

Forest Fire Risk: Mapping vulnerable areas in northeastern Algeria

Enhancing fire management through advanced remote sensing for predictive risk assessment and prevention.



Boutaleb forest, south of the Setif province in Algeria, before the wildfire of 2020.
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Boutaleb forest, south of the Setif province in Algeria, after the wildfire of 2020.
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/// Context ///

Forest fires pose an ongoing and complex challenge, increasingly threatening human life and ecosystems. In the face of this growing threat, better understanding and anticipation of these risks are becoming essential. In response to this growing need, remote sensing and geographic information systems (GIS) have emerged as essential tools in fire monitoring. They enable precise monitoring of environmental conditions and integration of data into predictive models, facilitating fire forecasting and the adoption of preventive measures.

Our study focuses on the development of a sensitivity map of fire-prone areas in the forest of northeastern Algeria. This involves the careful analysis of various criteria and factors influencing fire risk assessment. By exploiting GIS and remote sensing technologies, combined with the Analytical Hierarchy Process (AHP), our aim is to assign appropriate weights to these selected criteria. This approach aims to refine our understanding and management of forest fire risk by providing a rigorous and systematic methodology for assessing and mapping the susceptibility of areas to fire.

/// Solution for a Resilient Future ///

To enhance preparedness and adaptability to fire hazards in Northeast Algeria, we employed an innovative approach combining geographic information systems (GIS), remote sensing, and the analytic hierarchy process (AHP) to create a fire risk sensitivity map. These tools helped identify areas most prone to fires, facilitating the implementation of preventive measures and effective risk management.

GIS is capable of processing and analyzing large spatial data, while remote sensing offers a comprehensive view of environmental phenomena. These technologies have enabled the monitoring of multiple factors influencing fire risk, such as vegetation cover, terrain, and climatic conditions. Using the AHP, we evaluated and ranked these factors according to their importance and impact. This approach contributed to identifying high-priority areas for monitoring and intervention. As a result, a

detailed sensitivity map was created, showing the probabilities of fire occurrences in the targeted area.

This map is a valuable tool for decision-makers and emergency services, enabling them to identify the most fire-prone areas and efficiently direct resources and efforts towards those locations. Additionally, the map enhances public awareness of fire hazards and supports efforts to mitigate these risks. This study represents a significant step towards achieving a more resilient and safe future in the face of fire hazards, enhancing the local communities' capabilities to adapt and respond effectively to these challenges. By combining modern technologies with scientific analysis, we hope to provide sustainable solutions that contribute to protecting lives and the environment in Northeast Algeria.

The different stages of the study on the sensitivity of areas to the risk of forest fires in the North-East of

Algeria, concerning forest areas, can be detailed as follows:

- Identification of criteria and collection of spatial data: Identify the criteria that influence the study of the phenomenon of forest fires. These criteria include factors such as vegetation cover, topography, weather conditions and other relevant variables. Next, collect corresponding spatial data for each criterion, to use in the analysis.
- Using the AHP to determine criteria weights: Once identified the relevant criteria and collected the corresponding spatial data, the analytical hierarchy method (AHP) was used to assign weights to each



Forest fire in Boutaleb, South of the Setif province in Algeria.
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criterion. The AHP allowed to compare the relative importance of each criterion compared to the others, taking into account the objectives of the study and expert opinions.

- Ranking the criteria on a single scale: Each criterion was ranked on a single scale, assigning values to indicate their sensitivity to wildfire risk. The least sensitive criteria received lower values, while the more sensitive criteria received higher values. This classification allowed to identify the areas most exposed to fire risk in the region studied.
- Final objective: Creation of a sensitivity map of areas exposed to fire risk.



Forest fires damage biodiversity and threaten the ecological balance.
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/// Always Moving Forward ///

To effectively manage fire risk in northeastern Algeria, several key actions are required. Firstly, it is important to regularly update data on vegetation, weather conditions and terrain in order to accurately analyze fire risks. In addition, it is necessary to improve the monitoring infrastructure to obtain real-time information. By expanding the use of geographic information systems (GIS) and remote sensing, it is possible to cover larger areas and obtain a more comprehensive view of risks on a national scale. Training civil servants and raising public awareness of fire management and prevention is also

essential. Strengthening cooperation between government agencies and organizations specializing in fire risk management will enable more effective strategies to be developed. It is also important to draw up detailed emergency plans and train specialized response teams for rapid, effective action. The use of modern technologies such as satellites and sensors for early warning is also recommended. Finally, scientific research should be promoted to develop innovative fire detection and prevention techniques.

Further information

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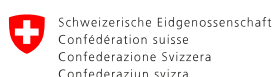
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Partners: INRGREF – National Institute of Rural engineering research, Water and Forests



Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

Project co-funded by



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