

Corvallis July 2019



# How to translate knowledge on ecological processes and interactions into operational tools and innovative management practices?

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## The context

- ✓ The questions we are being asked

- ✓ How should I manage my forest holding?
- ✓ How may I assess the effectiveness of a forest policy?

- ✓ The challenges

- ✓ How to estimate the impact of management options on the provision of ecosystem services?
- ✓ How to take into account the information provided by the answer to the first challenge to make better decisions?

# Ecosystem resource capability models



✓ Wood,  
Biodiversity



✓ Water



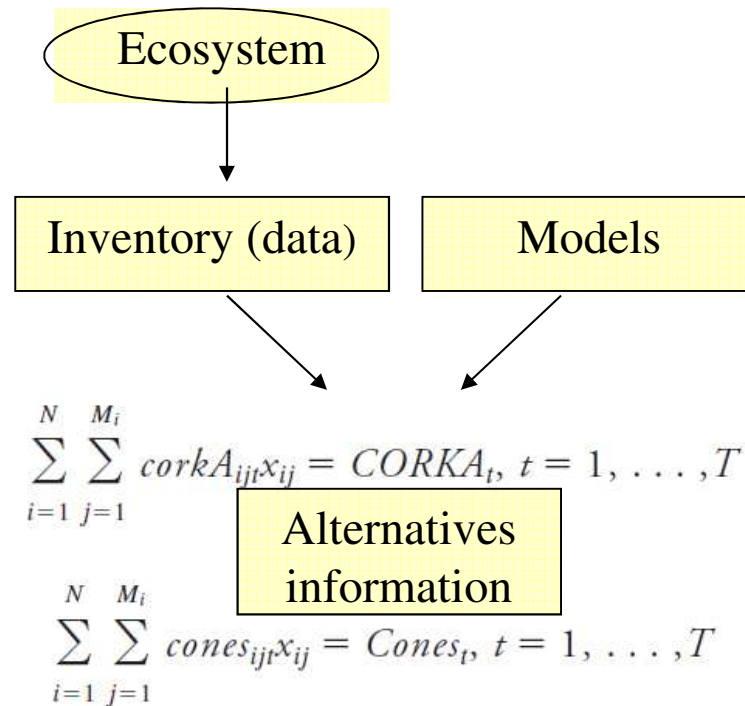
✓ Carbon



✓ Cultural

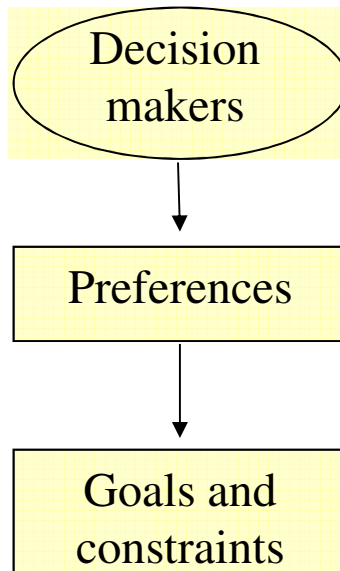


✓ Regulatory

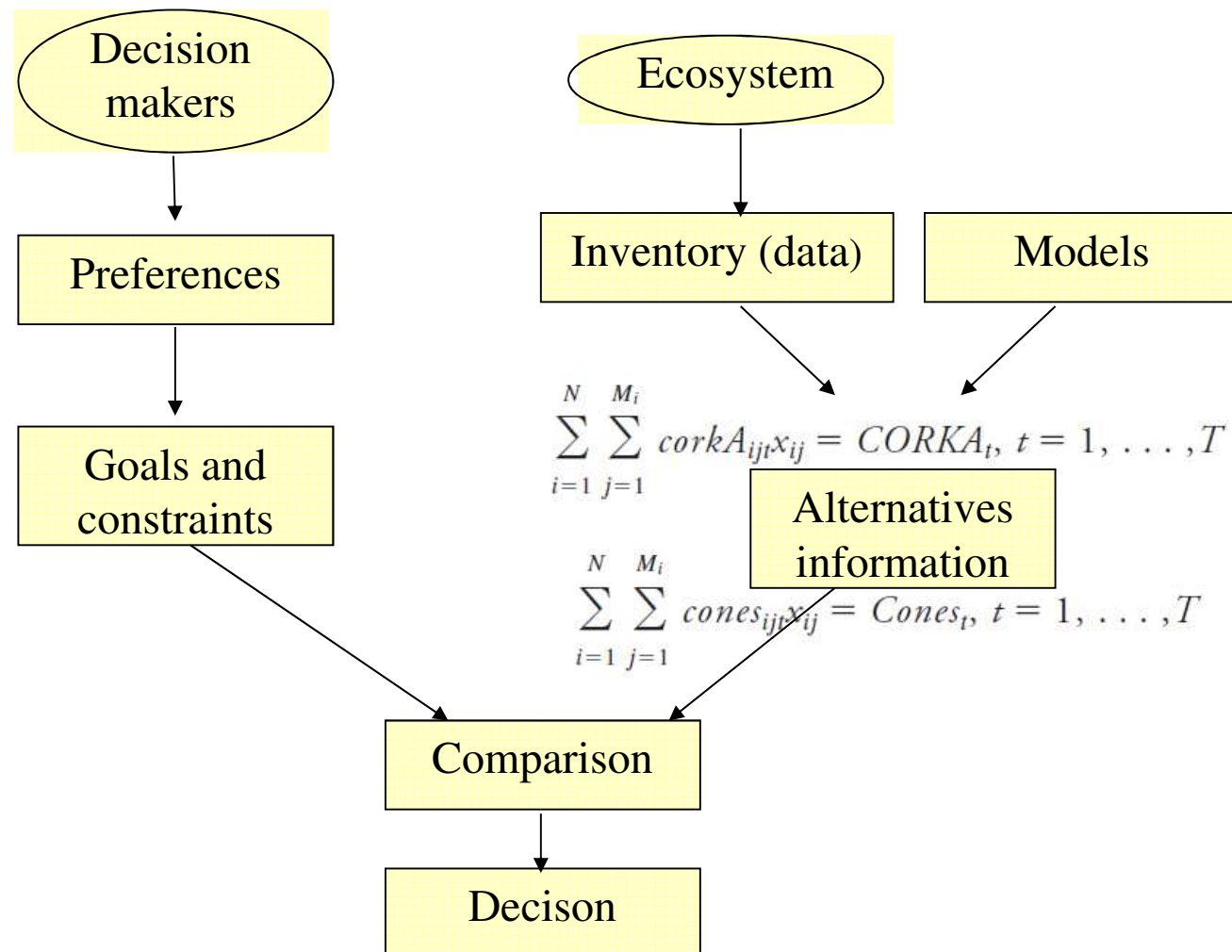


## The decision makers

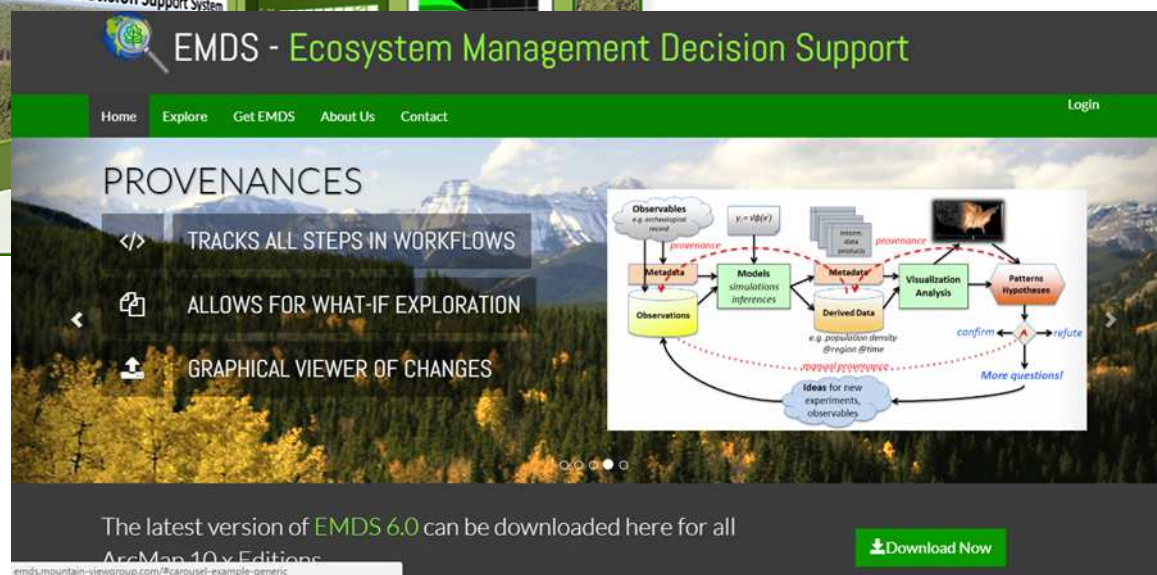
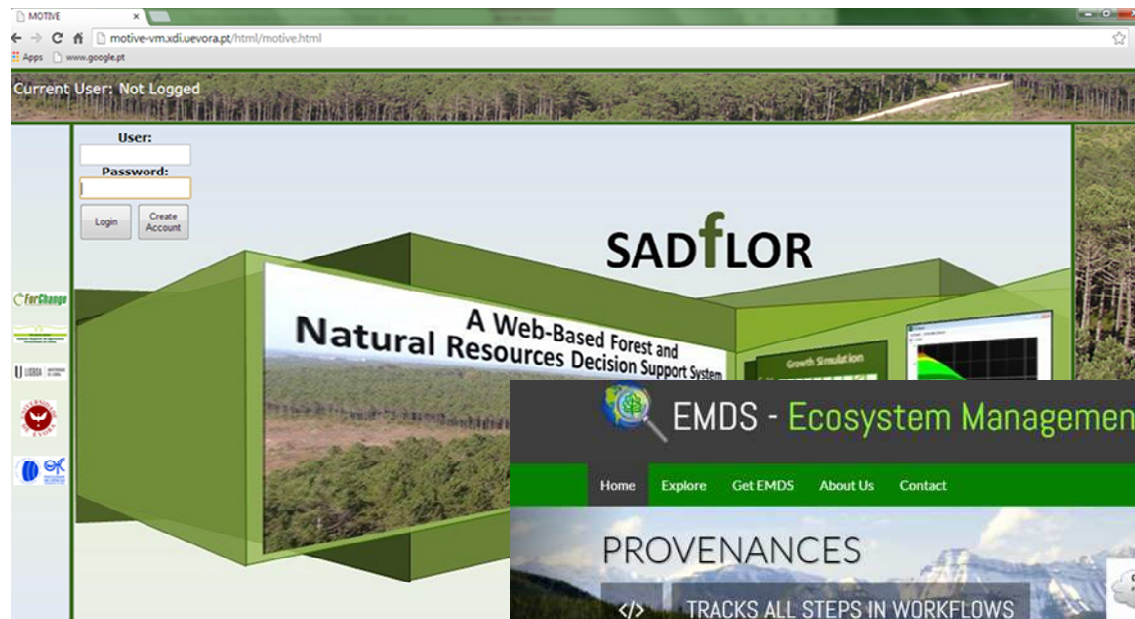
✓ ALTERFOR / BIOECOSYS workshops



## Bringing together decision makers and ecosystem resource capability models



# Decision support systems



## Decision support methods. A spatially explicit Pareto Frontier multiple criteria method

- Borges, J. G., S. Marques, J. Garcia-Gonzalo, A. U. Rahman, V.A. Bushenkov, M. Sottomayor, P. O. Carvalho and E.-M. Nordström 2017 A multiple criteria approach for negotiating ecosystem services supply targets and forest owners' programs. *Forest Science* 63: 49–61
- Nordström, E.-M., M. Nieuwenhuis, E. Z. Başkent, P. Biber, K. Black, J. G. Borges et al. 2019 Forest decision support systems for analysis of ecosystem services provisioning at landscape scale under global climate and market change scenarios *European Journal of Forest Research* (in press)
- Marto, M., K. M. Reynolds, J. G. Borges, V. A. Bushenkov, S. Marques, M. Marques, S. Barreiro, B. Botequim and M. Tomé 2019 A Web-based Architecture for a Forest Resources Management Decision Support System Submitted for publication in *Computers and Electronics in Agriculture*
- Linkevičius, E., J. G. Borges, M. Doyle, H. Pülzl, E.-M. Nordström, H. Vacik, V. Brukas, P. Biber, M. Teder, P. Kaimre, M. Synek, J. Garcia-Gonzalo 2019 Linking forest policy issues and decision support tools in Europe *Forest Policy and Economics* 103: 4-16

## **Decision support methods. Combining models, multiple criteria, multiple attribute methods and fuzzy logic**

Marto, M., K. M. Reynolds, J. G. Borges, V. A. Bushenkov and S. Marques 2018 Combining Decision Support Approaches for Optimizing the Selection of Bundles of Ecosystem Services. *Forests* 2018, 9, 438

Reynolds. K. M, H. Vacik, M. Lexer, J. G. Borges, M. Lakicevic and G. Shao 2019 Decision support systems in forestry In: *V. Kint, F. Mohren, B Muys and R. Wulf (Eds) Forest Management Planning for Multiple Ecosystem Services*. Springer

Special Issue "Decision Support to Address Multiple Ecosystem Services in Forest Management Planning". Editors: J. G Borges, H. Vacik, K Reynolds, L. C. Rodriguez and E Baskent

[www.mdpi.com/journal/forests/special\\_issues/Decision\\_Support\\_to\\_Ecosystem\\_Services](http://www.mdpi.com/journal/forests/special_issues/Decision_Support_to_Ecosystem_Services)



## Project proposals

- ✓ BABEL 2nd stage H2020 proposal
  - ✓ Developing a decision support system for management of native and alien BAB (Bark and ambrosia beetles) populations in Europe

# Project proposals

- ✓ MEDfOR Mediterranean Forestry and Natural Resources Management (EMJMD – <http://www.medfor.eu>)



# Project proposals

- ✓ Marie Curie application



**Thank you**