



## MAESTRO

### **Dynamic sampling and inference for a smart forest monitoring with applications to the French National Forest Inventory**

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#### *Context —*

Forest resources are strongly scrutinized for their ability to deliver a diversity of ecosystem services and functions. Increasing environmental pressure on these resources and a greater public awareness have put a strong emphasis on their survey and monitoring. Concomitantly, a strong collapse of the scientific expertise in France and Europe is witnessed. The role of the project is to contribute to renew academic skills in the field, and develop new sampling and inference strategies in the field of environmental monitoring and forest inventory.

#### *Objectives —*

The aim of this research project is to develop and optimize the sampling strategies of the French NFI, focusing on accuracy, flexibility, and responsiveness. A first objective is to describe and evaluate current post-stratified statistical estimators of the NFI, and compare them with existing estimators in Europe in critical contexts. A second objective is to evaluate and optimize the forest stratification / post-stratification schemes with variance-bias trade-off and small-sized strata issues as perspectives. A third objective is to re-design the sampling strategy of this inventory and increase its flexibility and independence, in order to both better inform small forest areas and produce more accurate annual forest information.

#### *Approaches —*

The project will elaborate on survey sampling theory, experimental simulation, and retrospective analysis of NFI data. 15 annual samples are already recorded, offering an invaluable and easily accessible research material. The original research cluster constituted for the project will make survey sampling and inference, database methodology and simulation skills readily available for the project.

#### *Expected results and impacts —*

The project is intended to evaluate and renew statistical estimators, stratification and sampling schemes implemented in forest inventory in order to increase precision especially over critical forest sub-domains, and foster temporal reactivity and accuracy. Lastly, the project will allow renew academic skills in a critically restricted community, and extend ARBRE capacity in this field.