



Case Study Report FRISK-GO

Multicriteria risk analysis

Christophe Orazio¹

Adding value with a European Forest Risk Facility

Case study reports are a tool to investigate and document how a European Forest Risk Facility can add value to current actions using concrete examples based on real events/incidents

A) Description and background

Biotic and abiotic hazards in forests can cause considerable damages. They have been increasing and are likely to continue doing so due to a set of different factors one being the climatic of climate change. Furthermore, a forest stand can subject to more than one hazard. A forest may simultaneously face threats from fire, drought and biotic hazards, thus often resulting in contradictory recommendations given for risk management. It is therefore important to analyse multiple risks rather than separate hazards when dealing with global change.

As a task within the FORRISK project², the Regional Office of the European Forest Institute 'EFIATLANTIC' conducted a multi-criteria analysis to rank various forest management options according to multiple risks for the following species: Maritime pine, Radiata pine and Poplar.

B) Approach taken

The methods used are based on Jactel et al. (2012) and were adapted for this multi-criteria analysis on multiple risks. Risk analysis generally defines the frequency and the intensity of hazards, the vulnerability of forests to the particular hazards and their impact on forests (i.e., the stakes). These are then integrated with all available data in order to calculate an overall risk value (Figure 1).

¹ European Forest Institute Regional Office EFIATLANTIC

² Network for Innovation in Silvicultural and Forest Risks Management Systems (FORRISK). Duration: 01/10/2012 to 31/12/2014.
www.forrisk.efiatlantic.efi.int



In this case, all values were used in the decision support tool Visual Prométhée (Mareschal, 2014) to compare the different options by varying the weighting factor of the criteria on which the comparison of options is carried out. The detailed protocol can be consulted online at: www.forrisk.efiatlantic.efi.int

$$\text{Hazard} \times \text{Vulnerability} \times \text{Stakes} = \text{Risk}$$

Figure 1. Definition of risk

The method showed promising for delivering input to formulate recommendations for best management practices which forest managers could apply following multi-hazard occurrences. The main advance to be implemented in future analyses is to include profitability in the ranking for more holistically promoting best management options in a selected region under a given regime of risk.

C) Added value

Main added value of this approach is to provide integrated recommendations considering a multitude of risks for a given area/region, and avoid detached information and results from specialists dealing with individual risks and show when brought together to be either inconsistent or contradictory. Further this approach allows for identifying gaps in knowledge and data for producing reliable comparisons on management options.

For example in Figure 2, Prométhée II ranking results are shown (for detailed protocol consult: www.forrisk.efiatlantic.efi.int and EFIATLANTIC, 2014). In the case of maritime pine, the analysis shows that in Aquitaine and Galicia, the scenarios are very different from each other, while those in Portugal and Asturias are more similar. Some scenarios, like M4 (short-term scenario) and M7 (biomass scenario), are ranked as those being least at risk. In the same way, the standard scenario (M2) and M6 ('half-allocated to biomass' scenario) often rank in the middle. It needs to be kept in mind that not all scenarios based on the same set of hazards within the selected regions. That will influence the ranking of the scenarios for both 'hazards' and the 'vulnerability to hazards'. Moreover the results show that the short duration scenarios (M4 and M5 25 years; M7 12 years) are the least at risk, as the value at stake is generally low. Scenarios the most at risk are those that have a longer rotation time such as M1 (60 years), M3 (55 years) and the scenario not applying any management.

Other types of analyses can be performed based on the applied multi-criteria risk analysis approach. Those can include multi-region integration as well as other types of discrimination between tested scenarios. This tool constitutes one of a few allowing a multi-risk approach. A future European Forest Risk Facility could take up the task to apply such multi-criteria risk tools jointly with its expert network for addressing needs within the risk community (research, management).



Thus gathering and analyzing data from different disturbance types, and producing results and recommendations for integrating several risks could become a valuable contribution of a European Forest Risk Facility to the European forest risk community from local to pan-European scale.

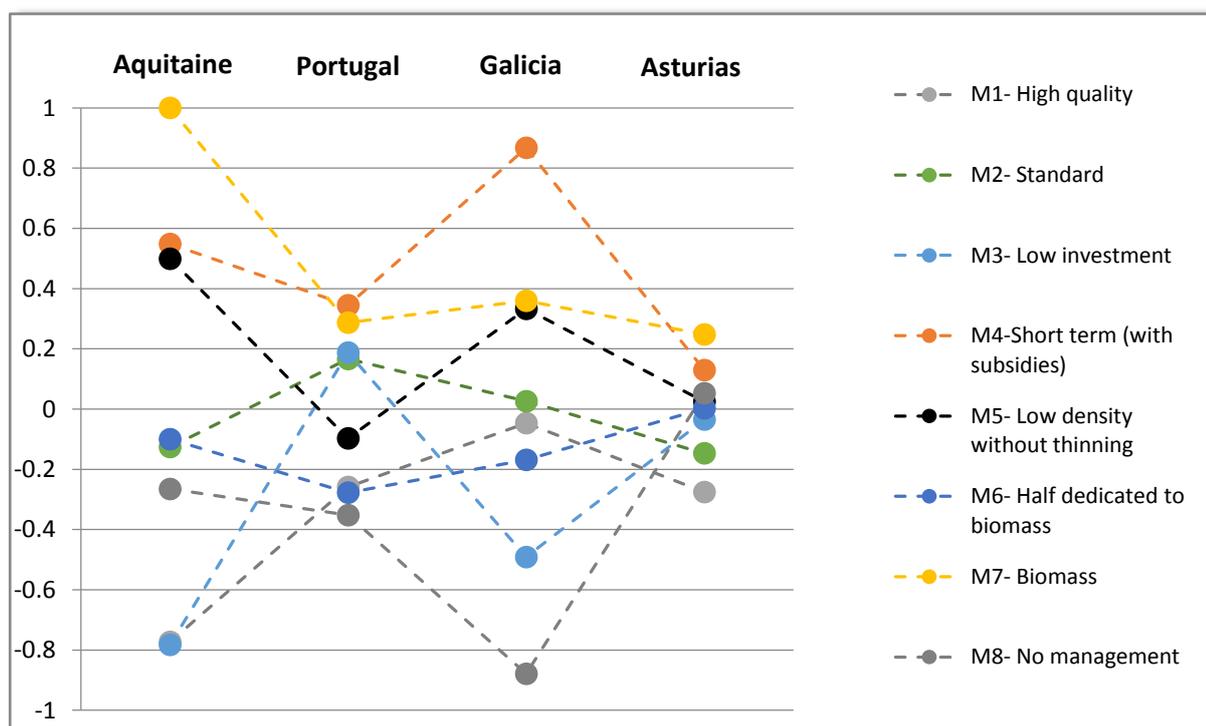


Figure 2: Prométhée II ranking results for the maritime pine in each of the regions: Aquitaine, in Portugal, in Galicia and in Asturias (-1 is the value most at risk and 1 the least at risk)

D)References

Jactel H., Branco M., Duncker P., Gardiner B., Grodzki W., Langstrom B., Moreira F., Netherer S., Nicoll B., Orazio C., Piou D., Schelhaas M., Tojic K., 2012. A multicriteria risk analysis to evaluate impacts of forest management alternatives on forest health in Europe. *Ecology and Society*, 17(4): 52.

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EFIATLANTIC (Project coordinator). 2014. FORRISK, Gestion intégrée des risques en forêt, Gestin integrada de los riesgos en los bosques plantados, Gestão integrada dos riscos nas florestas cultivadas, 143 p.