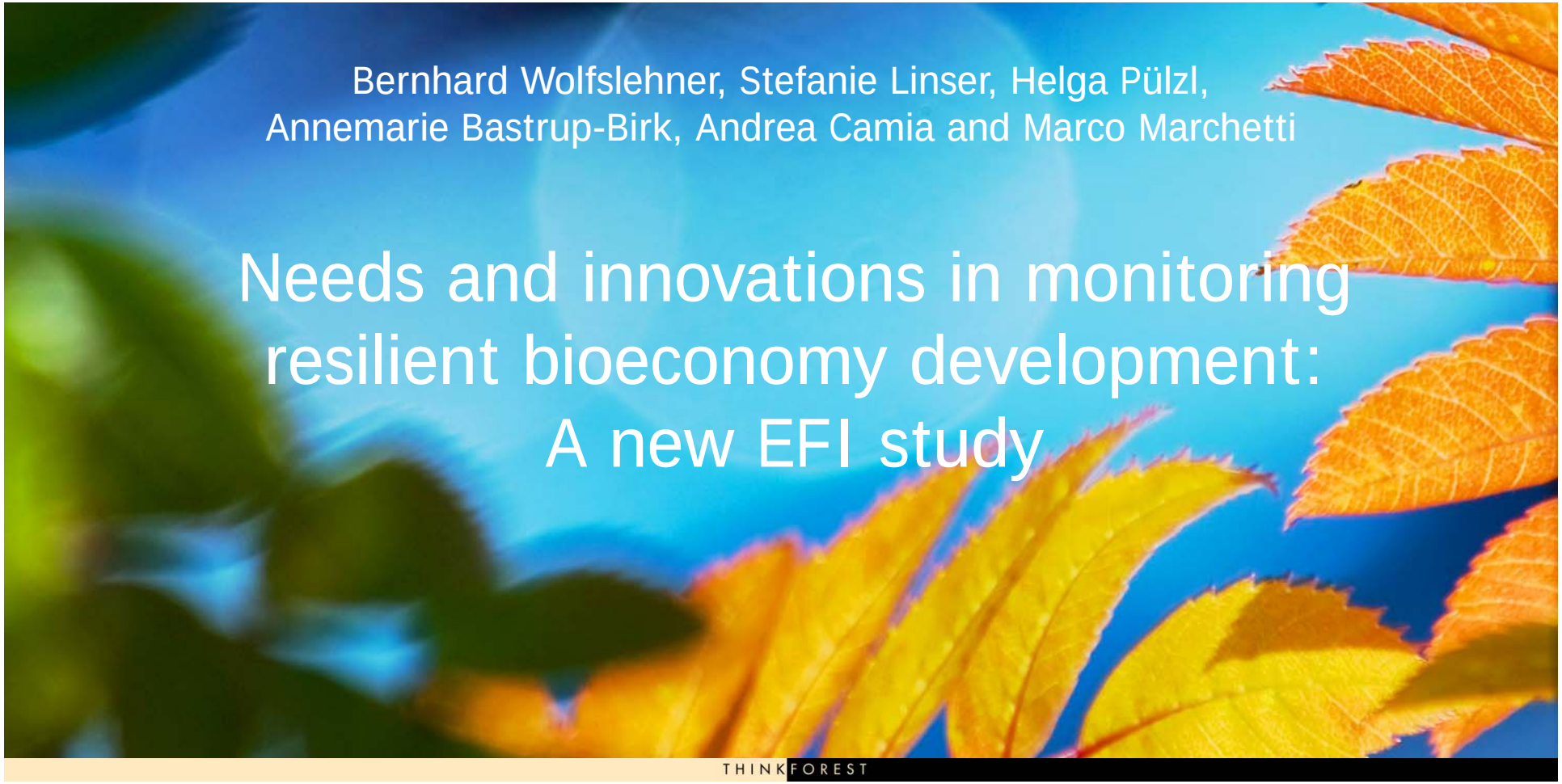
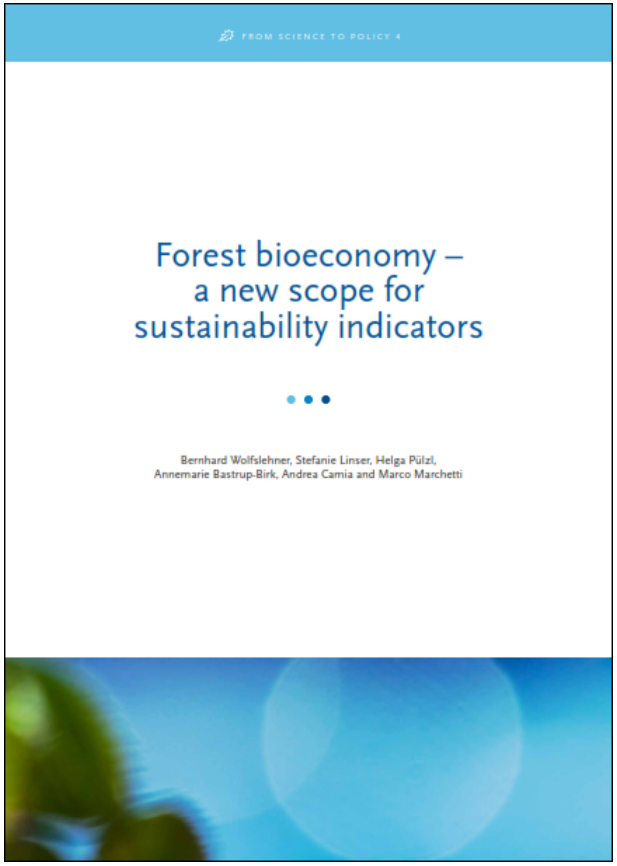
THINKFOREST



Bernhard Wolfslehner, Stefanie Linser, Helga Pülzl,
Annemarie Bastrup-Birk, Andrea Camia and Marco Marchetti

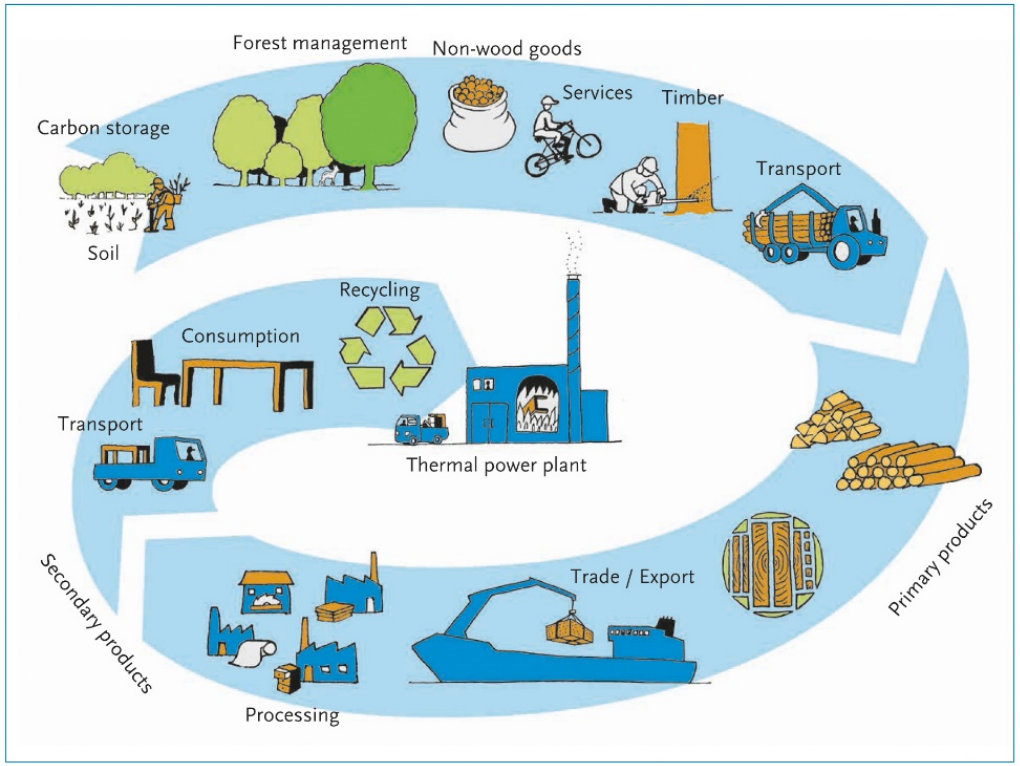
Needs and innovations in monitoring resilient bioeconomy development: A new EFI study


FROM SCIENCE TO POLICY 4
Forest bioeconomy – a new scope for sustainability indicators
Bernhard Wolfslehner, Stefanie Linser, Helga Pülzl, Annemarie Bastrup-Birk, Andrea Camia and Marco Marchetti

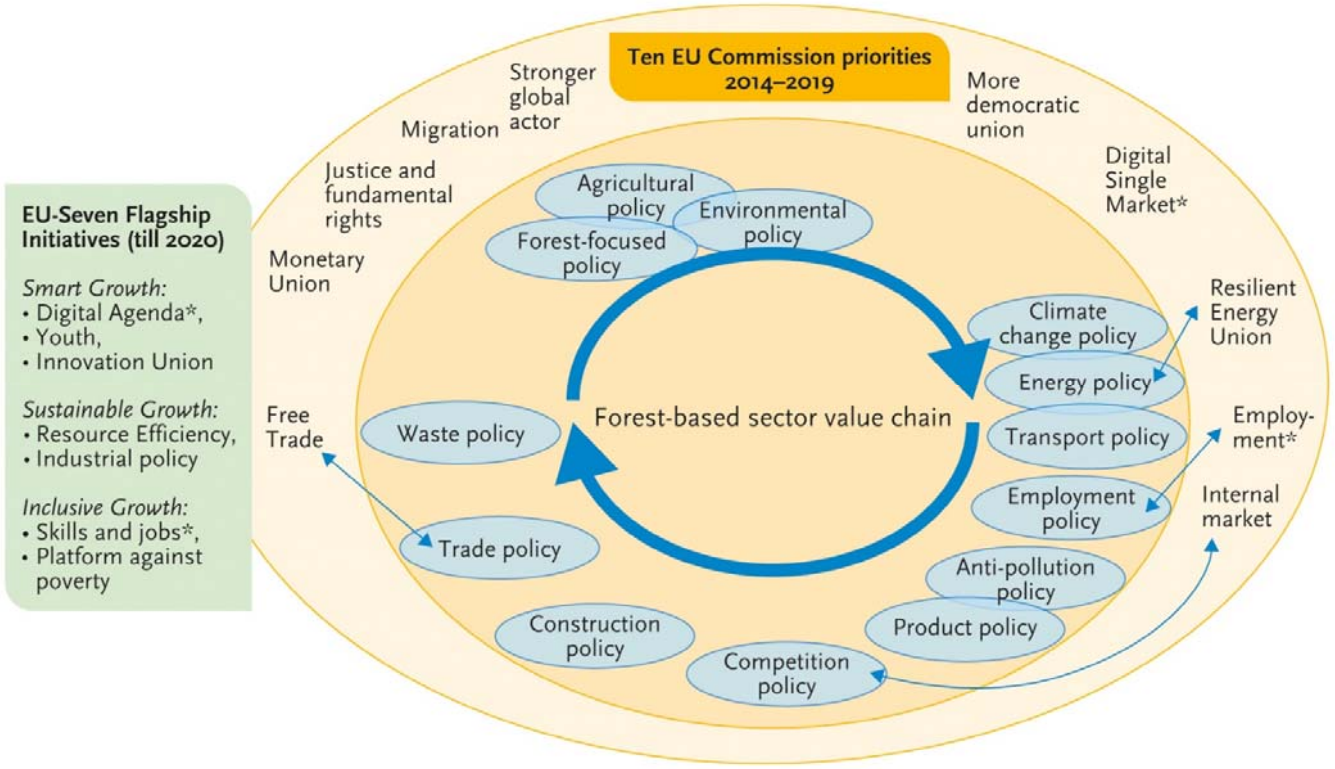
Study goals

1. Evaluate monitoring instruments for a sustainable forest bioeconomy
2. Review indicators as tools to report on sustainable development
3. Explore pathways for further development of forest bioeconomy indicators

Forest bioeconomy – a value chain approach



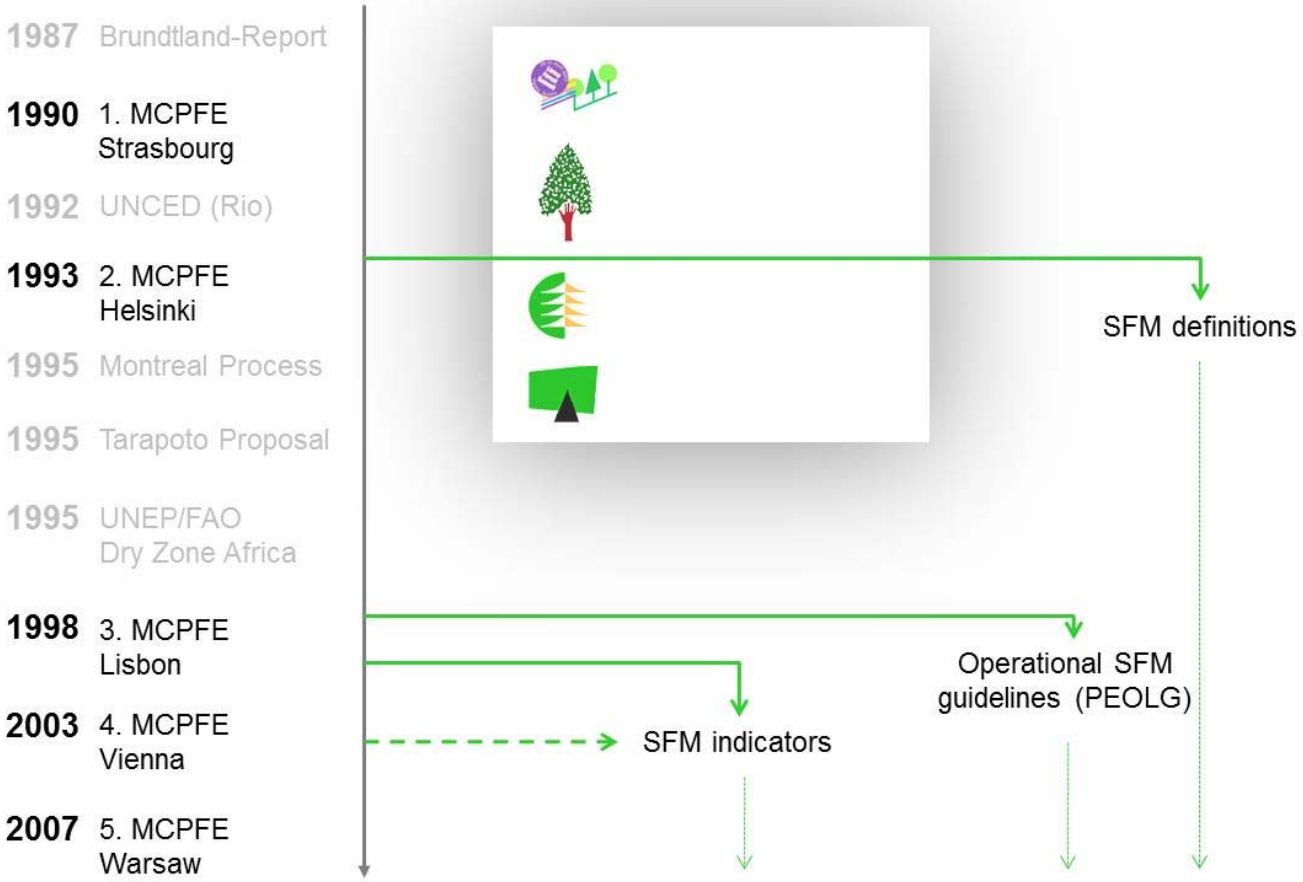
… in a demanding policy environment



Sustainable development is a necessary condition for a forest-based bioeconomy...

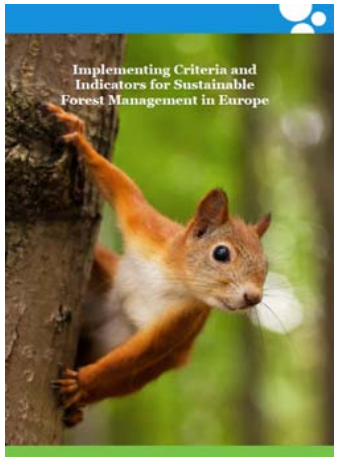
...but how to measure, monitor, and assess forest bioeconomy development?

A rich competence and expertise in the sector



Forest indicators – an advanced framework

- Reference framework for dialogue and communication
- Tool for monitoring and reporting on progress towards sustainable forest management (SFM) and improve quality and comparability of forest information
- Reference framework for development and adaptation of national policy instruments
- Assessment tool for measuring progress towards SFM and identifying emerging issues
- Information tool for creating links to other sectors and global initiatives (e.g. SDGs)



… but room for further development

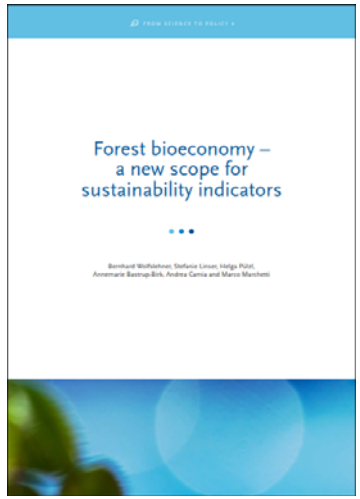
- Narrow focus so far – resource side mainly
- Sectoral tool with limited outreach
- Limited harmonization with other statistical and information instruments
- Unused potentials in communication, assessment, and conception *(e.g. ecosystem services)*

New opportunities for indicator use in a bioeconomy

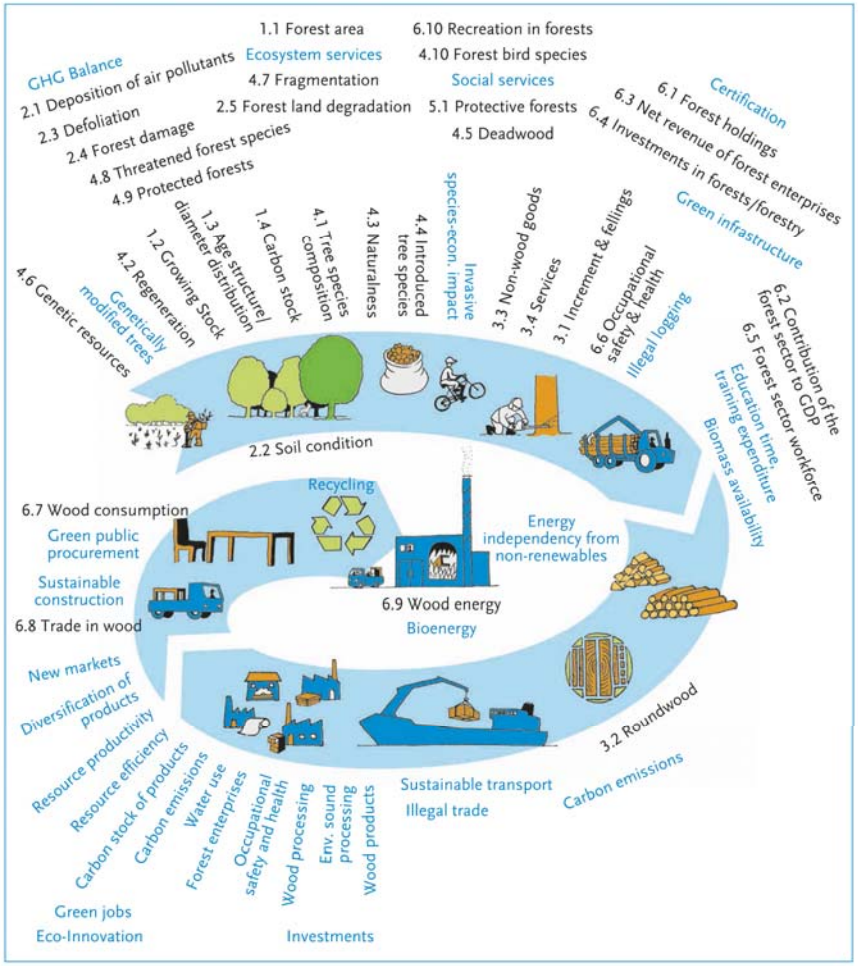
- Address opportunities and challenges voiced by EU Bioeconomy Strategy
- Define inter-sectoral tools that seek compliance with other sectors and initiatives
- Strengthen assessment features to estimate sustainability impacts of moving towards a bioeconomy

EFI study

- Analysed 203 indicators from different sources
- Conceptualised connection of indicators to a bioeconomy
- Identified indicator and data availability gaps
- Explored 3 pathways for future bioeconomy indicator use



Option 1: Complement existing indicators towards forest bioeconomy



Blue coloured indicators complement existing

Option 2: Subsets of bioeconomy indicators

Sustainable resource management
Red List Index
Natural Resource Index
Forest area
Forests under management plan
Protected forests
Threatened forest species
Age structure and/or diameter distribution
Increment and fellings
Roundwood
Growing stock
Forest fragmentation
Tree species composition
Regeneration
Naturalness
Deadwood
Common forest bird species
Value of marketed services on forest and other wooded land
Recreation in forests
Impacts on human wellbeing
Urban forestry and human health
Trends in forest land degradation
Illegal logging and associated trade
Woody bioenergy feedstocks supplied in accordance with EUTR

Independence of non-renewables
Carbon footprint
Resource productivity
Share of renewable energy in gross final energy consumption
Resource use of the bioeconomy
Indirect land use/ embodied land for agriculture and forestry products
Recycling rate for paper and wood products
Wood consumption
Raw material consumption
Production of goods and services in total FWC and by sub-sector
Use of wood in total FWC and by sub-sector
Cascading use of biomass
Use of permanent materials
Trade in wood
Cost-competitiveness of biofuels compared with non-renewable energy sources
Net energy balance
Wood energy

Climate change adaptation & mitigation
GHG balance
Resource and materials efficiency
Forest-related carbon stocks
Forest damage
Deposition and concentration of air pollutants on forest and other wooded land
Defoliation
Soil condition
Introduced tree species
Economic impacts of invasive species
Genetic resources
Genetically modified trees
Protective forests

Food security
Blue water footprint of wood products
Water use in total FWC and by sub-sectors
Value and quantity of marketed non-wood goods from forest and other wooded land

Competitiveness & jobs
Employment in the total bioeconomy and its sectors, and the contribution of the bioeconomy to total regional employment
Eco-innovation index
Forest holdings
Contribution of forest sector to GDP
Forest sector workforce
Education time in total FWC & Training expenditure as % of turnover in total FWC
Quality of employment in total FWC
Occupational safety and health
Production & employment in wood-working, manufacture of pulp, paper & paper-board, converting, printing
Renewable energy jobs
Innovation – new products in total FWC and by sub-sector
Growth of specific bio-based technologies, processes or products
Use and development of biotechnology in the bioeconomy
Development of advanced biorefinery technologies for the production of energy and materials
Research into technical and organisational aspects of new bioeconomy initiatives
Development of environment-related technologies, % all technologies
Patents on resource efficiency technologies
Share of biofuel industry that is part of the bioeconomy in terms of GDP, employment, turnover
Share of chemical industry that is part of the bioeconomy in terms of GDP, employment, turnover

Option 3: bioeconomy key indicators

Resource use
Resource productivity
Resource and materials efficiency
Water footprint
Natural resources index
Share of renewable energy in gross final energy consumption
Indirect land use/embodied land for agriculture and forestry products
Red List Index of threatened species
Carbon footprint of the forest and harvested wood chain (carbon stock changes)
Greenhouse gas balance (emissions and sequestration)
Employment in forest-based bioeconomy sectors, and contribution to regional employment
Eco-innovation index

All three options are exploratory at this stage, and not mutually exclusive

Towards European bioeconomy monitoring: a synthesis

- Reach beyond forest sector boundaries
- Harmonise data acquisition and assessment
- Build a flexible tool for future challenges
- Link to the political arena
- Create a platform for joining forces

Policy implications

1) Indicators need to **capture synergies** and **trade-offs** between different societal demands for forest resources, and to other sectors

2) **A harmonized** use of monitoring and statistics helps reflect **changes in increasingly diversified forest-based sector**

3) **The experience and lessons learned** from forest indicator development should **be capitalized**

4) **A cross-sectoral forum** could strengthen political dimensions of bioeconomy indicators

Policy implications

5) Bioeconomy indicators should be **adaptive to national strategies** and give support to implementation on national level

6) Indicators have a huge potential to **communicate bioeconomy** and provide information to a broader public

7) **A common platform** for EU and national data providers could improve efficiency and consensus on bioeconomy monitoring

Thank you for your attention!

Dr. Bernhard Wolfslehner
European Forest Institute