

A COMPARATIVE ANALYSIS OF WILDFIRE CHALLENGES AND MANAGEMENT APPROACHES BETWEEN NORTHERN PORTUGAL AND NORTHERN ALGERIA



Institute for Water
Energy Sciences
and Climate change



Belkhir Zakarya
University of PAUWES, (Algeria)
forest.belkhirzakarya@gmail.com

António Bento-Gonçalves
University of Minho, Communication and Society Research Centre
Institute of Social Sciences, Department of Geography (Portugal)
bento@geografia.uminho.pt

Introduction

Mediterranean regions are increasingly vulnerable to catastrophic wildfires due to climate change and land-use practices that prioritize flammable monocultures. Northern Portugal and Northern Algeria, though ecologically distinct, exemplify shared challenges in balancing fire risk with socio-economic demands. Portugal's Atlantic-influenced landscapes are dominated by *Eucalyptus globulus* plantations, which cover 26% of its forest area and amplify flammability, while Northern Algeria's *Pinus halepensis* monocultures face unprecedented drought stress, with precipitation declines of up to 40% over recent decades. Both regions also contend with expanding wildland-urban interfaces (WUIs), where human settlements intersect with fire-prone vegetation, increasing vulnerabilities and complicating firefighting efforts. This study compares these two regions to identify lessons for sustainable fire management in Mediterranean ecosystems.

Objetives

1. Compare wildfire vulnerabilities in Northern Portugal and Northern Algeria.
2. Analyze divergent management strategies for fire prevention, suppression, and landscape governance.
3. Highlight lessons for sustainable fire management in Mediterranean ecosystems.

Study Area

Northern Portugal is dominated by flammable *Eucalyptus globulus* monocultures (26% of forests), contributing to high wildfire risk. Dense wildland-urban interface (WUI) zones span 29,977 km, complicating fire response.

Northern Algeria faces drought-driven declines in *Pinus halepensis* monocultures, with 40% less precipitation increasing pest-related fuel loads. Mountainous WUI areas hinder suppression, while post-2021 investments aim to build permanent firefighting capacity.

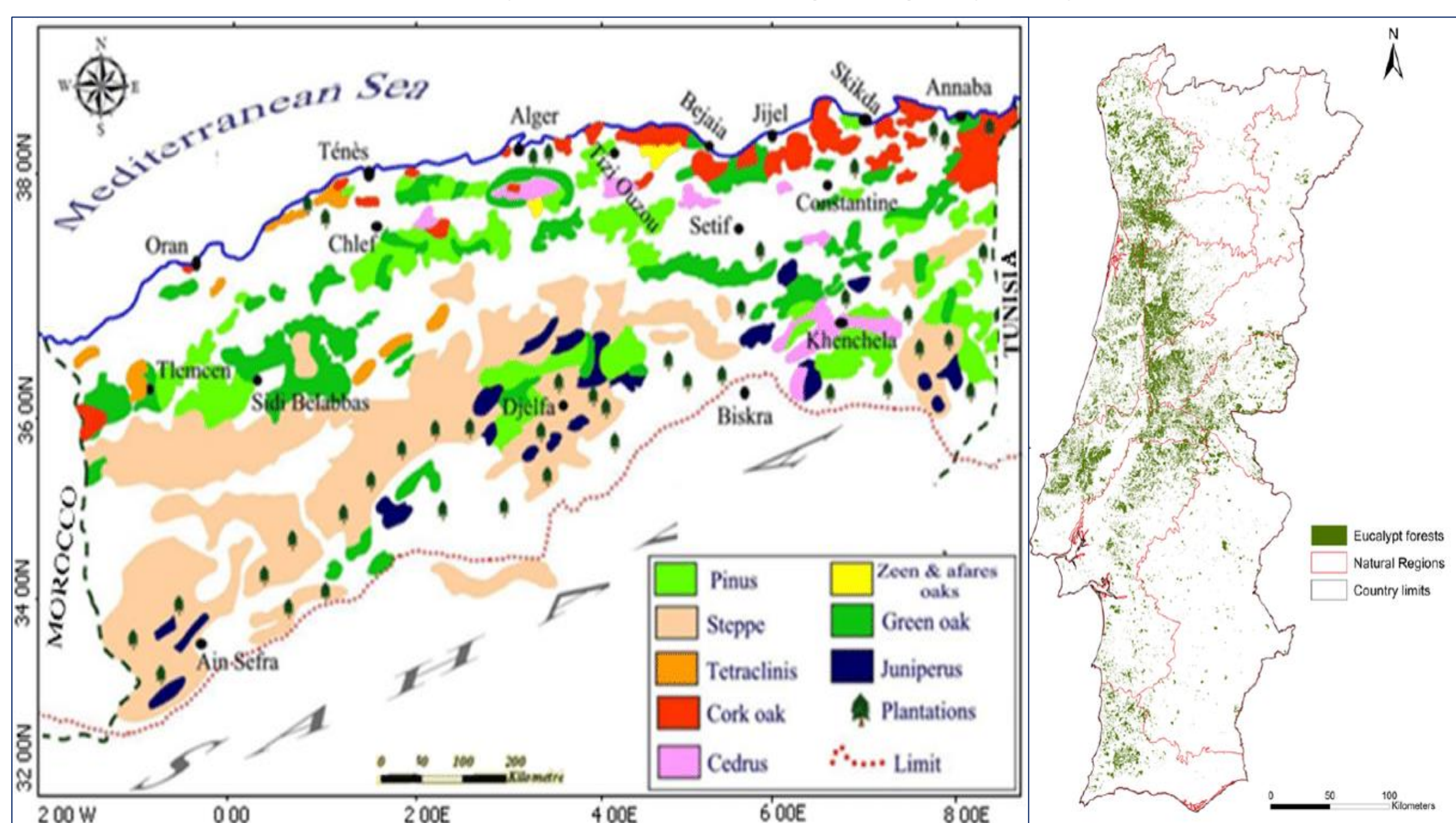


Figure 1: (Left) Main forest species distribution in Northern Algeria (Source: Bentchakal et al., 2022); (Right) Eucalyptus-dominated forests in continental Portugal's natural regions (Source: Catry et al., 2015).

Methodology

The study employed a comparative qualitative framework to analyze wildfire challenges in Northern Portugal and Northern Algeria:

Data Collection: Structured Field Observations: Site visits assessed monoculture health, fuel loads, and firebreak effectiveness (e.g., church-owned forests in Portugal, pest-damaged pine stands in Algeria).

Expert Interviews: Semi-structured interviews with fire management policymakers and suppression teams in both regions provided insights into operational challenges.

Data Synthesis: Systematic Literature Review: Peer-reviewed studies on regional fire policies, WUI dynamics, and monoculture impacts (e.g., Benali et al., 2021 on fuel management; Marques et al., 2011 on Portuguese wildfire trends) were analyzed.

Comparative Analysis: Contrasting fire governance strategies (e.g., Portugal's EU-funded aerial fleet vs. Algeria's permanent fleet development) and ecological vulnerabilities (e.g., *Eucalyptus* vs. *Pinus halepensis* monocultures) were evaluated using case studies from cited sources (Sá et al., 2022; Oliveira et al., 2020).

Results

Monoculture Risks:

- Portugal: High flammability in *Eucalyptus* stands vs. fire-resilient church forests with native mosaics.
- Algeria: Pest-infested *Pinus halepensis* (e.g., *Tomicus destruens*) increasing deadwood fuels.

WUI Challenges:

- Portugal's WUI requires balancing property protection and fire suppression.
- Algeria's decentralized settlements hinder coordinated fire response.

Firefighting Resources:

- Portugal invests in EU-funded aerial fleets (€600 million initiative).
- Algeria shifts from seasonal to permanent firefighting fleets post-2021.

Discussion

Fuel Management: Church forests in Portugal demonstrate reduced fire spread (Sá et al., 2022), contrasting with Algeria's pest-driven fuel loads.

Governance: Portugal's structured access control in parks aids prevention, while Algeria's open-access model complicates risk management

Policy Gaps: Both regions require adaptive strategies for climate resilience.

Conclusion

This comparative analysis underscores the urgent need for region-specific fire management strategies in Mediterranean ecosystems. In Portugal, diversifying monocultures and scaling up the mosaic planting practices observed in church-owned forests could mitigate landscape flammability. Algeria's pest-infested pine forests require integrated pest management and drought-resistant species to reduce fuel loads. Both regions must prioritize WUI zoning and invest in adaptive firefighting resources, such as Portugal's EU-funded aerial fleet and Algeria's permanent firefighting infrastructure. Collaborative knowledge exchange between these regions could address shared challenges while respecting ecological and socio-political differences, fostering resilience in an era of escalating fire risk.

Bibliography

- Alcasena et al. (2021) – Assessing Wildfire Exposure to Communities and Protected Areas in Portugal
- Benali et al. (2021) – Understanding the Impact of Different Landscape-Level Fuel Management Strategies on Wildfire Hazard in Central Portugal
- Bentchakal et al. (2022) – Meteorological drought and remote sensing data: an approach to assess fire risks in the Algerian forest
- Catry et al. (2015) – Assessing the extent and the environmental drivers of *Eucalyptus globulus* wildling establishment in Portugal: results from a countrywide survey
- Nunes et al. (2023) – An Evaluation of Wildfire Vulnerability in the Wildland–Urban Interfaces of Central Portugal Using the Analytic Network Process
- Sá et al. (2022) – Coupling wildfire spread simulations and connectivity analysis for hazard assessment: a case study in Serra da Cabreira, Portugal

