Integration of multi-sourced and multi-scale forest monitoring data for addressing local to global challenges on forest ecosystems

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Forests and climate change
(in relation to the Paris Agreement)

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(Articles 4 and 5):

Reduce the growth rate of atmospheric CO2 by **increasing carbon sequestration**

(Article 2):

Reduce radiative imbalance at the top of the atmosphere by **increasing albedo**

(Article 7):

Without increasing air **temperature** nor **decreasing precipitation**

Scientific evidence: mitigation vs. adaptation

ARTICLES
PUBLISHED ONLINE: 27 FEBRUARY 2017 | DOI: 10.1038/NCLIMATE3227
nature climate change

The key role of forests in meeting climate targets requires science for credible mitigation

Giacomo Grassi[1*], Jo House[2], Frank Dentener[1], Sandro Federici[3], Michel den Elzen[4] and Jim Penman[5†]

And what does recent science say?

LETTER nature
International weekly journal of science
https://doi.org/10.1038/s41586-018-0577-1

Trade–offs in using European forests to meet climate objectives

Sebastiaan Luyssaert[1,2*], Guillaume Marie[1], Aude Valade[3,5], Yi-Ying Chen[2,6], Sylvestre Njakou Djomo[4], James Ryder[2,7], Juliane Otto[2,8], Kim Naudts[2,9], Anne Sofie Lansø[2], Josefine Ghattas[3] & Matthew J. McGrath[2]

Focus on adaptation!

Forest management to sustain multiple ecosystem services (not just C sequestration)

Sustain Multiple Forest Ecosystem Services

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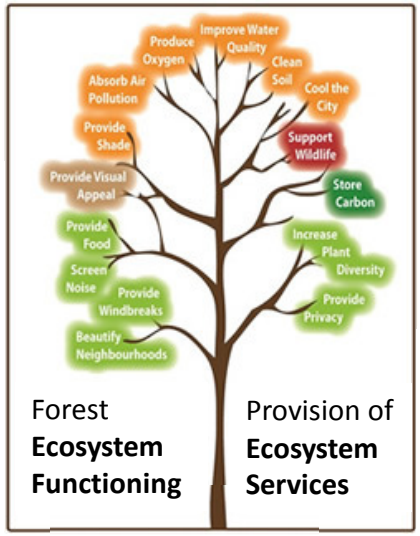
Climate change
adaptation & mitigation
UNFCCC

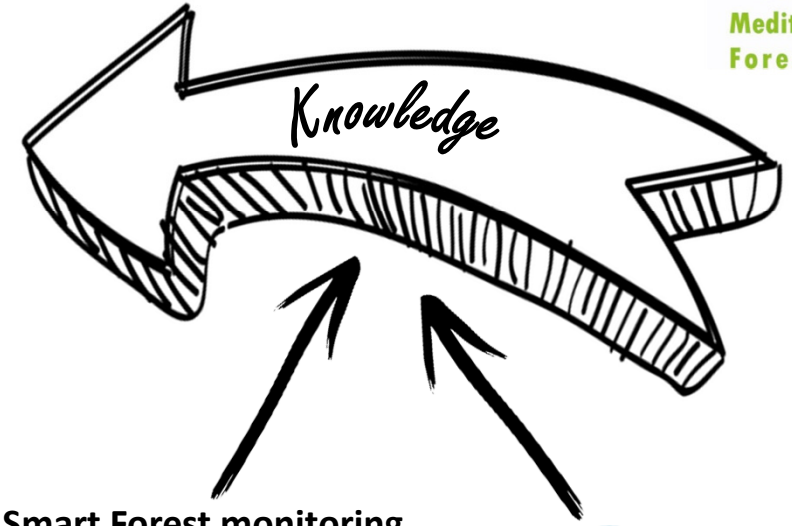
Biodiversity
Conservation
CBD



Revert Land
Degradation
LDN

Forest Land
Restoration
FLR

Combat
Desertification
UNCCD



Smart Forest monitoring

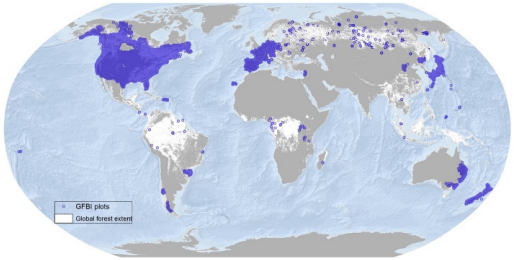
+

Data
Science

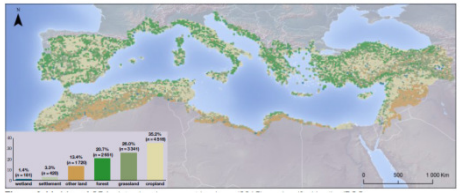
Data integration: multiple spatio-temporal scales

Scaling up

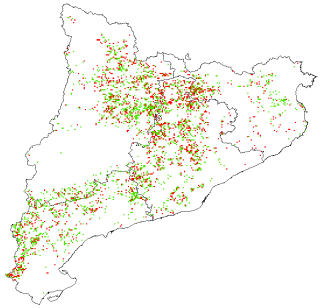
Global



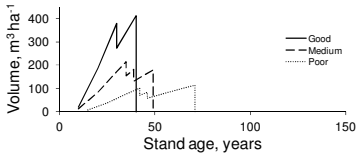
National / Regional

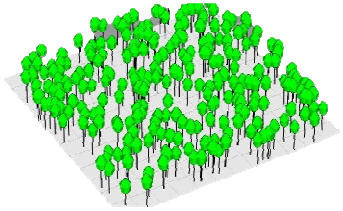


Landscape



Stand





Downscaling

Days
Months
Years
Decades…

Data integration: multiple data sources

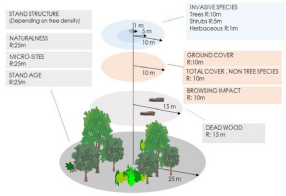
Scaling up

Global

GFBI

GEDI
ECOSYSTEM LIDAR

National / Regional



DIABOLO
Distributed, Integrated and Harmonised Forest Information for Bioeconomy Outlooks

Landscape

ALERTAFORESTAL

Stand

Downscaling

Days
Months
Years
Decades…

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Benefits of multi-scale & multi-source data integration

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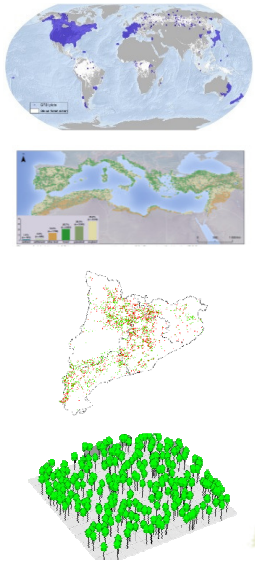
From local to global:

- **Experimental data** from intensive local monitoring
- **Data on specific features** seldom monitored in forest ecosystems at broader scales (e.g. fungal dynamics)
- **Accurate information** on forest dynamics & drivers operating **at smaller scales**

GLOBAL



LOCAL

From global to local:

- **New data** & **knowledge** not available at more local level (e.g., LiDAR-based forest structure)
- **Context & further insight** (broader frame compared to more local forest knowledge and dynamics)
- **Information** on forest dynamics & drivers operating **at larger scales**

Example of data integration & harmonization

DIABOLO
Distributed, Integrated and Harmonised Forest Information for Bioeconomy Outlooks

- Towards distributed, integrated, statistically sound and harmonised data, as well as outlooks on forest resources and their use.
- Combined with reporting, policy- and decision-making at multiple scales, it supports the development of a sustainable and circular bioeconomy while addressing the SDGs

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DIABOLO
POLICY
BRIEF

Responding to European, national and regional challenges with harmonised forest information

AUTHORS: Tuula Packalen; Markus Lier; Kari T. Korhonen; Anu Ruusila, Luke, Finland; Torgny Lind, SLU, Sweden; Laurent Saint-Andre, INRA, France; Cédric Vega; Jean-Christophe Hervé*, IGN, France; Iciar Alberdi, INIA, Spain; Matthias Dees; Pawan Datta, ALU-FR, Germany; Charles Harper, UCD, Ireland; Alexandra Freudenschuss; Klemens Schadauer, BFW, Austria

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Distributed, integrated and harmonised forest information from National Forest Inventories (NFIs) for international reporting and policies

Distributed, integrated and harmonised forest information	FAO GLOBAL FRA, UNECE, EUROSTAT, FOREST EUROPE, JRC Bioeconomy Knowledge Centre
Improved multisource and multipurpose NFIs and forest disturbance monitoring	The Forest Information System for Europe (FISE)
	Statistically sound forest information for evidence-based policy making
Improved tools for the NFI based scenario modelling	National and regional forest sector outlook studies
	Coordinated implementation of energy, climate, biodiversity, forest, circular economy and bioeconomy strategies
New ideas and experiences on Open Data and Open Science improve transparency at science-policy-practice interface	Open source software tools and web-based services support sustainable management of natural resources

Example of data integration & sharing platform

GFBI

Global Forest Biodiversity Initiative

Universitat de Lleida

Central GFBI Hub

- *Development of the **GFBI Data Management System** (GFBI DMS)*
- *Hosting the **GFBI Data Center** (GFBI DC)*

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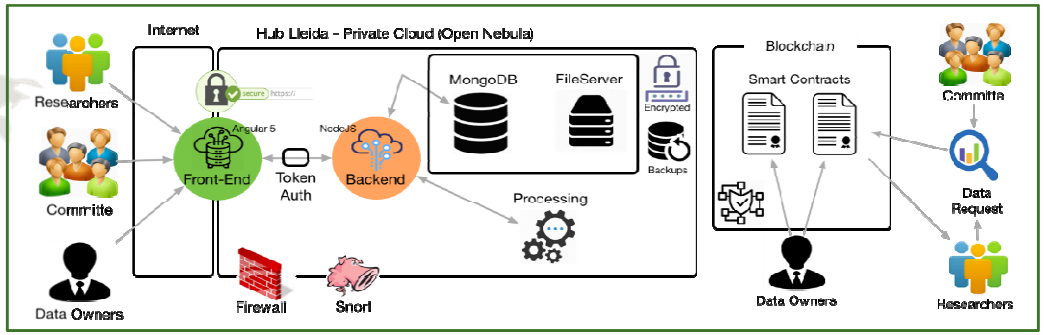


Largest individual-tree forest inventory database:

- **≈ 1.3 million plots**
- **≈ 30,000 tree species**
- From all continents and forest biomes

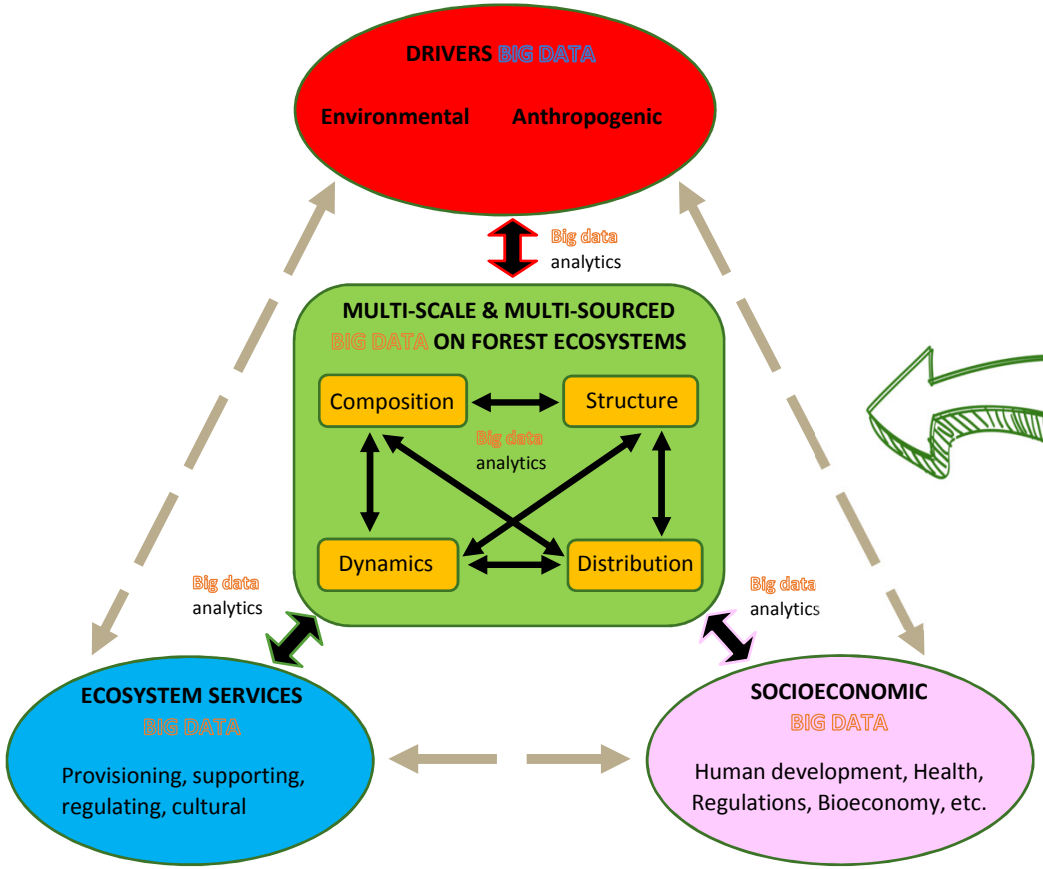
FOREST ECOLOGY

Science

Positive biodiversity-productivity relationship predominant in global forests

Jingjing Liang,* Thomas W. Crowther, Nicolas Picard, Susan Wiser, Mo Zhou, Giorgio Alberti, Ernst-Detlef Schulze, A. David McGuire, Fabio Bozzato, Hans Pretzsch, Sergio de-Miguel, Alain Paquette, Bruno Hérault, Michael Scherer-Lorenzen,

Data integration & sharing (monitoring is not enough!)



SCIENTIFIC DATA

Amended: Addendum

OPEN

SUBJECT CATEGORIES
» Research data
» Publication characteristics

Comment: The FAIR Guiding Principles for scientific data management and stewardship

Mark D. Wilkinson *et al.*

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FAIR Data: **F**indability, **A**ccessibility, **I**nteroperability, **R**eusability

Forest monitoring & data needs…

- **Harmonization**
- **Standardization**
- **Integration**
- **Sharing**
- **Transparency**
- **Security**
- **Communication**
- **Etc.**

+

Proper **analytical tools**:

- ✓ Big Data Technology
- ✓ Artificial Intelligence

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THANK YOU

… specially to Dr. Nicolas Picard (FAO)
for presenting this on my behalf.

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