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Title of document:

Capitalization paper – lessons learnt from past projects

Work package 1

Defining and implementing tools for wildfire prevention and mitigation

Activity 1.1

Implementation methodology

Deliverable 1.1.3

Capitalization paper – lessons learnt from past projects

Project full title:	Fire free MED
Mission:	Protecting, restoring and valorising the natural environment and heritage – Natural heritage
Priority:	Greener MED
Specific objective:	RSO 2.4 Promoting climate change adaptation and disaster risk prevention, resilience, taking into account eco-system-based approaches

Partner in charge: Comunidade Intermunicipal do Baixo Alentejo

Partners involved: Democritus University of Thrace, School of Agricultural Science and Forestry, University of Rijeka, Faculty of Maritime Studies, Fire rescue service Sežana, Rocca di Cerere Geopark, Municipality of Ulcinj and Centre of Integrated Geomorphology for the Mediterranean Area.

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Table of Contents

1. Introduction

The Mediterranean area is in deep need of transnational harmonisation of tools and practices designed to monitor and manage natural disasters and risks induced by human activities, creating a common approach to preventing climate change effects, particularly fires.

In that context, the main objective of the FRED project is to implement advanced ICT/UAS (Unmanned Aircraft System) remote sensing tools for climate change adaptation, disaster risk prevention and mitigation in the wildfire segment. The project's main result will be a significant increase in the prevention capacity of relevant authorities in the most endangered fire-prone areas.

FRED involves six piloting areas in different MED countries (Croatia, Portugal, Slovenia, Italy, Bosnia and Herzegovina and Montenegro). It indirectly connects stakeholders/beneficiaries through capitalising results and subsequent transferring of the specific, efficient and pragmatic tools for wildfire prevention and mitigation that will be implemented in this project. This is why, this deliverable - Capitalization paper – lessons learnt from past projects - is of vital importance for the successful development of the project.

The paper includes methodologies, tools and synergies from different projects already implemented by some of the partners in the consortium.

2. Projects to capitalize

2.1. Definition of the projects

This section details the projects selected for capitalisation in FRED.

The following projects have been selected for their suitability for the thematic area and their impact and relevance to FRED.

- Forest Monitoring System For Early Fire Detection And Assessment In The Balkan-med Area – "SFEDA" implemented by Democritus University of Thrace, School of Agricultural Science and Forestry.
- Ecological sustainable Governance of Mediterranean protected Area via improved Scientific, Technical and Managerial Knowledge Base implemented by the University of Rijeka, Faculty of Maritime Studies.
- CROSSIT SAFER implemented by Fire and rescue service Sežana.
- EU LEADER implemented by Rocca di Cerere Geopark.
- FIREPOCTEP - Prevention and management of the landscape exposed to huge forestry fires in cross-border rural areas between Spain and Portugal implemented by Comunidade Intermunicipal do Baixo Alentejo.
- Project on Capacity Building for Disaster Risk Reduction through National Forest Fire Information System (NFFIS) and Eco-DRR implemented by Municipality of Ulcinj.
- SPRINt (Integrated strategies for the prevention and monitoring of the fire risk and community awareness) implemented by Centre of Integrated Geomorphology for the Mediterranean Area (CGIAM).

Table 1 projects to capitalize in FRED

Name of the project	Funding program	Description of the project
SFEDA - Forest Monitoring System for Early Fire Detection and Assessment in the Balkan-Med Area	Interreg Balkan-Med	SFEDA was a project involving three countries: Greece, Cyprus and Bulgaria, and seven partners. The main output of SFEDA was the THEASIS system. THEASIS is a synergistic integration of mature technologies based on UAS, stationary thermal/optical cameras assisted by a fire risk assessment model. THEASIS is instrumental in minimising the time from onset to detection of a fire event, as well as false alarms, thus resulting in significant improvements in the average response time of a fire-fighting intervention. THEASIS is a scalable, modular system with various versions for autonomous monitoring and early fire detection, which was implemented and demonstrated in three forest terrains from the southern to the northern region of Balkan-Med countries.

EcoSUSTAIN - Ecological Sustainable Governance of Mediterranean protected Area via improved Scientific, Technical and Managerial Knowledge Base	Interreg Mediterranean	The goal of the EcoSUSTAIN project was to maintain biodiversity and natural ecosystems by strengthening the management and networking of protected areas; by developing an integrated management and networking methodology and by developing joint, state-of-the-art, water quality monitoring system. The core of the project was development of a short-term monitoring solution for water quality, to be implemented in four protected areas. This innovative ICT system that was developed within the project detects an increase of certain pollutants in the water and notifies designated recipients in real time.
CROSSIT SAFER - Cross-border cooperation between Slovenia and Italy for a safer region	Interreg Italia-Slovenija	The CROSSIT SAFER project deals with the reduction of geomorphological risk characteristics of the area and climate changes in the cross-border Slovenian-Italian area. The main objective of the project was to strengthen capacities of cross-border institutional cooperation in the way of encouraging public authorities and key actors of civil protection to plan common solutions for the potential of natural disasters; by striving for more coordinated preventive measures, preparedness measures and measures to respond to natural disasters.

EU LEADER	European Network for Rural Development (ENRD)	LEADER is a local development method which has been used for 30 years to engage local actors in the design and delivery of strategies, decision-making and resource allocation for the development of their rural areas. It is implemented by around 2 800 Local Action Groups (LAGs), covering 61 % of the rural population in the EU and bringing together public, private and civil-society stakeholders in a particular area (situation as of end 2018 - EU-28). In the rural development context, LEADER is implemented under the national and regional Rural Development Programmes (RDPs) of each EU Member State, co-financed from the European Agricultural Fund for Rural Development (EAFRD). All cultural, environmental education, sporting, entrepreneurial initiatives, etc. are designed in close contact with the people of this area and implemented by local entities who carry them out for the area.
FIREPOCTEP - Prevention and management of the landscape exposed to huge forestry fires in cross-border rural areas between Spain and Portugal	Interreg España-Portugal	FIREPOCTEP has as main objective the adaptation to climate change through the prevention and management of the landscape exposed to huge forest fires in rural cross-border areas between Spain and Portugal as of: • Identifying the strategic management areas for minimizing the risk and impact of the forest fires throughout the agroforest and grazing management of the landscape in a scenario of climate and global change. • Promoting public and private investment throughout the pilot experiences in a Green Economy framework. • Investigate new market niches.

FIREPOCTEP		• Educating fix and occasional rural population about the risk of forest fires, good preventive practices and self-protection; train and equip the cross-border operative personnel. Cross-border collaboration.
Project on Capacity Building for Disaster Risk Reduction through National Forest Fire Information System (NFFIS) and Eco-DRR		The West Balkan NFFIS and Eco-DRR Project aims to enhance resilience to natural disasters in the region through sustainable forest management and ecosystem-based approaches. It includes establishing a National Forest and Forest Information System, capacity building, promoting ecosystem-based disaster risk reduction, engaging communities and supporting relevant policies.
SPRINt - Integrated strategies for the prevention and monitoring of the fire risk and community awareness 		SPRINt is a project funded by Fondazione Con il Sud (Bando Ambiente 2018) and implemented between March 2019 and June 2022, aimed at defining different methodologies for forest fire monitoring, such as the selection of satellite data and processing algorithms for the delineation of burned areas, the study of the burn severity, and the resilience of fire-damaged areas by using integrated satellite and in-situ data. In addition, special attention was given to both procedures and algorithms for the optimal definition of a Fire Risk Map and the modelling relating to the determination of fire behaviour. Finally, the project included communication and dissemination activities for both technical-scientific and local

		community audiences. For these purposes, a webGIS platform to interactively analyse the project results and a smartphone application for forest fire detection and reporting were also developed. The target area of the SPRINt project, on which such methodologies have been successfully applied, is the "Appennino Lucano Val d'Agri Lagonegrese" National Park located in Basilicata region (Italy), whose Authority was partner of the SPRINt project and is also a CGIAM associated partner in the FRED project.

2.2. Tools, methods and synergies to capitalize

After detailing the projects selected for the capitalisation of some of their results in FRED, this deliverable explains which methodologies, tools or synergies will be used, how they can be used, the activities where they can be used, the benefits they will bring and the requirements and or restrictions to use them.

2.2.1. SFEDA - Forest Monitoring System For Early Fire Detection And Assessment In The Balkan-med Area

SFEDA used both stationary cameras as well as cameras on board UAS for fire detection and validation. Fire detection using UAS is a methodology that will be applied in FRED too. Furthermore, the Fire risk assessment that was conducted in the study areas of the SFEDA project helped to reduce false alarms but most of all, helped to increase the level of preparedness and alert of the fire fighting forces. This is of particular importance for reducing the time between fire ignition, fire detection and first attack.

The findings and tools developed in SFEDA will be capitalized in Activities A1.1. Implementation methodology and A1.2 Specification and implementation of the Wildfire risk prevention and mitigation platform where the methodology and the structure of the WFRPM platform will be developed. They will also be useful in Activities A3.1. Evaluation methodology elaboration and A3.2. Evaluation, where the developed platform will be tested and validated, where in this case some of the validation protocols used in SFEDA may also be employed by FRED.

The main benefit for using some of the SFEDA's methodologies is on the estimation of the fire risk assessment. This approach has been tested and it now forms part of the international literature. As a result, there is no need for testing alternative methodologies, which saves time and money. Furthermore, SFEDA provides an approach for the use of stationary and on-board UAS cameras for fire detection. Employing an existing and tested approach can also save time.

There is no restriction in using the employed methodology for fire risk assessment. The only restriction may be related to the availability of data which can be solved, given the availability of several alternative remote sensing-based data.

The investment for repeating the fire risk assessment is rather medium to low while the benefit of doing it is much higher. The replication of the entire methodology is not necessary in the frame of FRED, given that the later aims in providing a much more complete platform which will not only deal with

fire risk assessment but also with many other aspects such as detection, operational management, communication, prevention training etc.

2.2.2. EcoSUSTAIN - Ecological sustainable Governance of Mediterranean protected Area via improved Scientific, Technical and Managerial Knowledge Base

The idea, objective and methodology used in the development of the short-term monitoring solutions for the EcoSUSTAIN project follows the similar approach to solving problems caused by climate change. Technological innovations for monitoring different physical and biological parameters, natural conditions and the risk of unpredictable events in vulnerable environments as well as timely reactions to these conditions, connect both projects. In EcoSUSTAIN, water quality sensors mounted on a single buoy provide critical measurements and send data over the internet to the central server. The central platform serves as a dashboard where the users can read the data values on interactive charts, create reports and monitor the state of the critical water-quality-related parameters. Each pilot site had specific characteristics and risks, consequently, different working environments had to be integrated into the developed solution. The same might be expected in the FRED project. Different characteristics and risk levels in pilot areas can be integrated in the joint developed solution.

The know-how from the EcoSUSTAIN will be used in FRED as well, particular in Functional design of the wildfire prediction and mitigation platform and for the software solution to be developed. That includes technical level of interconnections between different sensors to be used on drones, data collection and management, communication protocols for data exchange in real-time etc. Features of the integrated platform built for EcoSUSTAIN and their working principle will help in creating the specific needs and functionality of the software solution in the FRED project.

Presumably, the description of some of the communication functionalities for functional specification (A1.2) will be the same, particularly push/pull notifications of the designated recipients.

The benefit that this solution will bring is to understand better the working condition of the different component of the system. In this way functional design, equipment selection, data collection and integration can be made more efficiently and reliably.

There are no restrictions on tools, however, there is different equipment and different types of challenges regarding real-data transferring and processing. For example, in the EcoSUSTAIN project, the equipment was stationary (buoys) and sensors collected spatial stationary data, whereas in

FRED, sensors will collect spatial and temporal dynamic data from drones and/or other sources.

Investment might be considered as medium or high only related to new specific equipment which is more flexible and covers much more testing area. However, the replication of the communication protocols is relatively low or low-to medium if some specific requirements in pilot areas occur.

2.2.3. CROSSIT SAFER

The project CROSSIT SAFER has several methodologies that are very relevant for FRED. In particular, these are:

- The methodology for mapping wildfire risk in the wildland-urban interface;
- A real-case study on the risk assessment of fires interacting with urban domains;
- Forest fuel assessment by LiDAR data. A case study in NE Italy.

These methodologies could be used in WP1 Defining and implementation tools for wildfire, specifically in A1.1 - Implementation methodology, contributing to deliverable 1.1.1 Preliminary data collection and processing study.

Capitalizing these methodologies, will contribute to the implementation of the collection data into the model.

Introducing the advantages of increasing the accuracy of the model, using captured data for simulations of fires in urban environments.

There are not considered restrictions/ investments for the implementation of the mentioned methodologies.

2.2.4. EU LEADER

The project has some lines of methodological action that could complement FRED's objectives such as:

- Recover cultural heritage, natural heritage and neglected resources through a process of cultural dynamization of integration of resources both physical and human and qualification of tourism offerings;
- Improve the usability of the area with the parallel development of a "communications system" to connect and promote the different areas for both local people and tourists;
- Enhance sites of landscape value;

- Establish the area of geosites with IUGS (International Union of Geographic Sciences) experimental research by defining geological and geomorphological interest for conservation and enhancement;
- Carry out restoration work on sites of high natural and scenic value such as ponds, forks, hedges, monumental tree specimen's representative of the traditional agricultural landscape.

This completed project allowed for creating a network of local stakeholders interested in the exploitation of the rural landscape and in the preservation of natural environment.

Many of those stakeholders are rural entrepreneurs and people involved in the tourism industry. This network will be capitalized in the present project as many of the contacts are valuable to the objectives of the FRED project.

This network can be used as a preventive observation network to detect initial phases of fires integrating the experience of some of the piloting partners with other categories of stakeholders like bus drivers and boat pilots.

Two main actions of the LEADER project could be adopted in FRED:

- Territorial Marketing to activate public and private stakeholders towards fire risks and mitigation;
- Environmental Culture to disseminate information and knowledge about the project and the services that will be activated and empowered. The intervention involved the creation of educational courses of knowledge, interpretation and diffusion of the main characteristics of the territory to create a real identity card of the territory itself at least as regards the emergence of important naturalistic, cultural, historians.

On the other hand, the LEADER project is providing an existing and running network for territorial dissemination of the tools, information and knowledge coming from the project.

The existing network collects the most part of private rural stakeholder that has to be involved to have a better knowledge of the territory and its maintenance state (in those parts that are not under the control of public stakeholders such as Forest Guards and Rangers).

The benefits that the project could bring to FRED are an enhanced sense of community (including a multidisciplinary network of rural stakeholders) and dissemination strategies and valorisation of the territory that will contribute to the mitigation of fires.

There is no restriction on using the project's dissemination methodologies and the network.

A dissemination phase is already planned within the project, and it is therefore possible to transfer this background without much additional investment.

2.2.5. FIREPOCTEP - Prevention and management of the landscape exposed to huge forestry fires in cross-border rural areas between Spain and Portugal

The main objective of the FIREPOCTEP project (Strengthening cross-border systems for preventing and extinguishing forest fires and improving resources for generating rural employment post-Covid-19) was to analyse the impact of climate change on fire risk and its effects on the environment.

To this end, joint tools were created to facilitate risk management in the cooperation territory by capitalising on the results, knowledge and good practices of projects already approved by POCTEP, such as CILIFO and GEFRECON. The experience of other projects such as SUDOE FIRE-RS will also be taken into account.

The FIREPOCTEP project promoted the improvement but also the cooperation and co-ordination of fire-fighting forces. It has set an example of good practice centred on the protection and promotion of the environment which enables job creation and innovation in rural areas by supporting the local economy and landscape conservation.

More specifically, the aim was to:

- Identify Strategic Management Zones to minimise the risk and impact of major fires through comprehensive landscape management in the face of global climate change.
- Encourage public and private investment through pilot experiments in the Circular Green Economy and research into new market opportunities.
- Educate the fixed and occasional rural population about the risk of major forest fires, good preventive practices and self-protection. Training and equipping the staff for cross-border operations.

These FIREPOCTEP project features could complement FRED's objectives and can also allow the sharing of good practices and the creation of a network of local and regional stakeholders interested in the field of the rural landscape, preservation of the natural environment from fires.

The benefits that the project could bring to FRED project are the experience in the creation of a multidisciplinary network of stakeholders, to present a wide range of good practices, to bring other FIREPOCTEP partners (such as academia partners) experience in what regards the work done in the definition of the Strategic Management Zones and the experience in what regards the dissemination strategies.

There is no restriction on using the project's dissemination methodologies and the network.

There are no considered investments for the implementation of the mentioned methodologies.

2.2.6. Project on Capacity Building for Disaster Risk Reduction through National Forest Fire Information System (NFFIS) and Eco-DRR

The following are methodologies, synergies and tools that FRED can utilize:

1. Methodologies:

- Ecosystem-based Approaches: The project employs methodologies that leverage natural ecosystems to reduce disaster risks, such as reforestation and habitat restoration.
- Participatory Approaches: Community engagement is facilitated through participatory methodologies, ensuring that local knowledge and preferences are integrated into decision-making processes.
- Capacity Building: Methodologies for capacity building include training workshops, seminars, and educational programs designed to enhance the skills and knowledge of stakeholders in forest management and disaster risk reduction.

2. Tools:

- National Forest and Forest Information System (NFFIS): The project develops and implements the NFFIS to collect, manage, and analyse data related to forest resources, land use, and ecosystem health. This serves as a key tool for informed decision-making.
- Monitoring and Evaluation Tools: Tools for monitoring and evaluating project activities and outcomes are employed to assess progress, identify challenges, and make necessary adjustments to project implementation.

3. Synergies:

- Cross-sector Collaboration: The project fosters synergies between different sectors such as forestry, disaster risk reduction, and biodiversity conservation to address interconnected challenges and maximise impact.
- Multi-stakeholder Engagement: Synergies are created through the active engagement of various stakeholders, including government agencies, NGOs, local communities, and academia, to leverage their respective expertise and resources.
- Policy Alignment: The project seeks to align with existing policies and initiatives related to sustainable development, climate resilience, and disaster risk reduction to ensure coherence and avoid duplication of efforts.

Moreover, it provides a comprehensive description of how to use those results:

1. Risk Assessment and Early Warning Systems:

- Activity: Developing and implementing advanced information systems for real-time monitoring of forest conditions and fire risk assessments.
- How: Using GIS, remote sensing technologies, and data from the NFFIS project to create comprehensive risk assessment maps. These maps can identify high-risk areas prone to wildfires, allowing for the establishment of early warning systems. Additionally, integrating weather data and predictive modelling techniques to anticipate fire behaviour and issue timely warnings to communities and authorities.

2. Ecosystem Restoration and Resilience Building:

- Activity: Implementing Eco-DRR strategies to enhance ecosystem resilience against wildfires.
- How: Utilising lessons learned from the Eco-DRR Project to design and implement ecosystem restoration activities such as reforestation, soil stabilization, and habitat restoration. Engaging local communities in sustainable land management practices to restore degraded landscapes and promote biodiversity. Establishing green infrastructure networks that act as natural firebreaks and reduce the spread of wildfires.

3. Community Engagement and Capacity Building:

- Activity: Empowering local communities to actively participate in wildfire prevention and management efforts.

- How: Organising community workshops, training sessions, and awareness campaigns to educate residents on fire prevention techniques, evacuation procedures, and the importance of forest conservation. Fostering partnerships with community leaders, NGOs, and local authorities to strengthen community resilience and establish community-based fire management teams. Encouraging citizen science initiatives for monitoring and reporting fire risks and incidents.

4. Technology Integration for Monitoring and Evaluation:

- Activity: Utilising technology for real-time monitoring and evaluation of fire risks and interventions.
- How: Integrating advanced monitoring technologies such as drones, satellite imagery, and mobile applications into the project framework. Use GIS platforms to analyse and visualize spatial data on fire occurrences, vegetation health, and land cover changes. Implementing a robust monitoring and evaluation system to assess the effectiveness of fire prevention measures and adapting strategies based on real-time data and feedback from stakeholders.

5. Policy Support and Advocacy:

- Activity: Advocating for policy reforms and resource allocation to support wildfire prevention and management efforts.
- How: Engaging policymakers, government agencies, and stakeholders at local, national, and regional levels to raise awareness of wildfire risks and promote policy reforms. Using evidence-based research and data from the NFFIS project to inform policy development and advocacy efforts. Advocating for the allocation of funds for fire prevention measures, firefighting equipment, and community-based initiatives. Collaborating with regional networks and international organisations to share best practices and lessons learned in wildfire management.
- By employing these methodologies, tools, and synergies we increase the effectiveness of the project in promoting sustainable forest management, reducing disaster risks, and enhancing the resilience of ecosystems and communities in the region.

2.2.7. SPRINt - Integrated strategies for the prevention and monitoring of the fire risk and community awareness

The methodology identified in SPRINt for fire risk mapping can find synergies with FRED's need to develop static Fire Danger maps. In addition, the FlamMap software was also used in SPRINt to characterise fire behaviour and define fire severity (rate of spread, flame height, energy emitted, etc.). The FRED project plans to implement the FlamMap simulation model within its forest fire management platform.

The experience gained from the implementation of the SPRINt project can support the activities of the FRED project, in particular the fire risk mapping (Activity 1.1) and fire behaviour modelling (Activity 1.2) to be implemented in the Wildfire risk prevention and mitigation platform. In addition, SPRINt's experience in fire risk and fire behaviour assessment allows it to support FRED in the evaluation of the methodology applied in the project's pilot actions (Activities 3.1 and 3.2).

The main benefits can derive from consolidated experience and validated procedures acquired in a very large study area (approx. 180,000 ha), including the “Appennino Lucano Val d'Agri Lagonegrese” National Park. SPRINt has provided excellent results for the validation procedures, leading the decision-makers of the Park Authority to adopt the results in their multi-annual plan for fighting forest fires related to 2023-2025. In addition, the Civil Protection Department of Basilicata Region has also declared interest in SPRINt methodologies and has signed a Memorandum of Understanding with CGIAM to this end.

The transfer of methods and procedures to FRED can contribute to data harmonisation and standardisation of procedures for wildfire hazard and risk mapping to make the methodology applicable throughout the Euro-MED programme area.

The SPRINt project has also inspired another project recently approved under the 1st call of the Interreg IPA ADRION programme, called RES2FIRE – “Models and Tools for Enhancing the Resistance and the Resilience to Wildfire in Natural Protected Areas and Wildland-Urban Interfaces”, whose main objective is to develop harmonized procedures at a transnational level for wildfire risk mapping and identification of suitable close-to-nature silvicultural interventions. CGIAM is the lead partner and the partnership include a network of 18 organisations (PPs + APs), made of national parks, municipalities, research centres, SMEs and other stakeholders. The RES2FIRE project is in the start-up phase and will invite the FRED

consortium to join to the RES2FIRE cooperation network and share experiences and know-how.

3. Conclusions

This deliverable reflects the richness of the FRED consortium, providing examples of projects from different partners to capitalise on tools, models, data collection, mapping and dissemination methodologies, territorial valorisation and community building.

The use of these results will lay the foundation for the successful implementation of FRED and achieve its main objective of fire mitigation in the Mediterranean area.

Capitalizing on previous results in fire risk prevention projects is vital. It promotes knowledge sharing, cost efficiency, risk mitigation, innovation, informed policy development and public engagement. By leveraging past experiences, FRED will be more effective in preventing and mitigating fire incidents, ultimately enhancing public safety and infrastructure protection.

In the following deliverables, FRED's methodologies and tools capitalizing on these results will be presented. Taking into consideration the barriers in previous projects, FRED will go one step further, bringing innovation to the prevention of fires in the area and contributing to the territorial development and the strategy of Climate change adaptation in the Mediterranean area.

In summary, capitalizing on previous results within an experienced and multidisciplinary consortium will lead to greater efficiency, quality, risk management, competitiveness and innovation, ultimately enhancing FRED's overall success and impact.