Participatory process of developing an integrated fire management strategy in Cyprus, from serious game to practical strategy

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Abstract

Wildfire risk is increasing across Europe, yet implementation of integrated fire management (IFM) strategies remains rare. In Cyprus, under the auspices of the Ministry of Agriculture, Rural Development and Environment, the EU-funded SEMEDFIRE project facilitated the development of the country's first IFM strategy and action plan. Led by the Centre-of-Excellence in Risk and Decision Sciences (CERIDES) of the European University Cyprus (EUC), the process engaged more than 100 stakeholders from 50 organizations through a series of participatory workshops. Innovative methods such as the "Pyropolis" serious game fostered social learning, improved mutual understanding, and supported collective decision-making. The resulting strategy is structured around 12 challenges with short- and long-term objectives, accompanied by a stakeholder's engagement plan to precise implementation across governance, land management, communication, and innovation.

1. Introduction

Like many Mediterranean states, the island of Cyprus is seeing an increasing incidence of sometimes deadly wildfires, and an ever-lengthening wildfire season (See Fig. 5, Chap. 1.1)

The government of the Republic of Cyprus has come to realise wildfire awareness with the general population is too low, and necessary land management actions to reduce wildfire risk are insufficiently taken. It is therefore exploring ways to involve stakeholder awareness in wildfire management. In collaboration with the Department of Forestry, the present authors, working together in the European funded SEMEDFIRE project (2022–2025), explored the use of a serious simulation game developed for the purpose, Pyropolis, in a workshop setting to raise awareness and to facilitate the development of an integrated wildfire management approach together with key stakeholders.

After sketching the background of increasing wildfire risk on the island, we identify the governance gap that led to the quest for more participatory involvement of the general population. We then explain the serious game's logic, analyse our experiences piloting them in the workshops held to develop an integrated fire management approach and end in conclusions.

2. Evolution of wildfire management in the Republic of Cyprus

1.1. Cyprus, hotspot of wildfire risk in the Mediterranean

Cyprus is the third largest island in the Mediterranean with an area of 9251 km^2 (925,148 ha); it is situated at the southeast of the Mediterranean basin, just northwest of the coast of the Middle East. 42% of the total area of the island is covered with natural vegetation (Land Cover, 2020)[1] of which:

- 19% is covered by high coniferous forests,
- 14% is covered by Maquis vegetation (shrubs),

- 9% by Garique vegetation (dwarf shrubs)

The natural forests of Cyprus, as well as the newly established plantations, consist of thousands of hectares of resinous pine trees like the Calabrian pine (*Pinus brutia*), Black pine (*Pinus nigra*), Cedar (*Cedrus brevifolia*) and Cypress (*Cupressus sempervirens*). The pine overstory is always associated with understory vegetation of bush species and other herbaceous plants which dry out during the summer period. The Department of Forests (DoF) of the Republic of Cyprus, which manages state forests, has the responsibility for wildfire prevention, suppression and restoration. The DoF is a department of the Cyprus Ministry of Agriculture, Rural Development and Environment (MARDE).

According to the Republic of Cyprus' Department of Forests (Statement of Forestry Policy, January 2013), fire is by far the most destructive single agent threatening the forests of Cyprus, and no real progress can be made in forest development unless the forests are adequately protected. The long, hot and dry summers, the frequently strong winds, the composition of the topsoil layer and the flammability of the vegetation all favor the outbreak and quick spread of fires. Furthermore, urbanization, biomass accumulation resulting from the abandonment of rural areas, and the climate crisis have raised the fire risk to very high levels.

Most wildfire ignitions in Cyprus are of human origin; mainly the consequences of negligence (Fig. 5) but in some cases, they are the results of arson. As shown in Fig. 4, the number of recorded wildfires has more than doubled in the past 15 years. The quick response on the part of the DoF has managed to keep the burnt area of forest at a reasonable level, but the challenge is expected to increase in years to come.

1.2. Wildfire governance in Cyprus

The Department of Forests (DoF) is the agency responsible for the prevention and suppression of fires in the forest and within a radius of 2 km from the boundaries of the state forests in the Republic of Cyprus (Cyprus Forest Law, 2012)[2]. As such, the DoF takes a series of measures aiming to reduce the number of wildfire occurrences and minimize the damages, while prioritizing quick detection and early reporting of fires, rapid intervention and effective control of wildfires.

Wildfire ignitions are often traced to human-made causes typically related to negligence and, to a lesser extent, malicious, intentional actions (see Fig. 5 below showing the possible causes of fires). According to this data collected by the DoF, the main ignition sources of wildfires in forests include agricultural activities (burning of pruning and other agricultural residues), discarding smoldering cigarette butts or matches, lighting fires in unauthorized areas, burning waste and garbage in unsanitary areas, hunting activities, residential activities such as the use of power tools that cause sparks, as well as short circuits of overhead power lines. The estimated average annual damage wildfires caused to forest vegetation in Cyprus is approximately €24M (Strategic Planning of Forest Department, 2021)[3] The protection of forests from fires is a priority of the DoF as they consider uncontrolled wildfires to be a destructive factor for the forests and wooded areas of Cyprus. The importance attached to forest firefighting is reflected in the budget of the Department and the number of staff involved in extinguishing them. Almost all of the

Department's staff is involved in fire prevention and response during the summer, while about one third of the Department's budget is spent on firefighting. And as shown on Fig. 5, the fire season extends from May up to November. This graph also shows the importance of wildfires from agricultural activities at the beginning and the end of fire season.

The DoF owns and leases a fleet of small and larger fire trucks, as well as helicopters. The protection of forests from fires by the DoF is presently achieved through actions such as the preparation and implementation of fire protection plans, development and maintenance of infrastructure (forest roads, fire zones, water tanks, water mouths, etc.), the purchase of firefighting equipment and supplies, carrying out enlightenment campaigns, recruitment and management of staff (fire / immediate teams intervention, forest duty watchdog, training), conducting ground and air patrols, and the suppression of forest fires by soil and air.

The map upon (Fig. 5) presents a compilation of available data on fire in Cyprus. This map has been produced by the European University of Cyprus, CERIDES. The dots show the starting point of fires, size is proportionate to burnt area and color to possible causes (sources: DoF, 2010–2020 and 2023, only for the areas under the effective control of the Government of the Republic of Cyprus). The black hatch indicates the areas burnt (EFFIS, 2008–2024)[4]. The green hatch areas are the public forests and the 2km buffer around, indicating where the Department of Forests is in charge of the planning and implementation of any measures deemed necessary to prevent forest fires (Cyprus Forest Law, 2012)[2].

This map shows that wildfires starting from a natural cause (lightning) have not burned big areas whereas human activities are responsible for the vast majority of wildfires with a risk exacerbated in a climate change context, inducing higher temperatures and dry vegetation. Most fires started in rural and peri-urban areas where fire prevention is a shared responsibility.

1.3. Needs and barriers to integrated fire management

The Department of Forests of the Republic of Cyprus considers that forest fires, favored by climatic conditions, constitute the greatest danger for Cypriot forests since they threaten their very existence. Effectively, the very dry weather conditions in Cyprus make it very hard for forests to be restored after a wildfire. Considering the climate change impacts, we could consider that in the coming years, it may be very hard to restore forest in some burnt areas ending in increasing desertification. In addition, the risk of forest fires is expected to increase further due to climate change, the abandonment of the countryside and the increase in the number of visitors to forests. In its strategic planning of 2021, the DoF targets a strengthening of the forest protection system against fires, so as to deal with the increasing risk but also to seek a reduction in the number of fires, a reduction in the annual burned area and a reduction in the average burned area per fire.

The protection of forests from fires is presently ensured by the Cyprus Forest Law of 2012[2], the effective implementation of the legislation as well as the preparation and implementation of an integrated forest fire management system. Special attention is paid to protected areas and territories with ecosystems

that are difficult to regenerate. The existing system will be strengthened by the preparation and implementation of a Fire Protection Plan, which will cover all three areas of action: prevention, preparedness, and suppression. Among the issues that will be given special importance is the development of operational fire suppression plans depending on the risk of ignition and spread of fires as well as an Incident Command System. These actions are presented in the DoF strategic plan, but an effective integrated fire management plan would exceed the perimeter of action of the DoF as this department is officially in charge of forest fires only within public forests and a 2km buffer around them (see light green area on Fig. 5). Presently, outside this perimeter, the Fire Service is in charge of wildfire suppression, but no one actor oversees prevention. Such planning needs a change in the method with a more integrated approach. The DoF has a key role and understanding of the actions to be taken but support of all stakeholders will be needed.

The participative work presented in this paper highlight the need for a better communication and collaboration for wildfire management in Cyprus, especially for wildfire disaster prevention. Last but not least, wildfire management is not only a technical issue but also integrates strong economic and political issues. Regarding wildfire prevention in Cyprus, one of the main issues expressed during the workshops organized in the framework of the SEMEDFIRE project is the need for better rural development taking in account the land abandonment issue. Land abandonment greatly increases wildfire risk as it leads to the uncontrolled build-up of fuel vegetation around public forests. In addition to facilitating access to the mountainous Troodos areas, the development of more resilient and living communities and landscapes, to effectively prevent wildfire damages.

The process of co-elaboration of an integrated fire management strategy and action plan developed in SEMEDFIRE project tried to answer to these needs expressed during the first workshop through a transversal approach involving all the stakeholders involved in wildfire management.

3. Participative process to co-elaborate an IFM strategy

3.1. Methodologies

From the beginning of the SEMEDFIRE project in December 2022, its lead institution, EUC-CERIDES, defined a participative process to develop an IFM strategy to ensure that the risk would be correctly addressed but also to have an IFM strategy and action plan sustained by local stakeholders. CERIDES aimed at supporting the design and implementation of a realistic but ambitious plan for Cyprus to improve wildfire management. With a view to conceptualizing and framing the methodologies for the abovementioned design and implementation, we capitalized on approaches and models such as the following:

- **Quadruple-Helix Approach.** Mainly following the 2016 EU Committee of the Regions' "*Using the Quadruple Helix Approach to Accelerate the Transfer of Research and Innovation Results to Regional Growth*", but of course also other works, such as: *"Quadruple Helix Co-creation in SSH:*

Experiences, Considerations, Lessons Learned" (Stein & Dobers, 2017), *"Co-shaping the Future in Quadruple Helix Innovation Systems: Uncovering Public Preferences toward Participatory Research and Innovation"* (Schütz et.al., 2019), and *"Role of Networks of Rural Innovation in Advancing the Sustainable Development Goals: A Quadruple Helix Case Study"* (Irungu et.al.., 2023).

- **Deliberative Democratic Participatory approaches**. Mainly following the 2022 European Commission's "*Citizens' engagement and deliberative democracy*" (EC, 2022), but also other works, such as: *"Methods for collaboratively identifying research priorities and emerging issues in science and policy"* (Sutherland, 2011), *"Participatory Policy Making"* (Rietbergen-McCracken, 2017), and *"Designing Participatory Technology Assessments: A Reflexive Method for Advancing the Public Role in Science Policy Decision-making"* (Kaplan et.al., 2021).
- **Science-for-Policy and Co-Creation practices**. Mainly following the 2020 JRC's "Science for Policy Handbook" (EC-JRC, 2020), but also other works, such as: *"Methodology for participatory policy analysis"* (Geurts & Joldersma, 2001), *"The Impact of Living Lab Methodology on Open Innovation Contributions and Outcomes"* (Schuurman et.al., 2016), and *"Innovation through the Quintuple Helix in living labs: lessons learned for a transformation from lab to ecosystem"* (Merino-Barbancho et.al. 2023).

To enhance its potential for success, the full process was developed under the auspices of the Ministry of Agriculture, Rural Development and Environment (MARDE) supporting involvement of governmental agencies and giving more legitimacy to the outputs. The Department of Forests was strongly involved in every step and workshop as well as the Fire Services, the Civil Defence and the Water Department as speakers and active participants. In all workshops organized we had participants from governmental institutions, research and academic agencies, non-governmental organizations and private companies giving a complete view of the society's stakeholders. Invitations to workshops were also sent to a wide range of sectors: agriculture, forest, water, environment, urban planning, fire service, civil protection, tourism as well as the reports of these participative works to keep all stakeholders informed.

Participative tools were used in every workshop as well as creative techniques like world cafe, prospective participatory analysis, a serious game (see below), or a graphic recording to facilitate inter-sectorial and multi-lingual dialogue. This approach, evaluated through survey after each workshop, has been very well appreciated by participants and was essential to building an integrated strategy.

Each step of collaboration with local stakeholders has been supported by European experts on fire management and was a mutual learning experience which permits to progressively rise the knowledge of all stakeholders on integrated fire management. After each workshop, participant and expert inputs were compiled and structured, to give back to stakeholders as a next step forward on the way to an IFM strategy for Cyprus.

More than 50 organizations and more than 100 people have been involved in one or more workshops supporting the development of an integrated wildfire management strategy and action plan. Their active participation and essential contributions have been essential in the process, not only to get these final

outputs but also to have this strategy understood and sustained by these stakeholders. We specify, however, that opinions expressed in this document are SEMEDFIRE consortium's statements, and do not bindingly engage any stakeholders involved. A list of the main stakeholders involved in this process is available in Section 3.3 expressing the diversity of the stakeholders involved.

3.2. Understanding each other: the Pyropolis serious game

In a workshop in April 2024, EUC-CERIDES facilitated an interactive stakeholders' experience by using "Pyropolis", a serious simulative game on wildfire management which has been adapted from WUR's serious game "Pyrotown" (De Vries, J. R., 2025)[5]. The first objective of running this game was to facilitate a better understanding of each other's roles and need for collaboration. By asking participants to develop measures and strategies that help to reduce the risk of wildfires and related risk communication strategies, it has been also the occasion to receive input from participants to build-up an integrated fire management strategy.

The Pyropolis map (Fig. 6), designed by the graphic designer Pantelis Valtadoros, represents the context of a village in the surrounding of a forest suggesting a Cypriot village context but not targeting a specific place to facilitate appropriation. The different roles should be adapted to the context, in Cyprus, the following role descriptions have been developed to provide the players with a better understanding on the goals of their role: Mayor/Political Leader of the Community/Town; Chief of the Fire Service; Director of the Department of Forests; Civil Defence and/or Police; Representative of Farmers; Representative of Environmental NGOs and/or Volunteer Organizations.

Depending on the number of participants in the workshop, another role was added: Head of the land planning office. He is assigned the Mayor's objectives and supports him/her in facilitating the elaboration of the strategy. In Pyrotown, developed by WUR, there was also a homeowners' representative and landowners' representative was also. Such roles are pertinent if they effectively exist in the country, which unfortunately is not yet the case in Cyprus.

While running the Pyropolis serious game, a number of land planning issues were raised. Some with the objective of facilitating intervention in case of emergency and other ones focusing more on the reduction of fuel in abandoned lands. The main goal of the actions proposed by participants was to develop resilient landscapes including biomass management and preparedness actions.

The serious game was presented in the agenda of the workshop as an interactive stakeholder's experience as sometimes people think that serious games are not for serious people! The feed-back on this experience was very positive, inputs of the different table were valuable to build-up a draft IFM strategy and each stakeholder came back home with a stronger understanding of the roles and responsibilities of the different stakeholders involved in wildfire management as well as the issues faced by these stakeholders.

3.3. From information to co-elaboration

Integrated approaches need to bring together a wide range of people from different horizons with different perceptions, sometimes opposed, with the objective of building a shared vision. It's a transformative process which needs time and adequate communication with the stakeholders involved. To build an IFM strategy for Cyprus, this transformation has gone through the following steps:

In October 2023, a participatory workshop entitled *Building a more resilient landscape for Cyprus* has been held with the aim of defining with the participants a desired future and what could be the path and good practices that would best support transition to a more resilient landscape in Cyprus. This workshop was not focused on wildfire risk but on identifying the main changes in the agriculture and forestry sector, drivers of change, climate-related impacts and consequences. In prospective work, participants also identify what are the needs and barriers for farmers and foresters to increase landscape resilience of Mediterranean landscape.

Participants underlined the usefulness of the participatory and interactive methods, as well as pledging their interest in future steps in defining good and sustainable practices. By supporting understanding of landscape resilience, this first session highlighted the important role of landscape to confront climate change and give opportunities to Cyprus stakeholders to co-build a global strategy and action plan to increase the resilience of Cyprus landscape. Long-term planning has been highlighted as part of resilience definition and participants underlined the need for more strategic horizontal and intersectoral planning, a call from participants for an integrated approach.

In April 2024, a new workshop has been held to share a better understanding on the concept of integrated fire management to build up an adequate holistic strategy and a stakeholder's mobilization plan for Cyprus. Speakers and participants gave inputs to develop an integrated fire management strategy for Cyprus, especially through an interactive stakeholders' experience where participants had to formulate a strategy for the Serious-Game "Pyropolis" (see Chap. 2.2). These inputs have been structured through a set of recommendations which have been structured as the 12 challenges for wildfire management in Cyprus presented in Chap. 3.2. The graphic recording represented on the figure gives a good summary of this workshop.

During another workshop in September 2024, representatives from PCF (Spain), AGIF (Portugal) and Wageningen University and Research (Netherlands) gave testimonies regarding the development of integrated fire management in their country and the workshop's participants developed the 12 challenges and associated short and mid-terms objectives in actions which will be structured into a stakeholder engagement plan later on. Specific attention has been given to prescribed burning as a wildfire prevention strategy followed in March 2025 by a prescribed burning demonstration in partnership with Pau Costa Foundation.

In October 2025, the integrated fire strategy and action plan will be more widely and publicly shared and a visit to the prescribed burning demonstration site proposed. In addition, the Department of Forests staff plan to participate in a prescribed burning training by the end of 2025. These actions are part of the communication plan to improve perception of prescribed burning as a real tool for wildfire prevention.

The shared vision and 12 challenges structuring the integrated fire management strategy co-developed through these participative workshops are presented in the following chapter.

4. Co-constructing Integrated Fire Management with a clear vision and action plan

4.1. Learning and co-building a vision together

The first goal of wildfire management is to protect lives, infrastructures and ecosystems. The vision developed in Cyprus during the past two years of consultation in the SEMEDFIRE project is that this will only be achieved through horizontal and intersectoral planning with the engagement of a large part of the society's stakeholders. Wildfire management needs a clear risk analysis and a land planning strategy with the involvement of state agencies in charge of urban planning as well as local authorities supported by NGOs. The core points of the joint vision developed with a diversity of stakeholders are:

- Effective wildfire management in Cyprus can only be achieved through a preventive strategy increasing the landscape resilience. While suppression efforts remain essential, today there is growing global agreement that large wildfires should also be addressed through effective preventive vegetation management. Supporting living rural landscapes and empowering local communities are the only ways to reduce land abandonment, a key factor in the increasing vulnerability of rural Cypriot communities to wildfire.
- Traditional practices, such as agro-pastoralism, drystone walling and traditional burning, have key roles to play in wildfire management in Cyprus. If innovation and technology are encouraged especially for fire detection and propagation, traditional practices should be also supported through a specific framework with regulatory tools and a funding scheme.
- The technical use of fire (also known as prescribed burning) can be a key element in prevention to reduce the intensity of large wildfires. Prescribed burning should only be managed by trained people and authorized by governmental agencies. Traditional burning can have a role to play in wildfire management, but it should be implemented only in very specific conditions. Alternative solutions to traditional burning like grazing, pruning, energy generation or composting should be encouraged and supported as well.
- Investing in prevention, supporting rural living communities and implementing an ambitious vegetation management programme can reduce the number of wildfires, their intensity and the number of lives lost and infrastructures destroyed. Protecting and preserving ecosystems, such as forests and other natural areas, can also protect society and ecosystems from other natural hazards (e.g. heatwaves and floods).

4.2. Agreeing on a vision and on key challenges to improve fire management

Drawing on the discussion with the stakeholders involved (governmental authorities, civil society organizations, private companies and research institutes), the 12 key challenges listed below were identified with specific objectives in the short and medium term to better protect the lives, infrastructures and ecosystems of Cyprus from uncontrolled wildfires. This analysis is a starting point, inviting stakeholders of Cyprus to more deeply consider how they could actively participate in this change to build up a more fire-resilient island.

Governance and Policies	**CHALLENGE 1 – Develop a long-term vision and a prioritized plan with short- and long-term actions to better protect people, infrastructures and ecosystems from destructive wildfires.**
	CHALLENGE 2 – Identify a lead agency for coordination and facilitation, assign responsibilities to key stakeholders for implementing and monitoring the integrated fire management action plan.
	CHALLENGE 3 – Adopt policies and regulations for management of fuel (biomass) to facilitate implementation of fire prevention and mitigation measures, including controlled grazing and prescribed burning.
Land Planning and Land Abandonment	CHALLENGE 4 – Develop land planning by defining strategic management areas to better protect lives, infrastructures and ecosystems and to create safer conditions for firefighters when responding to wildfires.
	CHALLENGE 5 – Manage the fuel load through adequate fuel reduction interventions prioritizing the wildland-urban-interface and the strategic management areas.
Cooperation and Coordination	CHALLENGE 6 – Facilitate intersectoral discussions at national and local level involving local authorities and local population/volunteers in training and coordination to better involve them in prevention and suppression measures.
	CHALLENGE 7 – Encourage a better cooperation at regional and international level to foster preparedness and capacity for suppression and improve collectively the resilience of the region to wildfire by sharing best practices on preventive measures.
Communication and Education	CHALLENGE 8 – Develop a communication strategy to improve the knowledge of citizens on how to prevent wildfires and get more involved in protecting themselves and their environment from destructive wildfires.
	CHALLENGE 9 – Educate society to better live with fire and advocate for a proper use of fire (prescribed and controlled burning) to reduce the impact of wildfires and protect biodiversity.
Digital Information Management and Innovation	CHALLENGE 10 – Develop wildfire risk analysis; harmonize and share fire information across sectors via a common GIS fire database with a standardized methodology.
	CHALLENGE 11 – Improve digital operational communication systems and early fire-detection through testing and adoption of adequate new technologies.
Financial mechanisms	CHALLENGE 12 – Develop financial mechanisms to support wildfire management measures, especially for prevention measures (e.g. agroforestry, controlled grazing, prescribed burning) prioritized on strategic management areas.

This strategy is one of the main outputs of the dialogue process. Each of the challenges has been detailed with short-term and medium-term objectives and an associated stakeholder's engagement plan has been subsequently proposed.

4.3. Transforming a strategy in an action plan

Following the design of the integrated fire management strategy developed through 12 challenges, a stakeholder engagement plan has been developed using the Wildfire Peer Review Assessment Framework structure (Wildfire PRAF, 2020)[6]. Following this framework developed to provide technical support for comprehensive and thematic reviews of disaster risk management within the UCPM 2020–2024 programme cycle, the stakeholder's engagement plan is structured on seven key topics:

- Governance of wildfire risk management
- Wildfire risk assessment
- Wildfire risk management planning
- Wildfire prevention
- Wildfire preparedness
- Wildfire emergency response
- Recovery and lessons learned.

This document is a collaborative analysis which has been supported by the partners engaged in the SEMEDFIRE project and all the local stakeholders involved in the workshops. In addition to the assessment process leading to a proposed action plan, our methodology also aims to build a common understanding of the need for integrated fire management strategy, as well as capacity building of the stakeholders involved.

For each action of this strategy, a potential responsible entity has been proposed for its implementation and follow-up. Nevertheless, the implementation of most of these actions needs a high degree of collaboration between the different stakeholders. The denominated potential lead actor would be taking the lead in facilitating the implementation of the action in coordination with the others relevant stakeholders.

A few identified actions require a political decision to validate who would be leading the action. These specific actions involving inter-ministerial coordination. In addition to the stakeholders presented below, a Lead Agency role has been proposed for a few points of the actions plan. The role of this lead agency is not to coordinate wildfire suppression efforts but to develop a wildfire integrated management policy and regulation as well as insuring its implementation and follow-up in the full territory of the Republic of Cyprus. The Department of Forest have a leading role in Cyprus, but we remind that the DoF is not in charge of wildfire outside of public forests except in a 2km buffer around these forests.

The potential responsible proposed in the action plan are the main stakeholders engaged during the participative process. They are briefly listed in Table 1 below:

Table 1: Key stakeholders engaged during SEMEDFIRE participative process.

Organization	Role and position
Department of Forests (DoF)	In charge of forest fire prevention and suppression in the public forests and 2km around these areas
Ministry of Agriculture, Rural Development and Environment	Strongly involved in this work and coordinating Departments of Forests, Agriculture, Environments and Water (Maria Panagiotou, 2024)[7]
Civil Protection	Presently named Civil Defence but we consider here the agency with potential extended capacities
Fire Brigade	In charge of fire suppression outside of forests and 2km buffer, as well as the Defence Fire and Rescue Service for the UK bases territory
Department of Agriculture and Cyprus Organization of Agricultural Payments	Supporting the definition and implementation of a policy for vegetation management with adequate agricultural practices, including financial support to vegetation management practices linked to agricultural and husbandry activities
Local authorities	District level and municipalities which have more capacities but also communities. The implementation of these actions may need support from governmental agencies, NGOs or research agencies
Research Agencies	For actions needing a scientific approach and collaboration with others European academic institutions, facilitating the capacity building of Cypriot organisations
Non-Governmental Organizations	e.g. for facilitating the link and capacity building of local authorities and citizens
Police	Especially involved in fire investigation

In addition, the below stakeholders which haven't been listed as potentially responsible (lead) actors for a specific action are also key stakeholders to develop an integrated fire management in Cyprus.

Organization	Role and position
Farmers unions and representatives	Facilitating the implementation of adequate vegetation management practices
Directorate for Sustainable Development	DG Growth could facilitate adequation with others national actions plans
Cyprus Deputy Ministry for Tourism	Have a role to play to ensure safety and behaviors of visitors
Department of Meteorology	Providing Meteorological data and inform about the high wildfire risk prediction
Department of Environment	Defining adequate recommendations for vegetation management practices to preserve biodiversity
Game and Fauna Service	Responsible for the implementation of the European Birds Directive, they could support landscape adaptation and give recommendations regarding bird habitats

All the stakeholders upon have been involved through participative workshops as well as the business sector through the participation of the Cyprus Chamber of Commerce and Industry as well as a few private companies.

5. Conclusion

Implementing the proposed action plan requires a decisive shift from a suppression-dominated approach to one that prioritizes prevention, supported by strong inter-agency cooperation. The establishment of a designated lead agency remains essential to coordinate, facilitate, and monitor integrated fire management (IFM) across the full territory of Cyprus—an issue that may warrant further dedicated study.

This document was elaborated through the participation of more than 100 individuals, including representatives from 20 governmental agencies. While the stakeholder engagement plan presented here is not yet an official governmental strategy, it was developed in close collaboration with public authorities.

Two important outcomes of this process can be highlighted. First, the principles and possible actions of IFM were presented and discussed in participatory workshops, ensuring that key stakeholders are now aware of the need for change in wildfire management and familiar with potential solutions. The value of the SEMEDFIRE project therefore lies not only in the written strategy, but also in the social learning and collective awareness it generated among those directly responsible for wildfire management in Cyprus.

Second, the action plan does not merely reflect academic recommendations, but also integrates concrete proposals from Cypriot stakeholders, including governmental authorities. This demonstrates both willingness and capacity to move toward implementation. Nevertheless, the precise definition,

timing, and allocation of responsibilities for each action still require further political validation and agreement.

The plan is inter-ministerial in scope. While the Department of Forests should remain central to prevention and suppression within forested areas, broader governance, planning, and communication responsibilities call for additional institutional support.

Finally, the IFM strategy must be linked with other national frameworks on disaster risk management, rural development, and climate change adaptation. At the local level, municipal and community authorities should be empowered to develop resilience plans that address wildfire risk alongside other natural hazards.

EUC-CERIDES will continue to support this process, including through the organization of a further participatory workshop with governmental authorities. The aim is to refine the action plan, ensure institutional buy-in, and strengthen implementation pathways—ultimately contributing to better protection of lives, infrastructure, and ecosystems in Cyprus against large wildfires.

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Author Contribution

M.J. wrote the main manuscript and did the graphic analysis on figure 4 and 5 as well as the mapping analysis on figure 6.All authors were active participants of the SEMEDFIRE project and participated in the different workshops organised in Cyprus to build-up an integrated wildfire management strategy for Cyprus.All authors reviewed the manuscript.

Data Availability

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Figures

Figure 1

Natural stand of *Pinus brutia*, Cyprus

Figure 2

Natural stand of *Pinus nigra* in Cyprus

Figure 3

Natural stand of *Cedrus brevifolia*, Cyprus

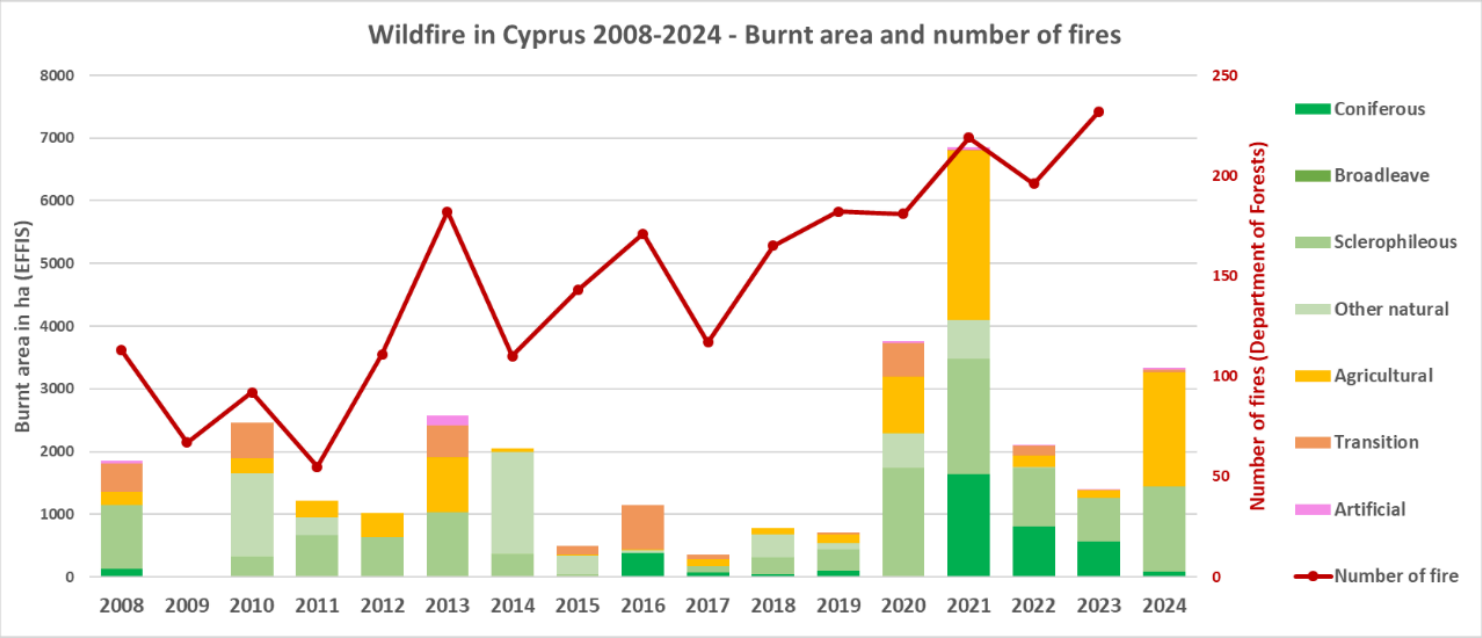

Figure 4

Burned area and number of wildfires in Cyprus. EUC-CERIDES, source: EFFIS and DoF

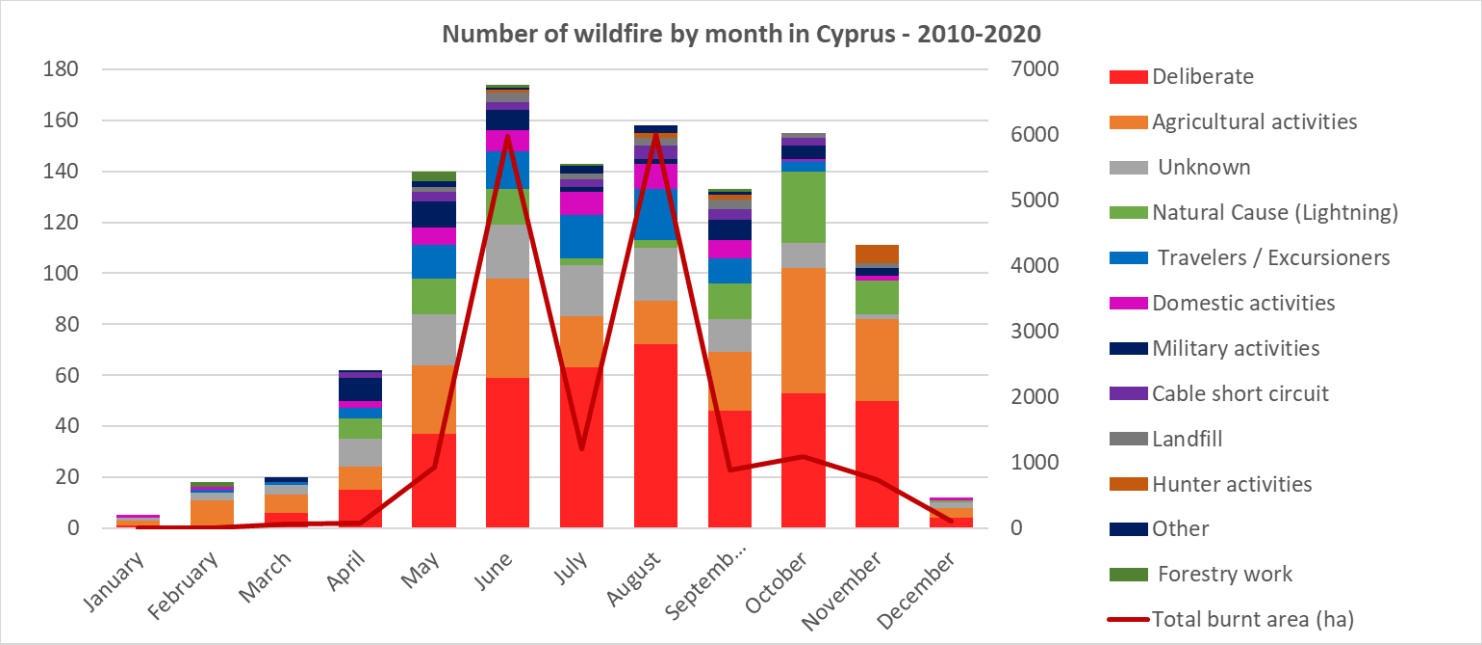

Figure 5

Number of wildfires and burnt area per month in Cyprus, Source: DoF 2010-2020

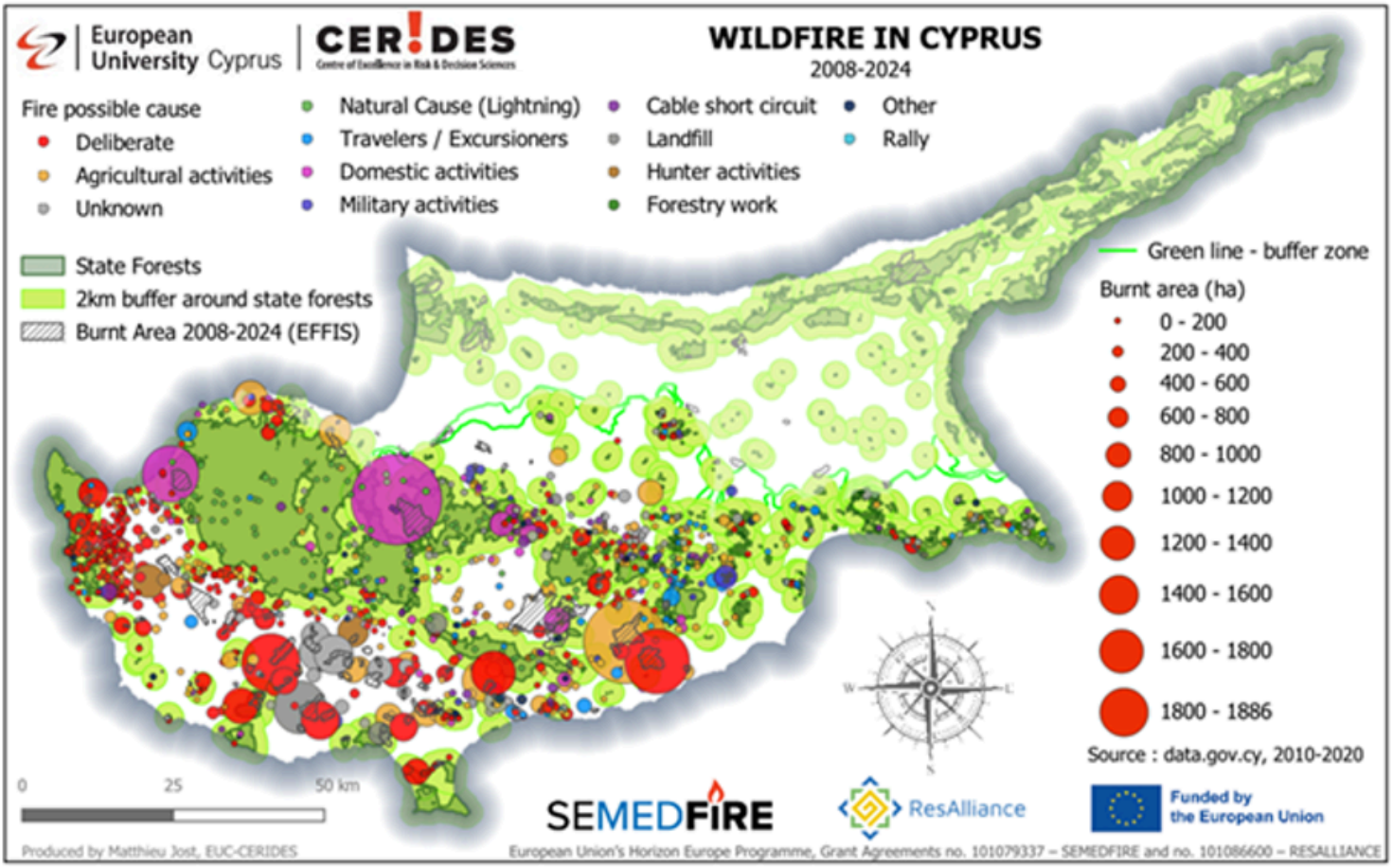

Figure 6

Wildfires in Cyprus - 2008 to 2024, European University Cyprus - CERIDES

Figure 7

Map of Pyropolis, wildfire management serious game, Pantelis Valtadoros, SEMEDFIRE

Figure 8

Running Pyropolis wildfire management serious game, April 2024, SEMEDFIRE

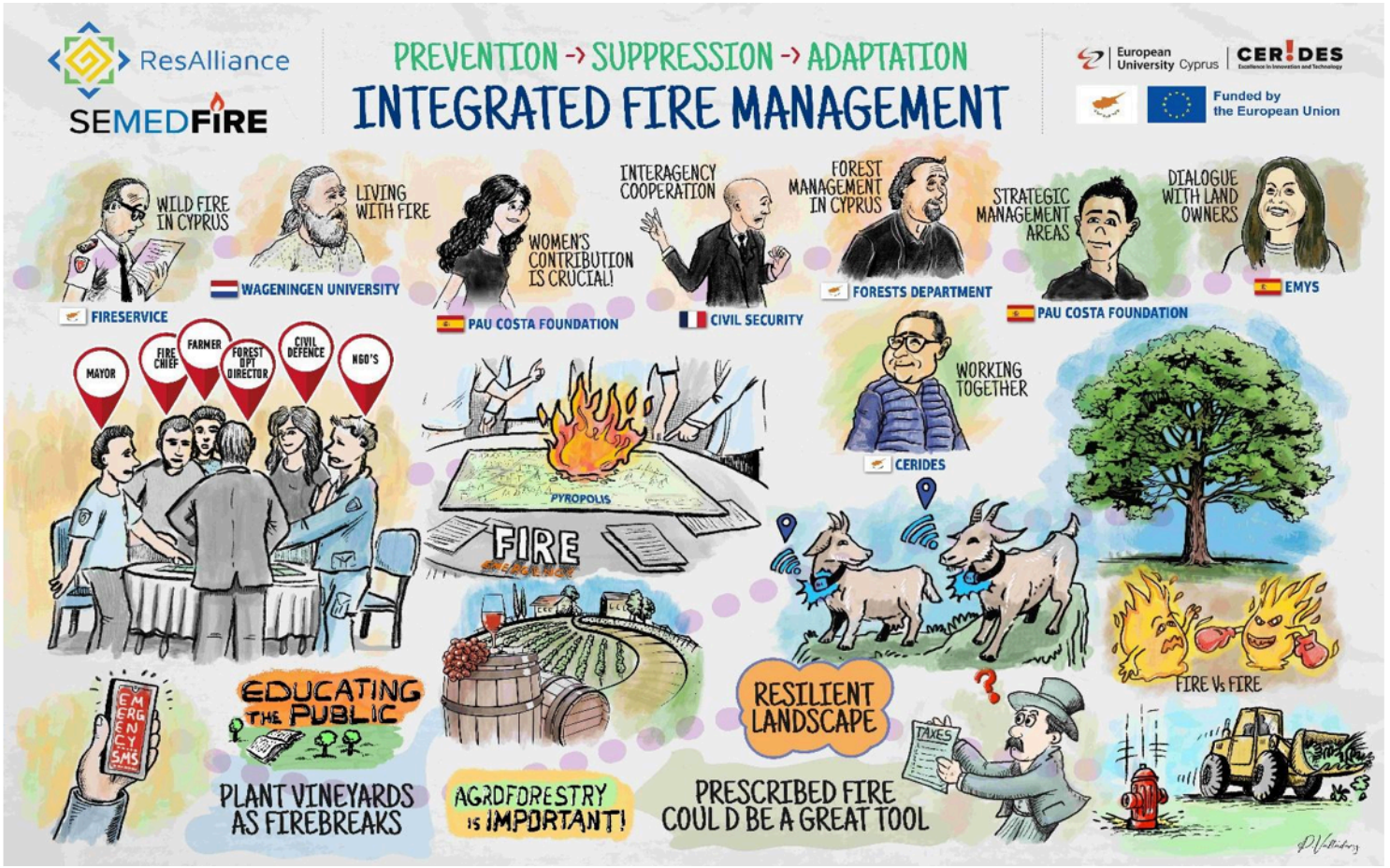

Figure 9

Graphic recording of workshop on integrated fire management, April 2024, Pantelis Valtadoros, SEMEDFIRE