these initiatives funded by specific programs, or could it be funded?** (related to the identification of smart solutions)
Other comments/contributions
Cost-efficiency analysis is needed for the applied measures. The public sector in Greece in not used to such an approach. Co-operation among all the responsible services, municipalities or volunteers must be achieved. It is not rare the situation that different human and material resources are devoted without intention for the same objective, duplicating the effort (e.g. People patrolling a specific area may ignore that there are other people doing the same in the same area at the same time).

4.2 Fuel management smart solutions assessment **– INTERVIEW**				
Basic information		**ID_INit**		**ID_INST**
Initiative/Solution	**Forest fire prevention in a highly visited forest at the outskirts of Athens**			
Institution	**Philodassiki Enossi Athinon**			
Personal data	Not publishable			
General competences				
Fuel management programs				
☐ EU projects ☐ Local/regional initiatives ☐ Normative compliance ☐ RDP ☒ Other	**Details** Forest fire prevention works and actions according to Forest Management Plan: - Silvicultural treatments - Fire protection infrastructure maintenance and improvement - Fire observatory staffing - Public awareness The works are carried out with the NGO's own funding			
Measures and indicators				

- **Silvicultural treatments**
  Pruning, thinning, selective cutting, removal of dead trees and fuel debris: forest stands improvement and fuel reduction according to the 10-year forest management plan (total surface 30-40 ha/year)
  weeding on the roadsides and outdoor recreation areas: fire prevention works - every year (surface ~10 ha)
- **Fire prevention infrastructure maintenance and improvement**
  Maintenance of:
  - a pumping unit, pipe and water tanks system, electrical control and automation installations
  - 12 water tanks placed in strategic points in the forest
  - 14 water points (with fire hoses)
  - forest road network maintenance (5-8 km/year)
- **Fire observatory staffing**
  Recruitment of seasonal staff for two (-2-) fire observatories
- **Public awareness**
  Maintenance of signposts with informative content about forest fires

Informative pamphlet circulation during summer

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

All the measures mentioned are directly linked with (wild)fire prevention, even the silvicultural treatments in forest stands which ameliorate the whole forest at the same time reduce the fuels.

Which are the limitations of the actions? (related to gaps/challenges)

The main limitation is the available budget (the forest is a recreation area and the owner is an non-profit NGO, so every year there is a prioritisation of necessary works).

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

Finding financial resources from public and private sector for ensuring the appropriate activities.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

Greek forest service implementing the RDP 2014-2020 opportunities (Measures 8.3 & 8.4).

Other comments/contributions

There is no cost-efficiency analysis for the measures applied.

4.2 Fuel management smart solutions assessment **- INTERVIEW**				
Basic information	ID_INit		ID_INST	8
Initiative/Solution				
Institution	**Decentralized Administration Authority of Crete (DAAC)- Forest Directorates (FD)**			
Personal data	Not publishable			
General description				
Fuel management programs				
	Details			

☐ EU projects x Local/regional initiatives ☐ Normative compliance x RDP ☐ Other	1. Financing of the FD through the "Green Fund" of the Ministry of Environment & Energy for the implementation of projects and tasks for wildfire prevention and fuel management. 2. Financing of the FD through the Public Investments Program of the Ministry of Development & Investments for wildfire prevention in forests and the construction-maintenance of forest roads. 3. Financing of the FD through the RDP 2014-2020 of the Ministry of Rural Development & Food. Measures: • 8.3.1 Wild fire prevention • 8.4.1 Reclamation of destroyed forest environments through reforestation • 8.4.2 Reclamation of destroyed forest environments.

Measures and indicators

1. Annual financing from the Ministry of Environment & Energy: Construction-maintenance-improvement of the forest roads network. For year 2020: €80,000 for the whole area of the region of Crete.
2. Annual financing from the Ministry of Development & Investments: Maintenance and improvement of the forest roads network. For year 2020: financing guaranteed but no credit distribution to the FD yet.
3. In previous year, 2019, seasonal staff was employed for 10 months for the cleaning of forest land vegetation (fuel removal) and the pruning of forest trees in forest areas surrounding towns and settlements.
4. For financing from RDP 14-20 (implementation until 2023), the following projects were submitted in April 2020:

- 8.3.1 Wild fire prevention:
  "Works for wildfire prevention on the island of Gavdos, SW Crete"
  "Protection and regeneration of the upland pine forests in SW Crete"
  "Works for wildfire prevention in the prefecture of Heraklion, Crete"
- 8.4.1 - 8.4.2 Reclamation of destroyed forest environments:
  "Reforestation of burnt upland forests in Eastern Crete"
  "Additional reforestation and fencing installation on reforested areas outside the city of Heraklion, Crete".

Projects' total cost estimation: €4,000,000

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

All the actions executed by the Forest Directorates of Crete aim directly to wildfire prevention as they have to do with works and infrastructure that build capacity against forest fires. Such works include: improvement of the forest roads condition; construction of new forest roads as well as of fire prevention zones; building of water reservoirs in sensitive natural areas; fuel removal out of forests and vegetation cleaning-pruning in forest ecosystems that neighbor settlements and main roads or in forest stands under a special protection regime.
Actions and works that have an indirect, yet equally critical, contribution to wildlife prevention are: reforestation of disturbed areas; cultivation and use of fire-resistant plant species; gradual replacement of the fire-sensitive species; enhancement of the natural regeneration procedures in burnt areas etc. Such measures also play an important role in the management of forest land reclamation as well as during the extinguishing process in wildfire incidents.

Which are the limitations of the actions? (related to gaps/challenges)

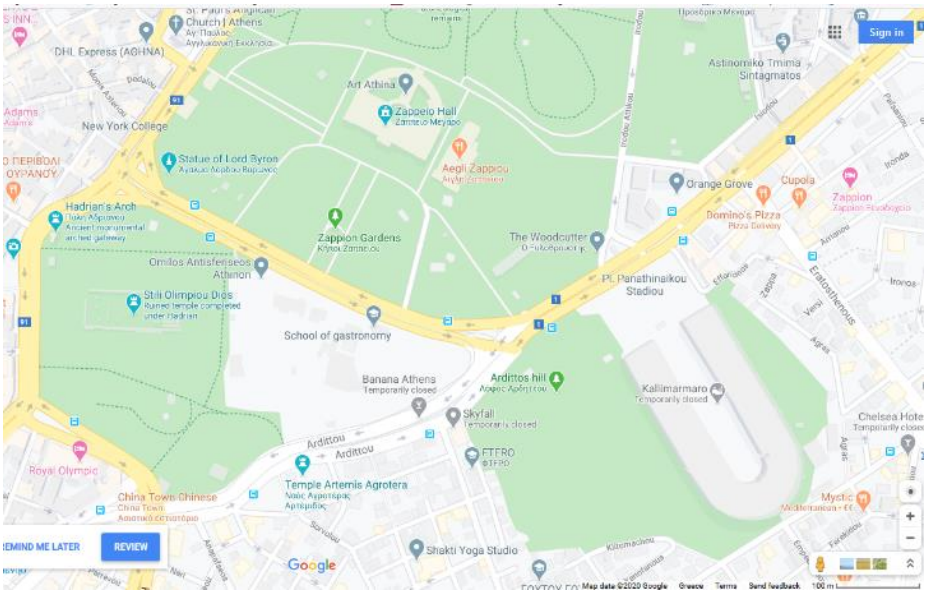
State financing for the fire prevention actions is insufficient for sensitive areas, like Crete, where the summer season usually lasts for six months and the weather conditions (winds, high temperatures, drought) favor fires. Also the financing is available to the Forest Directorates late in spring time so the wildfire prevention works start within the summer period.
The Forest Directorates of Crete are also severely understaffed and they can barely perform their basic duties.

How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)

E.U. and National spending should be considerably increased and paid in advance to the F.D.s that are responsible for performing all the needed actions and projects.
Regional and local management plans for the protection of forest environments should be prepared or updated.
Environmental education should be expanded and enhanced.

Do you know good initiatives/best practices linked with wildfire prevention and management?
Are these initiatives funded by specific programs, or could it be funded? (related to the identification of smart solutions)

European Forest Fire Monitoring using Information Systems (EFFMIS) is considered best practice for wildfire monitoring and prevention and was financed by the INTERREG IVC.
Other questions/comments/contributions
In the last few years, Greece implements a National Program of composing the Forests Map Charter as part of the procedure for creating a complete land registry of the whole country. The Ministry of Environment and Energy and the F.D.s conduct the actions needed for this great endeavor, to finally develop this important tool that will be precious for establishing land uses, protecting the natural environment and reducing the risks of wildfire incidents.

4.2 Fuel management smart solutions assessment - **INTERVIEW**				
Basic information	ID_INit		ID_INST	
Initiative/Solution				
Institution	**Olympia and Bequests Committee (OBC)**			
Personal data	Not publishable			
General description				
Fuel management programs				
☐ EU projects ☐ Local/regional initiatives ☐ Normative compliance ☐ RDP ☒ Other	**Details** Measures for forest fuel management and risk reduction in urban parks in the center of Athens, Greece (the gardens of Zappeion Megaron (Zappeion Hall), and the hills of Ardittos and Alea surrounding the Panathinaikon Stadium ("Kallimarmaro") where the first modern Olympic Games took place.. The area is of extreme importance due to its location and its history. 			
Measures and indicators				

(i.e. type of action funded, application/selection criteria, period of applicability, traceability (follow-up), indicators of cost-effectiveness, other indicators: surface (average per year or total per period) administrative records certified (per year or per period).

Fuel reduction is carried out in an area of 24 ha by four permanent workers under the directions of an agronomist. Work includes grass and shrub removal, tree pruning, and removal of dead litter on the ground. Additionally a team of at least three people is contracted every year, from May to September, to carry out fuel management work and 24-hour surveillance at a cost of 20.000 €.

Gap analysis (open questions)

Which are the contributions of the actions to wildfire prevention? (related to achievements)

There has been no fire in this protected area in recorded history, due to the surveillance measures and the reduced fuels, in spite of the significant number of visitors.
Which are the limitations of the actions? (related to gaps/challenges)
Funding availability is critical for continuing these actions in an adequate way. As there is no external funding earmarked for this task (i.e. no funding by a specific programme such as the funds for Civil Protection), each year there is a debate for securing this funding from the budget of the OBC, among many competing demands.
How to enhance the contributions of the actions towards wildfire prevention? (understanding that passive and active prevention are a fundamental axis for wildfire management)
The currently applied actions of passive and active prevention in the managed area appear adequate judging from the results. A major concern is to maintain a good link with the fire suppression mechanism in order to respond quickly in case of a detected fire.
Do you know good initiatives/best practices linked with wildfire prevention and management? **Are these initiatives funded by specific programs, or could it be funded?** (related to the identification of smart solutions)
All initiatives we know try to combine fuel management with reduction of the potential for fire starts and quick detection and response. It is important to achieve this efficiently (i.e. with reduced cost). In the case of OBC, the combination of permanent workers with additional seasonal personnel at the time of the fire season works well.
Other questions/comments/contributions
A series of photos of the hill of Ardittos, its location within Athens and the Panathinaikon Stadium, and the fuel management status are provided at the end of the document as Apendix.

Annex 5. Best smart solutions selection

<table>
<tr><th colspan="6">Initiatives and smart solutions towards fire resilient landscapes</th></tr>
<tr><td colspan="4">Basic information</td><td>ID INit_</td><td>15</td></tr>
<tr><td>Initiative</td><td colspan="5">SILVPAST: Cost-efficient implementation of silvo-pastoral mosaic systems of black oak.</td></tr>
<tr><td>Promoter</td><td colspan="5">TERRAPRIMA</td></tr>
<tr><td>Scope</td><td colspan="2">☒Regional/Sub-regional ☒National ☐EU</td><td>Place</td><td colspan="2">Portugal</td></tr>
<tr><td colspan="6">General focus (mark as much as necessary)</td></tr>
<tr><td rowspan="2">Classes into DRM cycle phases</td><td>☐Active prevention</td><td colspan="4">Passive prevention ☐Forestry production
☒Maintaining mosaic landscape and grazing
☒Other societal and structural support to rural development</td></tr>
<tr><td colspan="2">☐Preparedness</td><td colspan="2">☐Response</td><td>☐Recovery</td></tr>
<tr><td colspan="6">Description and complementary information</td></tr>
<tr><td rowspan="2">Main category</td><td colspan="2">☒Best practice</td><td colspan="3">☐Field reference guide / training material</td></tr>
<tr><td colspan="2">☐ Mobil app. / portal web</td><td colspan="2">☐ Software / IT / DSSS</td><td>☐ Video / Media resource</td></tr>
<tr><td>Available languages</td><td colspan="5">Portuguese and English</td></tr>
<tr><td>Short description</td><td colspan="5">The Operational Group SILVPAST (GO SILVPAST) on the “Cost-efficient implementation of silvo-pastoral mosaics of Quercus pyrenaica” will test and develop a method for the implementation of silvo-pastoral mosaics, using remote sensing approaches, that supports agricultural and forestry activity in areas of Pyrenean oak, which typically have low agricultural value.

GO SILVPAST targets two levels of intervention. The farm or property level, where the main actors are the forest owners and managers, and the level of territorial management where the main actors are the policy makers, from the local to the national level.

The silvo-pastoral model being proposed, as well as the planning and management tools that will be developed, aim to address the current lack of cost-efficient management alternatives in these regions and to promote economic viability through greater multifunctionality and resilience, and lower management costs.

The main objectives are:
• Test a cost-efficient production process that enables silvo-pastoral activity and guarantees its long-term sustainability
• Deliver methods and tools for the replication of the proposed process
• Support decision-making, and the evaluation and design of agri-environmental policy
• Promote the restoration of Pyrenean oak forest
• Contribute to control the risk of fire
• Strengthen territorial resilience to environmental and socio-economic changes</td></tr>
<tr><td>Complementary information</td><td colspan="5"></td></tr>
<tr><td>Web link</td><td colspan="5">https://www.terraprima.pt/en/projecto/23</td></tr>
<tr><td>Contact</td><td colspan="5">Not publishable</td></tr>
</table>

Initiatives and smart solutions towards fire resilient landscapes				
Basic information			**ID INit_**	**25**
Name	**Action areas enlargement of large fires prevention plan of Matadepera municipality**			
Promoter	ADF (Catalonia ID_Inst 10) Matadepera			
Scope	☒Regional/Sub-regional ☐National ☐EU	Place	Matadepera, Catalonia, Spain	
General focus (mark as much as necessary)				
Classes into DRM cycle phases	☒**Active prevention**	**Passive prevention**	☐Forestry production ☒Maintaining mosaic landscape and grazing ☐Other societal and structural support to rural development	
	☒**Preparedness**	☒**Response**	☐**Recovery**	
Description and complementary information				
Main category	☒Best practice	☐Field reference guide / training material		
	☐ Mobil app. / portal web	☐ Software / IT / DSSS	☐ Video / Media resource	
Available languages	Catalan			
Short description	The municipality of Matadepera (Barcelona province) has one Forest Defence Association (ADF, see Institution 10 of Catalonia) with more than 25 years of experience. The municipality has part of their territory in a Natural Park protected (Natura 2000) and has different projects promoted by the ADF, highlighting the Large Fires Prevention Project. The Project was enlarged to improve the efficiency and effectiveness in the emergency management by large forest fires. Different areas of action are defined in a supra-municipal scale through a joint plan between different owners' associations that determines some of actions included in the Large Fires Prevention Plan. This, was an opportunity to enlarge the wildfire prevention infrastructures on a larger scale. The ADF of Matadepera promoted the recovery of extensive grazing of sheep and goats to maintain these infrastructures (that implies a reduction of the fuel mass) through a specific contract with the cattle ranchers, that was an opportunity to comply with two objectives at the same time (recovery of the traditional grazing on the territory and maintaining the infrastructures with less mechanical work). As a part of the management, the ADF is in charge of till and sow some crops to produce meal for the cattle. With this cattle, that are doing wildfire prevention actions, is stablished a proximity market line that is selling the meat.			
Complementary information	This initiative was selected in 2019 as a prize-winner of different initiatives in wildfire prevention. The award was promoted by the Barcelona Province Authority to recognise the best wildfire prevention initiatives in Barcelona province.			
Web link	-			
Contact	Not publishable			

<table>
<tr><th colspan="6">Initiatives and smart solutions towards fire resilient landscapes</th></tr>
<tr><td colspan="4">Basic information</td><td>ID INit_</td><td>5</td></tr>
<tr><td>Initiative</td><td colspan="5">LIFE Monserrat. Integrated silvopastoral management plan: An innovative tool to preserve biodiversity and prevent wildfires (LIFE13 BIO/ES/000094)</td></tr>
<tr><td>Promoter</td><td colspan="5">Province authority of Barcelona (Catalonia ID_Inst 9)</td></tr>
<tr><td>Scope</td><td colspan="2">☒Regional/Sub-regional ☐National ☐EU</td><td>Place</td><td colspan="2">Barcelona province</td></tr>
<tr><td colspan="6">General focus (mark as much as necessary)</td></tr>
<tr><td rowspan="2">Classes into DRM cycle phases</td><td>☒Active prevention</td><td colspan="4">Passive prevention ☐Forestry production
☒Maintaining mosaic landscape and grazing
☐Other societal and structural support to rural development</td></tr>
<tr><td colspan="2">☐Preparedness</td><td colspan="2">☐Response</td><td>☐Recovery</td></tr>
<tr><td colspan="6">Description and complementary information</td></tr>
<tr><td rowspan="2">Main category</td><td colspan="2">☒Best practice</td><td colspan="3">☐Field reference guide / training material</td></tr>
<tr><td colspan="2">☐ Mobil app. / portal web</td><td colspan="2">☐ Software / IT / DSSS</td><td>☐ Video / Media resource</td></tr>
<tr><td>Available languages</td><td colspan="5">Catalan, Spanish, English</td></tr>
<tr><td>Short description</td><td colspan="5">LIFE Montserrat is a European Life+project with a duration of 4 years. The main objectives of the project are (1) the development of ecosystem-based measures to increase resilience and stability of forests against fires; (2) the contribution to biodiversity conservation and improvement in the Montserrat area, with habitats and species of high conservation value included in the Birds and Habitats Directives; and (3) biodiversity conservation by increasing connectivity through the creation of a mosaic of scrub, natural grasslands and forests that will link two Natura 2000 sites.

The project presents the grazing as an alternative of wildfire prevention. The capacity of livestock to effectively control shrub growth is supported by scientific evidence so targeted grazing could be expected to successfully reduce fuel loads.</td></tr>
<tr><td>Complementary information</td><td colspan="5">- Press (Spanish): https://www.efeagro.com/noticia/rebanos-ovejas-vacas-limpieza/?utm_source=rss&utm_medium=rss&utm_campaign=rebanos-ovejas-vacas-limpieza
- Layman’s Report (English): https://lifemontserrat.eu/wp-content/uploads/2019/07/00-Layman-Report-ENG-DIGITAL.pdf
- Project Newsletter (English): https://us11.campaign-archive.com/?u=fda7d33c9b960cb7485e98833&id=fa099af2cc&e=a98aa3e0d6
- Project presentation video (English): https://www.youtube.com/watch?v=EQg70lOIAEg&feature=youtu.be</td></tr>
<tr><td>Web link</td><td colspan="5">https://lifemontserrat.eu/en/</td></tr>
<tr><td>Contact</td><td colspan="5">Not publishable</td></tr>
</table>

Initiatives and smart solutions towards fire resilient landscapes				
Basic information			ID INit_	10
Initiative	**Boscos del Vallès (Valles Forests)**			
Promoter	Sub-Regional Authority of Vallès Occidental territory (Consell Comarcal del Vallès Occidental)			
Scope	☒Regional/Sub-regional ☐National ☐EU		Place	Vallès Occidental, Catalonia
General focus (mark as much as necessary)				
Classes into DRM cycle phases	☒**Active prevention**	**Passive prevention** ☒Forestry production ☐Maintaining mosaic landscape and grazing ☐Other societal and structural support to rural development		
	☐**Preparedness**	☐**Response**	☐**Recovery**	
Description and complementary information				
Main category	☒Best practice	☐Field reference guide / training material		
	☐ Mobil app. / portal web	☐ Software / IT / DSSS	☐ Video / Media resource	
Available languages	Catalan			
Short description	This project is an innovative initiative that brings a new approach to the wildfire prevention. It is based on the structuring of biomass buying-selling market, to achieve a good forest management, protecting from wildfires at the same time that brings an economic revitalization of the forest sector and the generation of proximity energy. This is an innovative project in Catalonia because works with wildfire prevention through biomass valorization, and also because the Sub-regional public authority has created its own competence and a Sub-regional Service of Biomass. The energy created through this biomass serves to provide energy to the different public equipments. Different actors are involved in: Sub-regional authority, municipalities, Government of Catalonia, Province Authority of Barcelona, Forest Defence Association (ADF), forest owners, potential big consumers of biomass (hospital, university, etc.), forest research centres, etc.			
Complementary information	Report of the project (CAT): http://www.ccvoc.cat/fitxer/4647/LLIBRET%20BOSCOS%20DEL%20VALL%C3%88S.pdf			
Web link	http://www.ccvoc.cat/consell-comarcal/serveis/area-de-territori-i-cooperacio-local/boscos-del-valles			
Contact	Not publishable			

Initiatives and smart solutions towards fire resilient landscapes			
Basic information		ID INit_	14
Initiative	**Open2preserve**		
Promoter	Interreg SUDOE – Coord. University of Navarra (SPAIN) participation of several Portuguese institutions.		

Scope	☒Regional/Sub-regional ☒National ☒EU	Place	Portugal/Spain/France
General focus (mark as much as necessary)			
Classes into DRM cycle phases	☒**Active prevention**	**Passive prevention**	☐Forestry production ☒Maintaining mosaic landscape and grazing ☒Other societal and structural support to rural development
	☒**Preparedness**	☐**Response**	☐**Recovery**
Description and complementary information			
Main category	☒Best practice	☐Field reference guide / training material	
	☐ Mobil app. / portal web	☐ Software / IT / DSSS	☐ Video / Media resource
Available languages	Portuguese/Spanish/english		
Short description	OPEN2PRESERVE provides a sustainable economic management system to reduce fire risks within Southwestern Europe. Thus, the project contributes to the preservation of ecosystems and to the ecological quality of open mountain spaces with high environmental value. In this sense, the Project is built upon the combination of technical fires and pastoralism and provides training to forest workers, solutions adapted to the territorial features and jobs.		
Complementary information			
Web link	https://open2preserve.eu/en/		
Contact	Not publishable		

Initiatives and smart solutions towards fire resilient landscapes			
Basic information		ID INit_	**19**
Name	**Grazing program for fire hazard abatement through the "Landa Carsica" business network**		
Promoter	Friuli Venezia Giulia Region		
Scope	☒Regional/Sub-regional ☐National ☐EU	Place	Monfalcone, Friuli Venezia Giulia, Italy (first experience, then replicated in other places)
General focus (mark as much as necessary)			
Classes into DRM cycle phases	☒**Active prevention**	**Passive prevention**	☐Forestry production ☒Maintaining mosaic landscape and grazing ☒Other societal and structural support to rural development
	☒**Preparedness**	☐**Response**	☐**Recovery**
Description and complementary information			
Main category	☒Best practice	☐Field reference guide / training material	
	☐ Mobil app. / portal web	☐ Software / IT / DSSS	☐ Video / Media resource
Available languages	Italian		

Short description	In the Carso area of the Friuli Venezia Giulia, North East Italy, a grazing program started in 2013 to reduce fire hazard in high fire risk areas. The program aims at reducing fuel load by grazing in strategic areas while sustaining intervention by activating a value chain of meat products. The program includes the temporary use of private lands for 5 years after notification to land owners if these areas fall within the area identified as strategic for fire hazard abatement (Regional Law 17/2019). Private lands are committed to local farmers. However, the owners continue keep their rights on them. A business network called "Landa Carsica" between local farmers was created to reach a consistent company size in order to gain access to RDP Measures. In this way, the economical sustainability of the program is guaranteed by gaining access to the RDP Measures 4.4.1. "*Investimenti non produttivi connessi con la conservazione e la tutela dell'ambiente*" to restore the "landa carsica" habitat and landscape, 11.1.1. "*Conversione all'agricoltura biologica*" to adopt the organic farming method and 10.1.8. "*Razze animali in via di estinzione*" to preserve the "grigio alpina" cattle breed whose population is facing a dramatic decrease.
Complementary information	Soon after, a second initiative started on the fire-exposed site of "Monte Sabotino", province of Gorizia, Friuli Venezia Giulia. Abandoned lands were committed to a non-profit association which raises sheeps for didactic ends. RDP Measure 4.4.1. "*Investimenti non produttivi connessi con la conservazione e la tutela dell'ambiente*" was activated to fund the scrub clearing and restore the productivity of the pastures.
Web link	RDP Measure: http://www.regione.fvg.it/rafvg/cms/RAFVG/economia-imprese/agricoltura-foreste/psr-programma-sviluppo-rurale/news/260.html Journal paper: https://www.fondazioneiseni.it/wp-content/uploads/2016/06/LIBERO_19-02-2017.pdf
Contact	Not publishable

Initiatives and smart solutions towards fire resilient landscapes				
Basic information			ID INit_	**4**
Initiative	**Ramats de foc (Fire flocks)**			
Promoter	Pau Costa Foundation (Catalonia ID_Inst 11)			
Scope	☒Regional/Sub-regional ☐National ☐EU		Place	Girona Province, Catalonia
General focus (mark as much as necessary)				
Classes into DRM cycle phases	☐**Active prevention**	**Passive prevention** ☐Forestry production ☒Maintaining mosaic landscape and grazing ☒Other societal and structural support to rural development		
	☐**Preparedness**	☐**Response**	☐**Recovery**	
Description and complementary information				
Main category	☒Best practice	☐Field reference guide / training material		
	☐ Mobil app. / portal web	☐ Software / IT / DSSS	☐ Video / Media resource	
Available languages	English, Catalan and Spanish			

Short description	Ramats de Foc brings together all public and private agents interested in the continuity of silvopastoralism, by aligning their various needs, and articulating a production and consumption chain of food products from herds with the added value of decreasing fire risk in woodlands with a strategic role in the propagation of wildfires (as determined by Firefighters of Catalonia and the Department of Agriculture). The added value of this initiative is to strength the links between wildfire management services, farmers and local butchers and restaurants. The initiative works in adding value to the products of the participating farmers, through a label that certifies the herds' fire risk management tasks. Customers will thereby know that eating Ramats de Foc products delivers societal benefits; it will keep alive local extensive livestock farming and preserve forests.
Complementary information	
Web link	https://www.ramatsdefoc.org/en/
Contact	Not publishable

Initiatives and smart solutions towards fire resilient landscapes					
Basic information				ID INit_	27
Name	**Rebanhos da Serra do Açor-Rabadão**				
Promoter	Anabela Martins & Luis Fontinha				
Scope	☒Regional/Sub-regional ☐National ☐EU		Place	Serra do Açor (Center region), Portugal	
General focus (mark as much as necessary)					
Classes into DRM cycle phases	☒**Active prevention**	**Passive prevention** ☐Forestry production ☒Maintaining mosaic landscape and grazing ☒Other societal and structural support to rural development			
	☒**Preparedness**	☐**Response**	☒**Recovery**		
Description and complementary information					
Main category	☒Best practice	☐Field reference guide / training material			
	☐ Mobil app. / portal web	☐ Software / IT / DSSS	☐ Video / Media resource		
Available languages	Portuguese				
Short description	Private initiative of a couple that rented a communal land to raise goats, to produce dairy products using local agricultural products, to maintain the primary firebreaks network, with the ultimate goal of being a living and practical experience of sustainability and integration with the environment. The project has 3 pillars: environment, fire management and forestry production. It will show forestry producers profitable options for maintaining the forest and the firebreaks in eucalyptus and conifers plantations. It will also show the benefits of integrating pastures (irrigated and non-irrigated) to have high quality forestry production. The academic field will be represented in the project by helping to think and define how to improve the agricultural and forest holdings, contributing to the local development. It will likely be created a flock of sapper-goats for fuel management around Gois town, showing community a profitable alternative to fuel management machines. The interaction with the community and the pedagogical perspective will be developed through visits, collaboration with the municipality, and workshops with interested entities and for the public, especially for the local community.				
Complementary information					
Web link	https://www.facebook.com/pg/Rebanhos-da-Serra-do-Acor-Rabad%C3%A3o-397052831049512/about/?ref=page_internal				
Contact	Not publishable				

Initiatives and smart solutions towards fire resilient landscapes			
Basic information		ID INit_	28
Name	**Landscape Fire Project – New methodologies for forest fire prevention**		
Promoter	EU, LIFE - Coord. Comunidade Intermunicipal Viseu Dão Lafões (PORTUGAL), participation of Spanish Institutions		

Scope	☐Regional/Sub-regional ☐National ☒EU	Place	Spain/Portugal
General focus (mark as much as necessary)			
Classes into DRM cycle phases	☒**Active prevention**	**Passive prevention** ☐Forestry production ☒Maintaining mosaic landscape and grazing ☒Other societal and structural support to rural development	
	☒**Preparedness**	☐**Response**	☐**Recovery**
Description and complementary information			
Main category	☒Best practice	☐Field reference guide / training material	
	☐ Mobil app. / portal web	☐ Software / IT / DSSS	☐ Video / Media resource
Available languages	English		
Short description	The main objective of this project is to develop an effective procedure for fire prevention in Viseu Dão Lafões (Portugal) and in Sierra de Gata, Las Hurdes and Sierra de San Pedro (Spain). It will carry out a series of pilot actions, based on a methodology successfully implemented elsewhere (in Andalusia and Catalonia). This methodology combines prescribed fires and grazing techniques to reduce forest fuel, converting fire-prone forests into more resilient areas. The project will contribute to a range of EU policy and legislation, including: the forest strategy; roadmap to a resource efficient Europe; circular economy action plan; thematic strategy for soil protection; biodiversity strategy; and the Habitats and Birds directives.		
Complementary information	Expected results include around 900 ha of grazed fire-breaks, reducing bare ground by 60%, leading to less soil erosion and compaction as well as a significant increase in soil organic carbon; and reduction of 120/ha in the maintenance costs for fire-breaks.		
Web link	https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=7215		
Contact	Not publishable		

Initiatives and smart solutions towards fire resilient landscapes					
Basic information				ID INit_	**18**
Name	**Firefighting training center of the Piemonte Region**				
Promoter	Regione Piemonte / FORMONT / Volunteers fire brigades of the Piemonte Region				
Scope	☒Regional/Sub-regional ☐National ☐EU		Place	Piemonte, Italy	
General focus (mark as much as necessary)					
Classes into DRM cycle phases	☒**Active prevention**	**Passive prevention** ☐Forestry production ☐Maintaining mosaic landscape and grazing ☐Other societal and structural support to rural development			
	☒**Preparedness**	☒**Response**	☐**Recovery**		
Description and complementary information					
Main category	☒Best practice	☒Field reference guide / training material			
	☐ Mobil app. / portal web	☐ Software / IT / DSSS	☒ Video / Media resource		
Available languages	Italian, English (main results)				
Short description	The training center of fire fighters of the Regione Piemonte was created in 2014 with the aim to train volunteer fire brigades in fire fighting and prescribed burning techniques. In the last year the training program uses a strategic fuel management site close to the center to train fire personnel to prescribed burning techniques. The strategic area divide two alpine valleys characterized by relatively flammable mixed broadleaved-coniferous forests, and consists in a fuel break 200 m large and 1.5 km long. The area is also grazed, consequently prescribed burning treatments implemented for training achieve multiple goals related to active fire prevention and grazing management.				
Complementary information	Free access video (in Italian): Training sessions on prescribed burning for fire hazard reduction carried out by the Fire Fighting Volunteer Corp of the Piemonte Region https://www.youtube.com/watch?v=hKF2jetdx7s https://www.youtube.com/watch?v=VtMgH76kGjU				
Web link	http://www.formont.it/peveragno.php; http://www.corpoaibpiemonte.it/?page=44556&c=44582&s=1651				
Contact	Not publishable				