TECHNICAL FACTSHEET 1:

estimating the effectiveness of fire-resilient landscapes in reducing the total burnt area by forest fires

MED ITER RE3

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1. Introduction

The **MediterRE3** project will provide projections of Burnt Area (BA) and associated Green House Gas (GHG) emissions, under different scenarios of (i) future climate change and, (ii) fire-smart landscape interventions, for different Mediterranean target landscapes. The three target landscapes (Fig. 1), selected for fire-smart management interventions, are in SE France (the wider area of the Luberon National Regional Park), S Greece (W Crete, Chania Prefecture) and SE Montenegro (focussing on the Prokletije/Komovi region).

The results of **Work package II** ("Development and application of a robust science-based methodology for estimating the reduction in fire-related GHG emissions under future climate change scenarios in fire-smart, mosaic-like resilient landscapes") are summarised in three technical factsheets.

The **current technical factsheet** (No 1, WPII, activity AII.1) details the approach behind estimations of the effectiveness of proposed fire-smart landscape interventions. Technical factsheet 2 (WPII, activity AII.2) presents base-line data for the target areas (e.g. climate variables, BA and GHG). Technical factsheet 3 (WPII, activity AII.3) shows projections of BA and GHG emissions, for each target area, under future climate change scenarios and under different management scenarios.

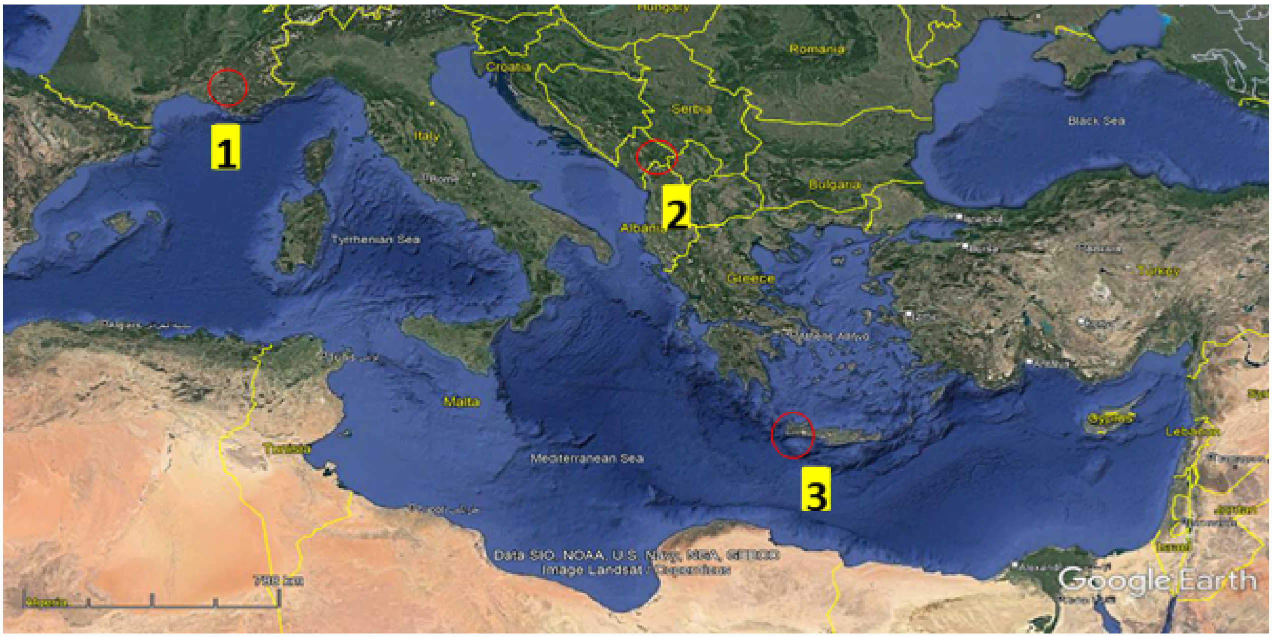

Figure 1. Location of the target areas (1. Luberon, SE France; 2. SE Montenegro; 3. W Crete, Greece)

1.1. Aim

Technical factsheet No 1 (WPII, activity AII.1) details the **approach** behind **creating numerical estimations** of the effectiveness of proposed fire-smart landscape interventions, at the three target landscapes, in reducing total burnt area by forests fires. These "numerical estimations" are subsequently applied to future projections of BA in the target areas to illustrate the effectiveness of proposed fire-smart landscape interventions under different climate change scenarios.

Annex A details the procedure and data sources to calculate the **numerical estimations** of the effectiveness of proposed fire-smart landscape interventions in the study areas.

2. Fire-smart landscape management: effectiveness studies

Fire-smart landscape management is defined as "*an integrated approach primarily based on fuel treatments through which the socio-economic impacts of fire are minimized while its ecological benefits are maximized*" [1]. To be effective in reducing BA and GHG emission from forest wildfires, fire-smart landscape management needs to be applied over large areas (i.e., at a regional level).

Long-term observational studies (>20 years) that detail the effects of fire-smart landscape management under the current climate are not available in the Mediterranean or elsewhere in the world, as these management methods have not been implemented for the required period of time. Therefore, **fire-vegetation models** are usually employed to estimate the influence of fire-smart landscape management on BA and fire conditions [e.g., 2 *and references herein*].

The fire-vegetation feedbacks and their complex interactions with fire-suppression policies and land-use changes make landscape dynamics difficult to predict, which challenges decision-making due to the large uncertainty of alternative management scenarios. Therefore, when **fire-vegetation models** are employed, other variables (such as fire-suppression policies, land-use change and climate change) are kept stable. This keeps the number of alternative scenarios limited and thus easier to compare. Percentage differences between scenarios are commonly calculated against a Business-As-Usual (BAU) management scenario.

Few studies look at the effect of fire-smart landscape management in the Mediterranean. Most existing studies are in the Iberian Peninsula [4 *and references herein*]. There are many different effectiveness scenarios, depending on locality / vegetation & land-use / management interventions. However, indicative studies suggest that fire-smart management of around 3% of the total region may lead to a 10-20% reduction in annual averaged BA [2,3].

3. Numerical estimates of reduction in BA at the target landscapes

We look specifically at the influence of future Climate Change (CC) on BA due to wildfires, and associated GHG emissions, under: [a] a business-as-usual land management scenario, and [b] a scenario that implements fire-smart land (FSL) management at the target areas.

[a] Business-as-usual land management scenarios include the assumption that the key variables of land-use & -cover, and fire-suppression methods remain stable in the future.

[b] The impact of FSL management on wildfire BA is assessed through "numerical estimates" that represent a percentage-reduction in BA at each of the three target areas. Key variables of land-use & -cover, and fire-suppression methods are assumed to remain stable in the future for the purpose of the modelling exercise.

Numerical estimates on the the effectiveness of fire-smart interventions in reducing annual BA for each of the target landscapes is detailed in Table 1. Please note that all of these intervention scenarios are at the low end of published studies (claiming often 10-20% reduction) [2,3], but all use the same approach and are thus directly comparable.

Study Area	Reduction in annual BA, under:	
	2% FSL interventions	5% FSL interventions
Samaria NP (Crete, Greece)	3.2%	7.9%
Luberon NP (France)	4.7%	11.8%
Prokletije NP (Montenegro)	5.6%	13.9%

Table 1*: numerical estimates of the effectiveness of fire-smart interventions in reducing annual BA for each of the target landscapes.* ***Annex A*** *details the data and methodology behind these estimates.*

4. Future projections of climate change, BA and GHG emissions

Projection studies estimate an increase in future Mediterranean BA varying from 5 to 50% per decade under different Climate Change scenarios [4 *and references herein*]. The future expansion of fire-prone areas into the north Mediterranean, and into Mediterranean mountains, is a growing concern. However, in more arid Mediterranean areas the climate-induced BA increases may be limited due to fuel constraints. Comparisons on the magnitude of the future increase in BA remain challenging because of heterogeneous methodological choices between projection studies.
There are three main sources of uncertainty that affect the reliability of future wildfires projections: **[i]** different climate change (CC) projections, **[ii]** climate-fire models and the influences of fuels (both changing under future CC), **[iii]** fire-vegetation feedbacks (affected by future CC) and human-related factors influencing the climate-fire relationships [4].

4.1 MediterRE3 project: advancement of the present state-of-play

A major goal for the MediterRE3 project is to create a common approach to estimate future BA (and associated GHG emissions) from wildfires under different future CC scenarios that can be used, and directly be compared, across the Mediterranean region.

This project will **only look** at the influence of climate change on BA and GHG emissions. It assumes that all other variables are stable: no change is assumed in land-use (cover), vegetation, fire-suppression methods and fire-ignition causes / climate-fire & fire-vegetation feedbacks. This is a common approach for modelling studies, to keep the range of alternative future scenarios within limits.

Further results of WPII (MediterRE3 project) are detailed in Technical Factsheets 2 and 3. Specifically, the methodology and model for deriving wildfire BA and associated GHG emissions from climate indices (detailed in factsheet 2) can be applied throughout the Mediterranean region. Future simulated CC data will drive this model to provide estimates of future BA and associated GHG emissions from wildfires (factsheet 3). The effectiveness of proposed fire-smart landscape interventions in the target areas, under different climate change scenarios, will be assessed through application of the “numerical estimations” (outlined in this factsheet) to future BA projections.
This approach permits the upscaling of the study across the Mediterranean and will enable the comparison of results across the region. Publicly available databases will be identified and used, to further improve the accessibility and replicability of the study.

5. References

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