The DIABOLO H2020 project: state of play in developing forest information

EIONET Meeting National Reference Centres Forests 2018
Tuula Packalen, Luke, Finland (DIABOLO Coordinator)
DIABOLO originates from H2020 SC2 ISIB-04-A-2014*: Improved forest data

- Country-specific national forest inventories (NFIs)
  - sound statistical designs
  - fulfilling e.g. the green house gas (GHG) reporting quality criteria
- New inventory methods and techniques
- European National Forest Inventory Network (ENFIN) since 2003 to work on harmonisation ([http://enfin.info](http://enfin.info)) – COST E43 and USEWOOD, Framework contracts with EC (JRC)

*ISIB=Innovative, sustainable and inclusive bioeconomy
The DIABOLO value-network

National reporting, policy and decision making processes

International reporting, policy and decision making processes

NFIs harmonized for summing up and comparisons

NFIs optimized for national information needs and specificity
DIABOLO aims at bridging the gaps in the provision of forest information

- based on the analysis of information gaps (WP1)
- by developing multi-source (WP2) and multi-purpose (WP3) forest inventory
- by enhancing forest disturbance monitoring using new European satellite data (WP4)
- by modelling wood supply and trade-offs (WP5)
- by harmonising and integrating distributed data (all WPs)
The DIABOLO Team

Over 100 researchers from 33 organisations in 25 European countries. Experts in policy analysis, forest inventory, forest modelling.

Countries involved in DIABOLO (in green). Shaded countries contribute also as WP leaders.

WP1 Torgny Lind (SLU)
WP2 Laurent Saint-André (INRA), Cédric Véga (IGN) and Jean-Christophe Hervé (IGN)
WP3 Iciar Alberdi (INIA)
WP4 Pawan Datta (ALU-FR)
WP5 Tuula Packalen (Luke)
WP6 Charles Harper (UCD)
WP7 Markus Lier (Luke)

Photos: Joensuu 2015, Copenhagen 2016, Vienna 2017, Madrid 2018
The DIABOLO Advisory Board

- Annemarie Bastrup-Birk, EEA
- Anssi Pekkarinen, FAO
- Jesus San-Miguel-Ayanz, JRC, DG E Space, Security and Migration
- Roman Michalak, UNECE
Progress beyond state-of-art by February 2018 (Month 36) and 22 Deliverables - 12 months to go
<table>
<thead>
<tr>
<th>Forest-focused indicators most <strong>demanded &amp; supplied</strong></th>
<th>Indicators- most demanded, but not part of the top 16 supplied indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Forest area</td>
<td>11. Water protection areas in forests</td>
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<tr>
<td>2. Protected forest areas</td>
<td>12. Natura 2000 forest habitat types and forest related species</td>
</tr>
<tr>
<td>3. Afforested area</td>
<td>13. Amount of dead wood due to biotic or abiotic damage</td>
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<td>4. Regenerated area</td>
<td>14. Harvested wood, incl. biomass for energy</td>
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<tr>
<td>5. Afforestation, reforestation &amp; deforestation</td>
<td>15. Amount of wood harvested due to biotic or abiotic damage</td>
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<tr>
<td>6. Age structure/diameter distribution</td>
<td>16. Forest fires</td>
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<td>7. Tree species composition/distribution</td>
<td></td>
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<td>8. Increment and felling</td>
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<td>9. Pest outbreaks</td>
<td></td>
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<tr>
<td>10. Forest holdings (number, size, ...)</td>
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</tbody>
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Baycheva-Merger T. et al. 2018, Forests
<table>
<thead>
<tr>
<th>Procedures, models</th>
<th>Pan-European equations</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Harmonized volumes in 21 NFIs</td>
<td>for volume and biomass (total and partial)</td>
</tr>
<tr>
<td>Reference definition(s) agreed for Task T2.1</td>
<td>for the main tree species in Europe</td>
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<tr>
<td>1 “Whole stem”</td>
<td>1 “Whole stem”</td>
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<tr>
<td>2 “COST Action E43”</td>
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<td>3 “Control”</td>
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<tr>
<td>4 “Merchantable stem”</td>
<td>4 “Merchantable stem”</td>
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<tr>
<td>5 “Merchantable stem and branches”</td>
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<th>Algorithms embedded into open source platforms</th>
<th>E-forest estimator</th>
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<td><strong>Processing chain for Terrestrial</strong></td>
<td><strong>multi-phase</strong></td>
</tr>
<tr>
<td><strong>Lidar plot Surveys</strong> (Computree platform)</td>
<td><strong>estimation approach</strong></td>
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<tr>
<td><strong>Knowledge, benchmarking, protocol improvements</strong></td>
<td><strong>Method for integrated assessment of</strong></td>
</tr>
<tr>
<td><strong>3D reconstruction algorithms from VHR images</strong></td>
<td><strong>forest information</strong> (operational to international)</td>
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<tr>
<td>and robustness of metrics (different acquisition &amp; forest conditions)</td>
<td>reporting level)</td>
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Procedures, models

- Methodology for the assessment of ecological connectivity
- Models for the estimation of NWFP
- Method to estimate canopy variables related to crown fire hazard, definition of fuel models

Knowledge, protocol improvements

- Suitability of NFI variables for the evaluation of conservation status of N2000
- Field protocols NWFP
- Proposal of a specific set of social indicators

Output

- Methodologies for using Sentinel2 data, and demonstrating them within Copernicus ICT framework
- Interactive tool for validation, rejection and modification of detected changes based on expert field knowledge

Outcome

- rapid disturbance detection approach to provide information to local and regional users
- disturbance management (near real time maps)
- decision support on disturbance management at different levels (aggregated)

Hirschmugl et al. 2017, CFR; S. Ullah et al. 2017, iForest
Output

• guidelines and a template for reporting the scenario assumptions
• scenarios on future land-use pressure and shifts for countries
• methodology for modelling biomass supply dynamics over time by countries

Outcome

• harmonisation for summing up & comparability of studies
• global context of increasing competition for land -> national level outlooks
• capacities for national outlook studies
• potential of European NFIs to produce distributed, integrated and harmonized forest information

Vauhkonen & Packalen 2017, Forests
Vauhkonen & Packalen 2018, Ecosystem services
State of the art before Diabolo

- COST E4, 39, 43, USEWOOD, FORSYS, ORCHESTRA
- the networks ENFIN, EFFIS, SOSIN
- the FP7 EUFODOS, S2BIOM, INTEGRAL, SIMWOOD, FIRE

Progress + Coming soon

- Synthesis on data demand and provision (WP1)
- Biomass and volume equations, TLS / Computree, 3D/ VHR, estimation for multi-source inventory (WP2)
- Indicators for multipurpose forestry (WP3)
- Monitoring disturbances (WP4)
- Wood supply analysis -> distributed, integrated, harmonized pilot of 23 countries (WP5)

Expected impacts

- Improved data value chains and networks, e.g. GHG reporting and planning mitigation measures
- Consistency and manifoldness of forest information
- Near real-time information on disturbances
Our focus until February 2019
Data demand and supply analysis WP1

Multi-source inventories WP2

Multi-purpose inventories WP3

Disturbance mapping WP4

Wood supply analysis WP5

Sampling, estimation and modelling techniques WP2

EC space-based applications WP4

Data demand and sampling analysis WP1

Wood supply analysis WP5

Indicators and estimation methods for multipurpose inventories WP3

Advisory Board:
- “Methods fit, open source appreciated”
- “Capacity building & networking expected”

Dissemination and communication for impact from progress
DIABOLO improves information for bioeconomy policies and future post-fossil alternatives from European to local levels.

The results will benefit all EU member countries on regional, national and European level.

Website: [www.diabolo-project.eu](http://www.diabolo-project.eu)
Vauhkonen & Packalen 2017, A Markov Chain Model for Simulating Wood Supply from Any-Aged Forest Management Based on National Forest Inventory (NFI) Data, Forests
Vauhkonen & Packalen 2018, Uncertainties related to climate change and forest management with implications on climate regulation in Finland, Ecosystem services