ForestNavigator

Workshop Report

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1st Stakeholder Workshop

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Abstract

This workshop report summarizes the key findings and insights from the first stakeholder workshop of the Horizon Europe ForestNavigator. The first workshop of a series brought together stakeholders from various fields and consortium members, establishing a key stakeholder group for the project to (1) co-develop alternative forest storylines that boost adaptation and mitigation in different EU regions (2) identify elements of cultural ecosystem services and trade-offs between different types of ecosystem services (3) provide suggestions to develop and improve a forest Policy Tracker. The stakeholders provided also feedback on the design of the ForestNavigator Portal and future wood demand scenarios from forest bioeconomy.

This report outlines the key outputs of all sessions, as well as the action points generated during the discussions with implications for the different work packages. It also sets out the next steps of the stakeholder engagement process that will follow in the upcoming year.

Keywords

Stakeholder engagement, workshop, co-development, forest management, management storylines, forest policy tracker, ecosystem services, adaptive forest management

Dissemination level

PU	Public, will be published on CORDIS	✓
SEN	Sensitive, limited under the conditions of the Grant Agreement	

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Stakeholder Board

Stakeholder Board's role within ForestNavigator

At the time of the workshop, the Stakeholder Board includes 23 stakeholders, selected from the dynamic stakeholder database established during the stakeholder mapping process and outlined in 'The report on stakeholder mapping and internal stakeholder database'. The Stakeholder Board is composed of all five identified stakeholder categories (policymakers and agencies, scientific experts, NGOs, forest owners and managers, and business and industries). The Stakeholder Board contributes to the Consortium work during three in-person stakeholder workshops and remote engagement activities planned during the project lifetime so that members can follow the journey of ForestNavigator and participate in the co-design of pathways.

Selection of the board

The Stakeholder Board was selected from the dynamic stakeholder database resulting from the stakeholder mapping (D1.1), paying attention to their expertise, sector, scale of engagement, region, and gender. After identifying a balanced shortlist of stakeholders, ForestNavigator partners contacted everyone on the list. At the time of the workshop, 21 stakeholders agreed to engage long-term and in-depth with the ForestNavigator project and the consortium.

First workshop summary

Purpose of the Workshop

The purpose of the first Stakeholder Workshop was to establish a key stakeholder group with whom the ForestNavigator consortium can iteratively and continuously exchange ideas. The consortium aimed at presenting to the stakeholders the ForestNavigator project, its expected outputs and its relevance for improved forest policies and design of future pathways.

Different work packages of the project wanted to (1) understand stakeholders' views, perceptions of policy goals and pathways (with a focus on European forests particularly in three selected regions: North, South, Central Europe), (2) talk about and better define cultural and recreational values of forests, (3) discuss and validate forest management options for three main forest storylines/stewardships (focusing on bioeconomy, multifunctionality and nature conservation), introduce, and collect initial feedback on, (4) the concept of the ForestNavigator Portal and the indicators that the portal will include (5) the scenarios of future wood demands from forest bioeconomy. The full agenda of the workshop is available in Appendix 1.

Set up

The workshop commenced with an introduction and overview to the project, a Tour de Table for all members of the Stakeholder Board and project partners to get to know each other at the beginning of a long-term engagement process, as well as a keynote speech from a member of the European Commission's DG CLIMA to kick off discussions about current forest policy needs of the European Union and anticipated policy relevance of ForestNavigator's outputs.

Following sessions centered around the status and needs of European forests and forest management and how they are modeled, co-designing three main forest storylines that reflects

forest management options in line with European climate mitigation, adaptation and biodiversity policy targets. The following sessions covered variables and indicators for ecosystem services, European policy mapping relevant to forests and scenarios on forest bioeconomy material and energy demands. A final session focused on the development of the ForestNavigator Portal.

Each session had a presentation and Q&A or activity sections to allow enough space for both capacity building and in-depth discussions. All materials shared during these sessions (e.g., presentations, information and activity sheets, agenda, information about the project, participants' feedback on the workshop) are archived and shared with the Stakeholder Board through an online collaborative whiteboard called the Miro board (*Figure 1*).

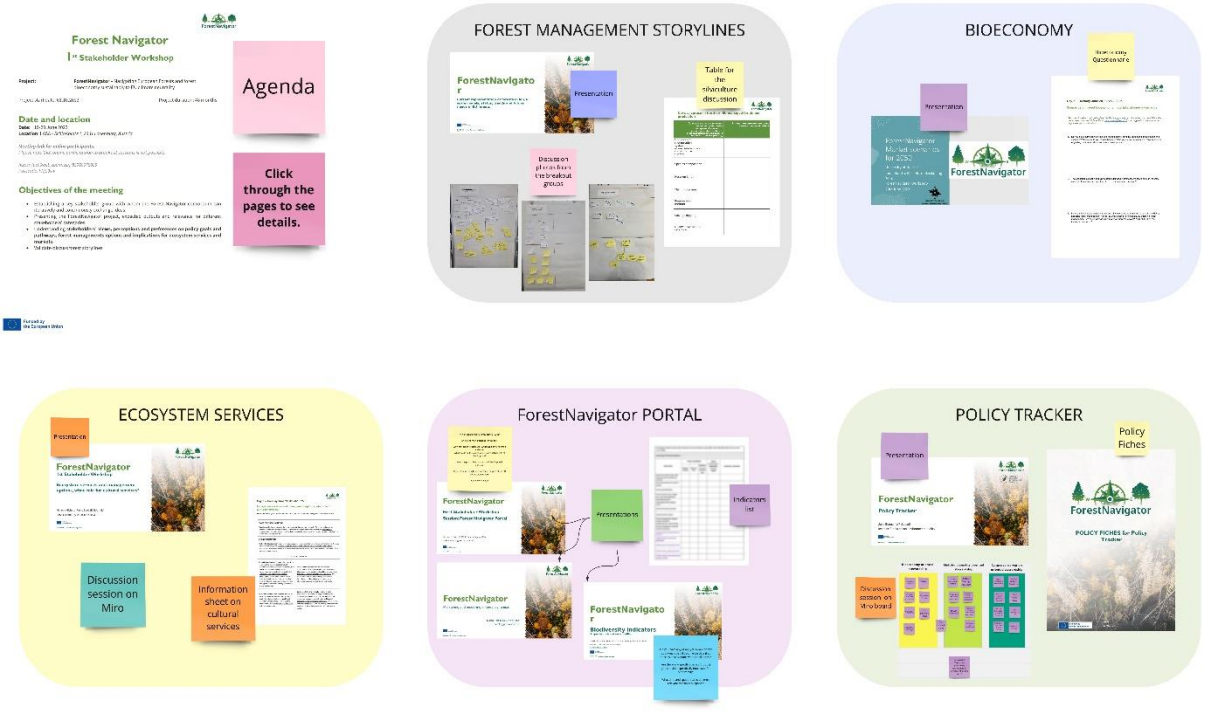

Figure 1: Visualized summary of the 1st stakeholder workshop (Source: WP 1)

General Outcomes

One of the main activities of this workshop was to be assisted by stakeholders' expertise and perspectives to select alternative forest managements in different EU regions, then to be modeled by consortium partners in biophysical models. These management options were considered within the context of three main storylines (bio-based economy oriented, nature oriented and multifunctionality), where each of the storylines would achieve the same policy objectives but by making use of different forest management goals and measures. In addition, stakeholders were asked to help address the monetary evaluation of different ecosystem services (with focus on cultural services), provide feedback on the conceptualization of the ForestNavigator Portal and to report information gaps that the ForestNavigator's Policy Tracker could address.

Some general outcomes from these sessions were:

- There were remarkable outcomes of the storyline discussions (e.g. the role of the wood use circularity being pivotal both in the nature-oriented and in the bio-based economy oriented storyline). Such stakeholder contributions enhance the work of researchers through literature and modeling.
- There is a need to agree on certain terms and names as a consortium to avoid mismatches and misunderstandings, and to cover the intended content as best as possible. For instance, the names of the storylines were adapted, based on feedback from the stakeholders.
- There is a need to agree as a consortium on the naming of indicators that we plan to provide on the ForestNavigator Portal. E.g., forest area, forest cover.
- The consortium should not overlook and work on the species composition of forests. It is understood that there are some rules of thumb to represent at least a minimum number of species in forests.
- The concept of circularity was present between the lines in the scenarios, however the best use of resources for circularity needs to be looked at in detail.
- The consortium should always be wary of different needs of forests in different regions in the EU. However, in some cases, it is not a regionality issue but rather accessibility and proximity of a forest to a big city.
- The permanence of carbon stocks is more important than increasing carbon sinks, due to the disturbances by climate change.
- Risk management is an important factor in forest management, and one should take preventive actions into account.
- Delivery of cultural services from forest ecosystems might be jeopardized by the increasing demand for provisioning services; they need to be carefully integrated and considered in envisioned forest pathways for the EU, to ensure sustainable and multifunctionality-oriented management while pursuing policy objectives.
- There was a high interest in the ForestNavigator Portal from the stakeholders. They shared wishes of what the portal should or could present to complement other similar tools. Stakeholders recommended using and integrating existing data sets to the portal, such as those that can be provided by the FAO.
- Finally, the stakeholder board reported interest to be highly engaged in the ForestNavigator project through future online and in-person activities.

Key outcomes by session

The ForestNavigator project and its outputs

Fulvio Di Fulvio from IIASA presented an overview of ForestNavigator, including main objectives and how the project achieves these objectives. The main recommendations from stakeholders for the project were:

- Suggestion to (1) map carbon increments rather than carbon stocks, (2) monitor forest (re)growth (sequestration rate) under climate change and the substitution effect, as forest carbon stock refers to only a specific point in time.

- A more detailed and consistent definition of “sustainable forest bioeconomy” in the EU is needed, because only then can the EU set goals and metrics to reach those goals that are commonly agreed and can be collaboratively acted upon.
- Research on how to achieve substitution benefits from wood use in a circular bioeconomy is needed.

Andrey Lessa from IIASA next explained the project’s forest modelling framework, illustrated with focus on refined modelling of forest growth under disturbances and climate change.

Key suggestions from stakeholders were (1) to include the modelling water cycle at watershed level and (2) limitation of modelling forest mitigation at EU scale while solutions for mitigation often occur at local and Member State level. The first feedback is partially addressed in the project, as there will be modelling of droughts in terms of water in soil and runoff, but not as changes in watershed level. The second comment is also addressed by some of the spatial explicit results being available at 10x10 km for spotting local mitigation solutions and by aligning and improving according to the EU tools also national models in four cases studies from Sweden, Czechia, Ireland and Italy.

EU climate policy targets and the role of EU forests in climate

Johannes Schuler from DG CLIMA gave a keynote speech during which he stressed the following key topics and outcomes:

- Adopt a holistic approach that encompasses not only forests, but also the AFOLU sectors (including the LULUCF).
- Support LULUCF regulation: Target for 2030 needs to be achieved on a Member State (MS) level, thus there is a need for detailed yearly observation outputs with real-time modelling of the sink at the MS level.
- Consider trade and its impact on forest degradation/deforestation in modelling exercises.

Schuler also mentioned the topics where ForestNavigator can potentially contribute:

- **Projections of biomass uses for different applications** – future biomass demands for materials and energy, looking at substitution effects such as wood products for construction and bioplastics from HWP.
- **Monitoring forests** – modeling and monitoring forest carbon, real-time updates, harmonizing EU-wide and MS specific models, impact of GHG emissions and removals from HWP.
- **Modeling biodiversity impacts and looking for win-win solutions for climate change** – impacts of mitigation and adaptation strategies on climate regulation, biodiversity and ecosystem services.
- **Aligning EU and MS scenarios –** modeling natural disturbances and CC impacts at regional, national scale; alignment of EU and MS modeling.
- **Improve assessment of carbon removal options -** e.g., carbon farming, biochar.

Stakeholders outlined a few key points during the Q&A session:

- ∉ Importance of forest monitoring in strategic forest planning regulations.

- Transparency of member states' contribution of their LULUCF impacts and targets in the NECPs.
- Importance of measuring the effects of trade on forest degradation and deforestation.

Current status and needs of European forests

In this session, Fulvio Di Fulvio and Andrey Lessa from IIASA and Manfred Lexer from BOKU gave presentations that covered:

- Trends in EU forests growth and climate targets contribution. These trends highlight a decline in carbon sequestration, which may be remedied by afforestation, management changes, and sustainable use of harvested wood products.
- The current mapping of species, forest types, and forest management categories in large-scale forest models.
- Main management concepts in the EU and central considerations regarding their modelling.
- Expected performance of current forest types and managements under climate change and their adaptation needs.

Central issues are the species choice, as climate change causes species ranges to shift, recent increases in natural disturbances, and the interaction between risk of natural disturbances and management concepts. These issues are among the most impactful influencing factors on the adaptation of EU forest management. To get further insight in these issues, stakeholders discussed key considerations revolving around two questions:

1) Which forest types and management concepts require the most urgent adaptation to future climatic conditions?

The stakeholders found it important to consider:

- Regions/forest types where we already observe catastrophic events.
- Regions where species might face strain due to future climate conditions and could require assistance to adapt/migrate.
- Natural dynamics of the ecosystems and trying to imitate them (close-to-nature management).
- Risks for all forest types.
- Needs of the bioeconomy.

2) How could we increase carbon sink in forest sector while considering biodiversity and other ecosystem services?

Stakeholders argued a definition of timeframe and a decision on short or long-term goals is necessary to answer this question. With growing disturbance risk, three factors must be considered:

- **Preserving existing carbon stocks** is vital, especially amid disturbances.
- **Bioeconomy is key** for wood-provisioning services and replacing fossil fuels.
- **Sustaining forest sequestration capacity** is imperative.

- **Foresters think in generations, which can clash with environmentalists** and mitigation policies, given the slow pace of possible adaptation options.

Forest management storylines: An exercise to detail and prioritize storylines

Three ForestNavigator forest management storylines are being designed and used as a key component for the ForestNavigator research. The storylines capture future societal developments, which describe the orientation of forest stewardships that capture alternative choices to face climate change, bioeconomy, and biodiversity challenges. These storylines are designed to achieve the same policy objectives, while emphasizing different forest management goals and measures. The three storylines were discussed and described in *Table 1*. The storylines will be used to represent archetype scenarios in the ForestNavigator models, as general principles for adaptation of forest management. Fulvio Di Fulvio described the three storylines as pre-conceptualized by the consortium partners (*Table 1*).

Table 1: Description and goals of the ForestNavigator storylines

Name of the storyline	Main description of the storyline	Goal of the storyline
1. Nature conservation-oriented Forest stewardship	A future where society increases the ambition for nature conservation and biodiversity pledges, reduces pressure on natural resources by a limited increase in bioeconomy demands for woody biomass.	Would prioritize nature-based solutions for achieving climate and biodiversity goals.
2. Multifunctionality-oriented Forest Stewardship	A future where society prioritizes forest multifunctionality, balancing nature conservation pledges with bioeconomy demands for woody biomass and demands for other ecosystem services.	Would balance nature-based and bioeconomy-based solutions for achieving climate and biodiversity goals
3. Bioeconomy-oriented Forest Stewardship	A future where society prioritizes woody biomass demands for bioeconomy growth and keeps the ambition on conservation of natural resources at a limited level.	Would prioritize bioeconomy-based solutions for achieving climate and biodiversity goals.

Source: ForestNavigator WP 3

The storylines were further detailed, based on stakeholder input during separate discussion groups. Stakeholders discussed the storyline names, based on which they were adjusted to be: (1) **nature-oriented** stewardship and (3) **bio-based economy** stewardship. Stakeholders were asked to add "goals" = *specific objectives to be achieved for each management measures and* "measures to achieve those goals" = *modifications of forest management concepts according* to a specific storyline.

A moderated discussion on the storylines goals and measures was guided by the question **"What are the most relevant goals and management measures that need to be considered for adapting current management concepts under this storyline?"**. The results of the discussions for each storyline are provided in summary below:

1. Nature oriented forest stewardship

This group started by discussing the terminologies “nature-based management”, “close-to-nature management”, and “pure conservation management”. The conclusion was that the first two approaches were closer to each other and better reflect the storyline than pure conservation management.

The group identified sub-elements of the mitigation, climate change adaptation, conservation, ecosystem services, and bioeconomy goals (*Figure 2*). The main mitigation goal is to store carbon on site by letting forests intact and not using wood intensively. For adaptation, the group emphasized that proactive, reactive, and passive approaches are all important to tackle the impacts of climate change according to regional specificity. To achieve conservation objectives, stakeholders suggested increasing the area of strictly protected sites, setting aside old-growth forests, and improving connectivity and structural complexity in the forest. The group suggested increasing habitat provision to protect biodiversity and to protect regulatory ecosystem services. For the goals of bioeconomy, the emphasis was on increasing the production of long-lived wood products (for carbon storage) and increasing circularity and cascade use of harvested wood products.

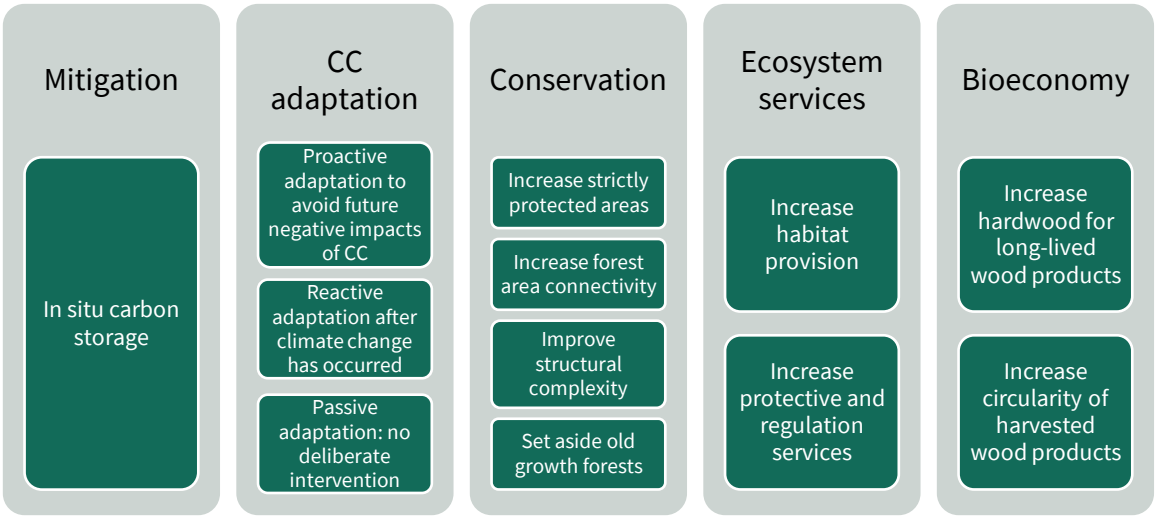

Figure 2: Goals and subgoals discussed for the nature-oriented stewardship

Ten measures were discussed in detail to measure steps towards sub-goals (e.g. creating snag islands, increase continuous cover forestry, increase thinning from above and reduce thinning intensity, install traps for bark beetles, introduce payments for carbon, introduce payments for conservation, leave more damaged wood in forests, promote natural regeneration but also assisted migration, promote species adopted to future climate, and reduce clearcutting systems). These measures will be taken into account in the storylines.

After the workshop, these measures were matched to sub-goals, with some measures being applicable to up to four sub-goals (Annex 3). For example, leaving more damaged wood in forests is a measure to achieve passive adaptation, but can also improve structural complexity, increase habitat provision, and helps in-situ carbon storage. Further specific measures are detailed in Annex 3.

2. Multifunctionality-oriented forest stewardship

Stakeholders agreed stability, resilience, and climate change adaptation (adaptability) to be the primary goals for this stewardship in addition to mitigation and ecosystem services (*Figure 3*). A few subgoals were identified for mitigation and ecosystem services.

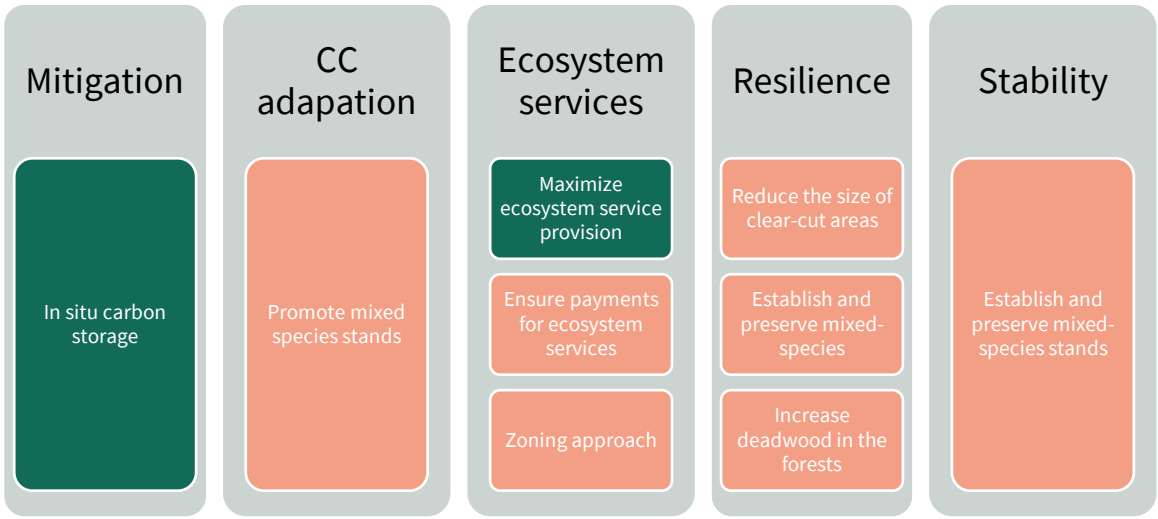

Figure 3: Goals, subgoals (green) and measures (orange) discussed for the multifunctionality-oriented forest stewardship

Actions associated with achievement of the goals: (1) preserving existing carbon stocks, (2) maximizing forest ecosystem services provision, by prioritizing them according to a zoning approach. This group suggested that 'population density' can be a zoning parameter, where density is indicative of timber provision and recreational- and biodiversity-related ecosystem services. For example, at higher population density, timber provision will be relatively low to accommodate higher recreational- and biodiversity-related ecosystem services.

A measure to achieve stability is to establish and preserve mixed-species, to achieve this, measures would need a consideration of both short-and long-term life span of species. This would also promote resilience, which can further be achieved by reducing the size and frequency of clearcut areas and increasing continuous cover forests, maintaining a share of logging residues, and increasing deadwood in forests.

To pay for all these activities, and to compensate for the reduced income coming from a decline in timber harvesting, payments for ecosystem services should be enforced. This opens a role for third-party verification for measuring the results and giving assurance to urban dwellers to motivate them to pay for ecosystem services.

3. Bio-based economy-oriented forest stewardship

Stakeholders discussed four prominent goals for this storyline: mitigation, climate change adaptation, conservation, and bioeconomy. And, identified four sub-goals for the bioeconomy (*Figure 4*).

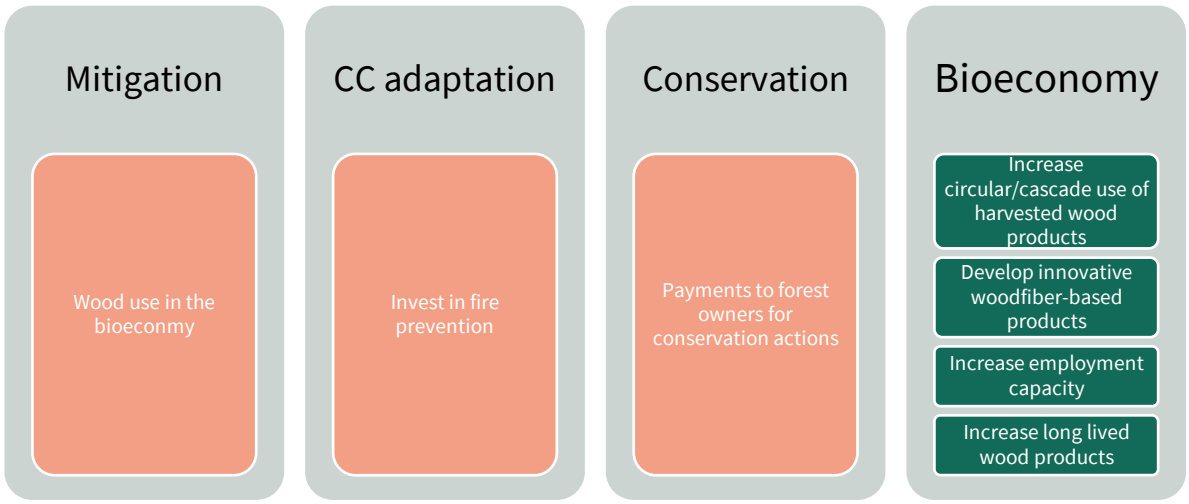

Figure 4: Goals, subgoals (green) and measures (orange) discussed for the bio-based economy-oriented forest stewardship

For the mitigation goal, stakeholders underlined the important contribution of using wood in the bioeconomy. For decarbonization, the role of forests and forest products is key, where wood is an important substitution material. For climate change adaptation, more investments in fire prevention were discussed. This could also include bringing interventions to mitigate fire risks like increasing thinning regimes, which would simultaneously also increase pulpwood production and the quality of final wood products. One measure to improve conservation efforts deemed important is to use payments to forest owners for conservation actions. Stakeholders considered payments to conserve areas with high natural value to be more important than payments for changing managements. Four important bioeconomy subgoals were identified related to circularity, product innovations, employment capacity, and long-lived wood products (*Figure 4*).

Stakeholders highlighted the need for innovative wood products and prioritization in existing biomass use for improved circularity. Development of innovative wood fiber-based products was voiced as an important element of circularity as well as prioritization of sawn wood over pulpwood and energy wood. Some other considerations for measures related to the bioeconomy include (1) extended forest rotations, which results in longer lived wood products shares and consequently increases carbon storage, (2) apply smart salvage logging as a measure to reduce cutting trees for energy use, (3) prioritize shelterwood and coppices with standards for combination of different wood products (4) taking forest sector employment into account while developing storylines for the future (5) avoiding economic incentives for bioenergy but create a sustainable market based silviculture. *Figure 5* lists the subgoals and measures for the bioeconomy goal in the bio-based economy-oriented storyline.

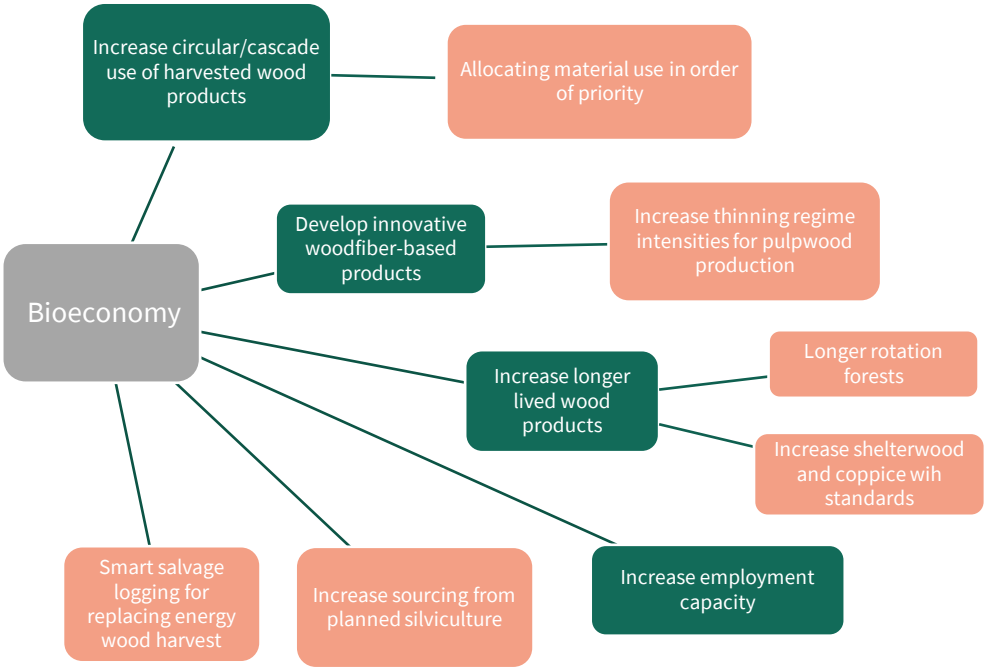

Figure 5: Subgoals (green) and measures (orange) discussed for the bioeconomy goal

Further details of the forest management storylines

Fulvio di Fulvio and Andrey Lessa from IIASA together with Manfred Lexer from BOKU discussed further details of the forest management storylines during a breakout session with ten sylviculture experts. They presented forest management concepts in need of adaptation in selected EU regions (Northern, Central, Southern) and the most promising, emerging adaptation options. The main objective was to decide which points for different key silvicultural measures can be applied in EU forests for adapting to climate change and for reducing environmental risks.
The discussion revealed that the following measures and concepts need to be adapted to accommodate the impacts of climate change:

- Stakeholders agreed that increasing the number of species (with a minimum of three species) and creating more structural diversity in forests are the most important adaptations needed. Furthermore, structural diversity can also be achieved by more uneven-aged silviculture or deadwood in the forests.
- When discussing 'What is considered a "natural" species?', the suggestion was made that species most adapted to future climate conditions should be considered rather than historical tree species present in a certain location.
- Different proactive and reactive regeneration and adaptation strategies are required to enhance the adaptation. Strategies will depend on local context and could include assisted migration and opening of mature stands for getting new species with natural regeneration.
- Creating species buffers (e.g., broadleaves in the Alps) can help stop the progress of fire or other natural disturbances and could play a role in reducing the risk exposure.
- A common discussion and resulting remark were that the storyline formulation and modelling needed further consideration of regional adaptations to local societal needs (e.g., timber industries and local communities' needs), as well as the local forest and climatic contexts.

As a next step, storylines have been updated to capture the stakeholder feedback. In particular, the stakeholders reiterated the importance of regional differences, whether or not forests are public or private, and to identify drivers/measures to achieve goals according to these aspects. After receiving further refinement from the ForestNavigator research community, an online session will be organized with interested stakeholders to assist completing the project task of selecting alternative forest managements that boost adaptation and mitigation in different EU regions.

Policy tracker

Julia Bognar from IEEP, with the support of Krystyna Springer, presented an overview of the idea and draft content of the ForestNavigator Policy Tracker. Stakeholders provided feedback on the policy aspects to be included in the ForestNavigator Policy Tracker based on three questions. The questions and discussion are summarized as follows:

- **What policies might be relevant for forestry and should be added to the Policy Tracker?** Policies with direct implications for the management of EU forests were discussed, such as the Renewable energy directive, Strategic Plans under the Nature Restoration Law, Carbon Removal Certification Framework, NECPs (National Energy and Climate Plans), as well as policies with indirect implications for the management of EU forests, such as the Deforestation Regulation. Several policies with a less apparent link to forests were also highlighted, such as the Agricultural Block Exemption Regulation, the Water Framework Directive and the Green Claims Directive.
- **What other information could be useful?** An emphasis on the Common Agricultural Policy (CAP): Some countries have retrieved their funding from CAP and therefore do not need to submit forest-related data anymore. This pattern creates a gap/imbalanced information situation. Suggestion from stakeholders: Policy tracker can aim to fill this gap, by focusing on the countries who withdrew from CAP. Another useful information they would benefit from is better and more accessible MRV (Measuring, Reporting and Verification) datasets, information regarding Member State-level implementation, and domestic market implications of any outward-looking policies. Stakeholders also noted that more granular information on the progress of policies passing through the legislative process may be useful.

- **What is the main barrier to relevant policy information?** The current spatial scale of measures, collected at the national or NUTS2 level, are not detailed enough to measure agriculture and forestry policy effectiveness. More detailed information, for example at NUTS3 level would be necessary. Information at the NUTS3 level is not available: even the EU court of auditors criticized that policies are averaged at too large scale.

Stakeholders were also asked to categorize relevant EU and national policies/strategies within the three forest management storylines developed by the ForestNavigator (i.e., bio-based, multifunctional and nature oriented). Stakeholders found agreement in which forest management storylines the policies should be placed, exception for Sustainable Taxonomy. *Figure 6* shows the resulting groupings.

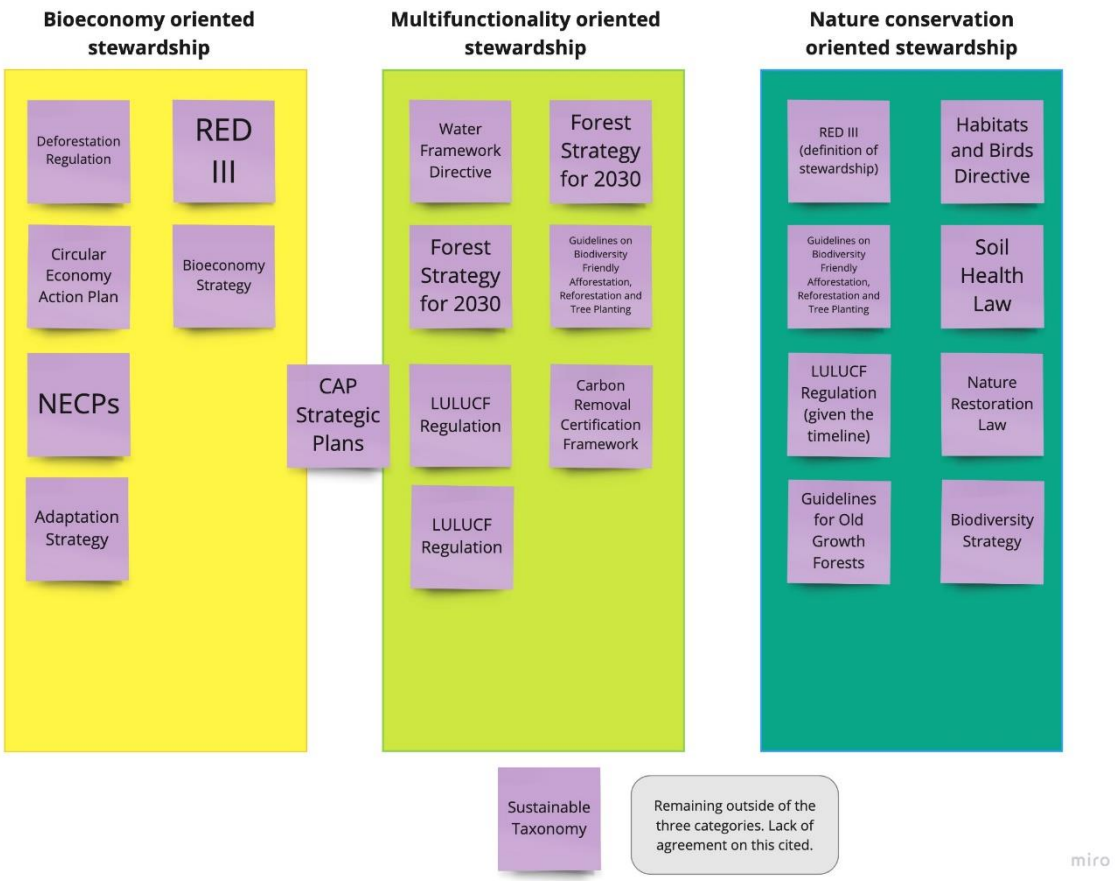

Figure 6: The results of the policy mapping exercise

Ecosystem services and management options: what role for cultural services?

The session started with Melania Michetti and Fabio Eboli from ENEA presenting the concept, meaning of ecosystem services (provisioning, regulation, cultural), and their classifications relying upon the definition adopted by the System of Environmental Economic Accounting – Ecosystem Accounting (SEEA-EA, 2021).

The aim of this session was to address the following project objectives to reach together with stakeholders:

- Deriving the monetary value for the different ecosystem services, specifically cultural services;
- Assessing changes in these values as a response to variations in forest management and storylines;
- Analyzing trade-offs and synergies amongst services.

Stakeholders completed a 15-minutes online survey[1], composed of two parts: (1) General concept of forest ecosystem services, their definition and trade-offs amongst the alternative forest management regimes, as presented in the previous workshop session; (2) Cultural services, their definition and categorization. After taking a quick look into the results together, stakeholders were divided into two focus groups favoring a deeper discussion on the cultural services and their four dimensions:

1. Recreation

2. Visual amenity
3. Education, research, scientific services
4. Spiritual, artistic and symbolic services

Stakeholders were asked whether the lists of items provided by the consortium (*Table 2*) for visual amenity and recreation dimensions were complete, whether trade-offs and synergies existed amongst them, and if some items characterized specific EU areas or regions the most.

Table 2: ForestNavigator team suggested recreation and visual amenity dimensions of cultural ecosystem services

Recreation	Visual Amenity
• Paths, signs and trials, routes for hiking/trekking/biking… • Wild product harvesting • Hunting, fishing, beekeeping areas • Sport, exercise, gym facilities • Dog walking, horseback riding facilities • Bird/nature watching facilities • Picnic areas	• High tree density • Structural heterogeneity (forest age, tree height and size, tree leaf cover • Old growth trees • Species mixture • High number and diversity of bird species and wildlife animals • Low density of invasive, alien species • Habitat diversity (e.g., presence of water bodies such as lakes, rivers)

For the other cultural services ('education, scientific and research services' and 'spiritual artistic and symbolic services'), for which current literature does not provide detailed information, stakeholders were asked to report key elements, aspects, concepts (Figure 7).

Key outcomes of the survey and the discussions were:

- Need for (1) Better definition of the cultural ecosystem services; (2) An agreed choice of indicators useful to map and represent ecosystems services; (3) A translation of storylines (forest stewardships) into changes in services provision
- A clearer view on the existence and identification of ecosystem services trade-offs, and their relative importance across forest stewardships.
- The three stewardships (bio-based economy, multifunctional and nature oriented) have varying impacts on different ecosystem services. For example, bio-based economy stewardship may lead to an increase in the provisioning ecosystem services but to a decrease in cultural system services, especially in visual amenity. In contrast, a nature-oriented stewardship may allow for richer cultural ecosystem services (especially visual amenity) but result in a decline in provisioning services.
- As expected, as we move towards higher intensive management, forests services are claimed to switch from regulation and cultural, to provisioning only.
- Amongst the three stewardships, an increase in the multifunctional oriented one is expected to affect only marginally the amount and distribution of ecosystem services (provisioning, regulation, cultural) as it is perceived as a status quo scenario, compared to bio-based economy and nature-oriented stewardships.

Recreation services are mostly related to paths, signs, and trials for biking/hiking/trekking, but more specific facilities or infrastructure are needed for more specialized sports and activities;

bird/nature watching is also a valuable item and can trade-off with the existence of too many people and recreation facilities/infrastructure; trade-offs between hunting/fishing and other recreation activities also exist.

Visual amenity is recognized as especially linked to structural heterogeneity of forest as well as habitat diversity; landscape amenity also represents an important element of visual amenity; high conservation may not necessarily imply higher visual amenity since an open-view forests appear to be preferred to high-tree density forests.

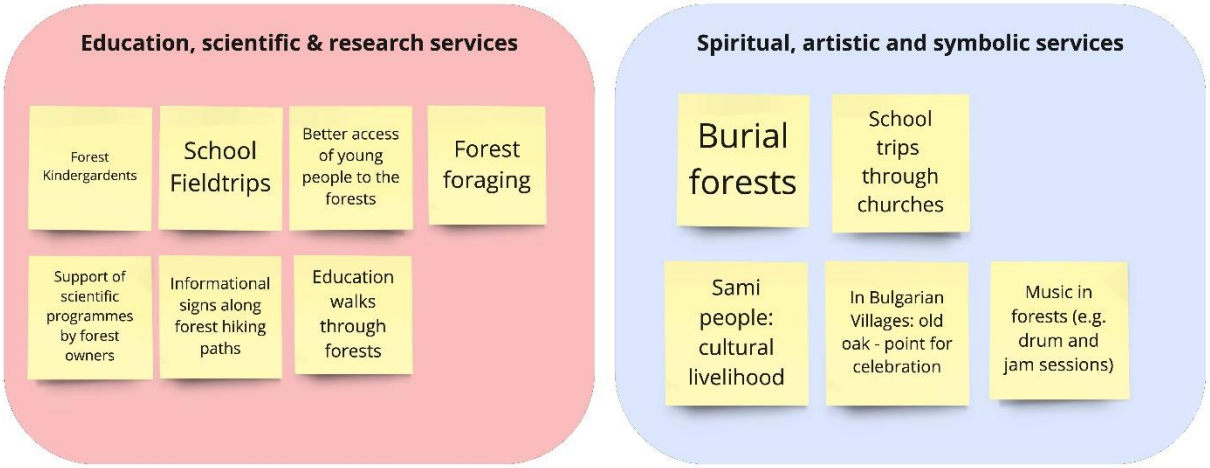

Figure 7: Stakeholder suggested interpretation of education and spiritual dimensions of cultural ecosystem services

Scenarios on forest bioeconomy material and energy demands

Janni Kunttu from the University of Helsinki gave a presentation on potential market scenarios for the use of wood-based materials in the European Union by 2050, concentrating on three distinct product categories: wood-based textiles, wood-derived biochemicals and biofuels, and wood-based construction. The presentation highlighted three key aspects:

- Anticipated changes in the market shares of chosen wood items and their potential non-wood substitutes by 2050.
- The extent to which wood products could viably replace other products.
- The impact of evolving demand for wood raw materials on their eventual uses and the level of harvesting.

Stakeholders were given a survey where they had a chance to express their opinions, if they differed from the statements presented in the scenarios. We asked the stakeholders for their opinions on future market shares and whether the EU has sufficient industry-available forest resources to cover increased demand and how they think an adaptive forest management would play a role in providing wood-resources. Two main points emerged during the plenary discussion:

- There are different settings for industrial activity and production across Europe. For example, due to the fragmentation of land ownership in Southern Europe, it would be challenging to have plants similar to the Finnish Industrial plants.
- It is important to adapt forest management: Only a limited number of tree species (Pine, Spruce, Eucalyptus, Beech, and Ash) are currently being processed for the pulp industry,

where a uniform mixture of raw materials is needed. Therefore, there is potential capacity building necessity for forestry experts on forest market scenarios in terms of learning how the markets and raw material demands may evolve and building strategies on how to adapt forest management accordingly for satisfy the industry's needs. As well as developing strategies on industry adaptations to future forest management conditions.

ForestNavigator Portal: Data Explorer and EU Pathways Explorer

Fulvio Di Fulvio from IIASA presented the Forest Navigator Portal concept and objectives, which will be a decision support tool for the following objectives:

1. monitoring the progress towards policy objectives,
2. visualizing spatial explicit forest adaptation and mitigation potentials, synergies and trade-offs,
3. visualizing policy pathways co-identified with stakeholders, and
4. ensuring effective dissemination of results.

Stakeholders received information regarding the back-end repositories intended for researchers, and the front-end web explorers designed to assist decision makers. They were asked to reflect on their present usage of existing explorers and to what extent and how they see the Forest Navigator Portal as a complementary tool.

Stakeholders made a few key recommendations:

- Encouraging the design of end-user oriented and easy-to-use tools.
- The need for these new Explorers to be easily distinguishable from and complementary to existing ones, such as those provided by FAO, rather than repeating what other portals provide.
- Suggestions to enhance the visualization of the Data and Pathways. One recommendation was to incorporate additional layers (such as NUTS4 administrations and water catchments) to facilitate the presentation of localized statistics aggregated within these layers in the Data Explorer.
- Highlighting data stemming from FAO initiatives, such as catchments and sub-catchment data, could prove valuable in examining the correlation between forest coverage and water provisioning.

Simon Besnard from GFZ gave a presentation about monitoring and modelling forest dynamics, highlighting the main forest monitoring objectives of the project, and described the relevant indicators to be included in the data cube: forest area and cover, forest disturbances, aboveground biomass, and forest age and structure.

Stakeholders made a few key comments on S. Besnard's presentation:

- Significance of adhering to Land Cover/Land Use definitions as outlined by UNFCCC/FAO/MS. Stating the importance of incorporating these definitions in both statistical production and the depiction of forested areas.

Finally, Maximilian Hesselbarth from IIASA gave information about how species distribution modeling will model biodiversity. Furthermore, he presented several biodiversity indicators to

quantify biodiversity and which potential species (and taxa) will be included in the biodiversity assessment. As a next step, ForestNavigator partners will follow-up with stakeholders' perspective on the policy relevance of indicators.

Next Steps for Stakeholder Engagement

An important key outcome from the workshop is the feedback we received through Mentimeter at the end of the workshop. This will help us to improve our engagement and activities in the stakeholder dialogue process. Key points to take away:

- The audience was very satisfied with the group and atmosphere, as well as the facilitation and program. 'Satisfaction with the outcome' scored slightly lower, accordingly the consortium plans to improve by following up regularly on specific topics with interested stakeholders.
- The favorite parts of the workshop were, for most people, group discussions and networking opportunities (organized or in free time).
- A few suggestions: to improve/better time management, more time for group discussions, engaging small-scale forest owners, a bit more time on introducing the project and connecting it to the aim of the workshop.
- The stakeholders showed a clear preference for in-person interaction for future activities, followed by an interest in thematic online meetings.

It was agreed by many that we had envisioned an ambitious task to achieve in such short sessions and needed more time to work together. Therefore, ForestNavigator aims to conduct follow-up online or by surveys with interested stakeholder board members. The consortium established the following next steps:

- **June 2023 - Providing all materials shared during the workshop** (e.g., presentations), as requested by the participants. *(done)*
- June 2023 - Establishing thematic subgroups to allow easy (e.g., online meetings) and focused means to hold follow-up discussions so that we engage effectively and efficiently with our Stakeholder Board members to avoid excessive time commitments. *(done)*
- **Twice annual Newsletters** to share regular updates from project outcomes. (*ongoing*)
- **Fall 2023 – Workshop Report,** outlining the main discussions, outcomes of and the next steps from the first stakeholder workshop. *(done)*
- **September 2023** – The ForestNavigator General Assembly, updates from which will be included in the newsletter following the GA. *(done)*
- **Q1, Q2 of 2024** - Following up with thematic subgroups to improve findings from the first workshop, other results from the project and building towards the second stakeholder workshop.
- **Spring 2024 -** Kick-start of online thematic group discussions are anticipated.
- **September 2024** – Second Stakeholder Workshop. Showing draft results on the storylines developed, building on the input from the first stakeholder workshop.

Annexes

Annex 1 - Workshop Agenda

19 JUNE 2023, 12:00-18:00	
TIME	ITEM
11:15	Bus departure from Wien HBF to IIASA
12:00-12:50	Registration and lunch at IIASA
12:50-12:55	**Welcome to IIASA** Speech by Petr Havlik
12:55-13:25	**Opening**: Objectives of the meeting Tour de Table
13:25-14:10	**The ForestNavigator project and its outputs** (hybrid) • Overview of the project • Enhancements in biophysical models
14:10-14:30	**Keynote speaker (DG CLIMA: Johannes Schuler)** (hybrid) • Forest policy needs in the EU • Anticipated policy relevance of project outputs
14:30-14:45	Coffee break
14:45-15:25	**Current status and needs of European forests** (hybrid) • Main forest types and management concepts in large-scale models • Main interventions in each management concept • Expected performance of current forest types and managements under climate change and needs for adaptation
15:25-16:30	**Forest management storylines** • Break out group discussion on the ForestNavigator forest management storylines setting up conservation, multi-functionality or bioeconomy-oriented forest management stewardships
16:30-17:00	Coffee break
17:00-17:50	**Breakout group S: Further details of the forest management storylines** • Break out group discussion on decision points for different management options for most representative forest types in three European regions **Breakout group P: Policy tracker** (hybrid) • Break out group discussion on policy mapping of relevant existing EU and national policies and their prioritization in the storylines
17:50-18:00	**Wrap up** **Plan for the next day**

20 JUNE 2023, 09:00-13:00	
TIME	ITEM
08:00-08:15	Meeting at the bus stop at Wien Hbf.
08:45-09:00	Check-in to the venue at the reception
09:00-09:20	**Welcome** Outlook to the day Notes from the first day
09:20-10:25	**Ecosystem services associated with different management options** ● Breakout groups: Identify variables and indicators for ecosystem services (focus on recreation) representation, within the storylines discussed during previous sessions ● *Group and room allocation: G1 Wodak, G2 Gvishiani*
10:25-11:05	**Scenarios on forest bioeconomy material and energy demands (hybrid)** ● Collecting feedback on the work done so far in the project with regards to material and energy demand scenarios
11:05-11:20	Coffee break
11:20-12:30	**ForestNavigator Portal: Data Explorer and EU Pathways Explorer (hybrid)** ● Introduction to the ForestNavigator Portal ● Identifying most policy relevant indicators related to forest management, to be represented in the Portal: a focus on carbon stock and biodiversity
12:30-13:00	**Wrap up and Outlook**
13:00-14:00	Lunch
	Walk through Schloßpark Laxenburg

Annex 2 - List of Participants

Name	Organisation
Antonio Brunori	PEFC Italia
Benjamin Chapelet	CNPF, France
Bérénice Kimpe	Xylofutur
Daniel McInerney	Coillte
Davide Pettenella	University of Padova - TeSAF Dept.
Elizabeth Ashley Steel	FAO
Felix Montecuccoli	CEPF (AT; Land&Forst Betriebe), Austria
Georg Schweizer	Austropapier, Austria
Gerry Lawson	EURAF
Ivan Barka	National Forest Centre, Slovakia
Johanna Klapper	International Forestry Students' Association (IFSA)
Kelsey Perlman	FERN
László Gálhidy	WWF Hungary
Lora Stoeva	Forest Research Institute, Bulgaria

Malin Sahlin	Swedish Society for Nature Conservation (SSNC)
Martin Greimel	BOKU Centre for Bioeconomy
Raul Radu	LULUCF Romania
Rebecka McCarthy Tune	Sveaskog, Sweden
Zoltán Somogyi	University of Sopron, Forest Research Institute, Hungary

Annex 3: Nature-oriented storyline by goal and subgoal

Table A.3.Nature-oriented storyline by goal and subgoals, representing the way stakeholders discussed it during the workshop.

Goal	Subgoal	Measure
Bioeconomy	Increase circularity of HWP	
Bioeconomy	Increase hardwood for long-lived wood products	Promote species adapted to future climate (hardwood)
CC adaptation	Passive adaptation: no deliverabe intervention	Leave more damaged wood in forests and install traps for bark beetles
CC adaptation	Proactive adaptation to avoid future negative impacts of CC	Promote natural regeneration but also assisted migration (e.g. Planting of non-local species)
CC adaptation	Proactive adaptation to avoid future negative impacts of CC	Promote species adapted to future climate (hardwood)
CC adaptation	Reactive adaptation after climate change has occurred	
Conservation	Improve structural complexity	Create snags islands
Conservation	Improve structural complexity	Increase continuous cover forestry
Conservation	Improve structural complexity	Increase thinning from above and reduce thinning intensity
Conservation	Improve structural complexity	Leave more damaged wood in forests
Conservation	Improve structural complexity	Reduce clearcutting systems
Conservation	Increase forest area connectivity	
Conservation	Increase strictly protected areas	Introduce payments for conservation
Conservation	Set aside old growth forests	Introduce payments for conservation
Ecosystem services	Increase habitat provision	Leave more damaged wood in forests
Ecosystem services	Increase protective and regulation services	Introduce payments for carbon
Ecosystem services	Increase protective and regulation services	Introduce payments for conservation
Mitigation	In situ carbon storage	Increase thinning from above and reduce thinning intensity
Mitigation	In situ carbon storage	Introduce payments for carbon
Mitigation	In situ carbon storage	Leave more damaged wood in forests
Mitigation	In situ carbon storage	Reduce clearcutting systems

Source: stakeholder workshop 1

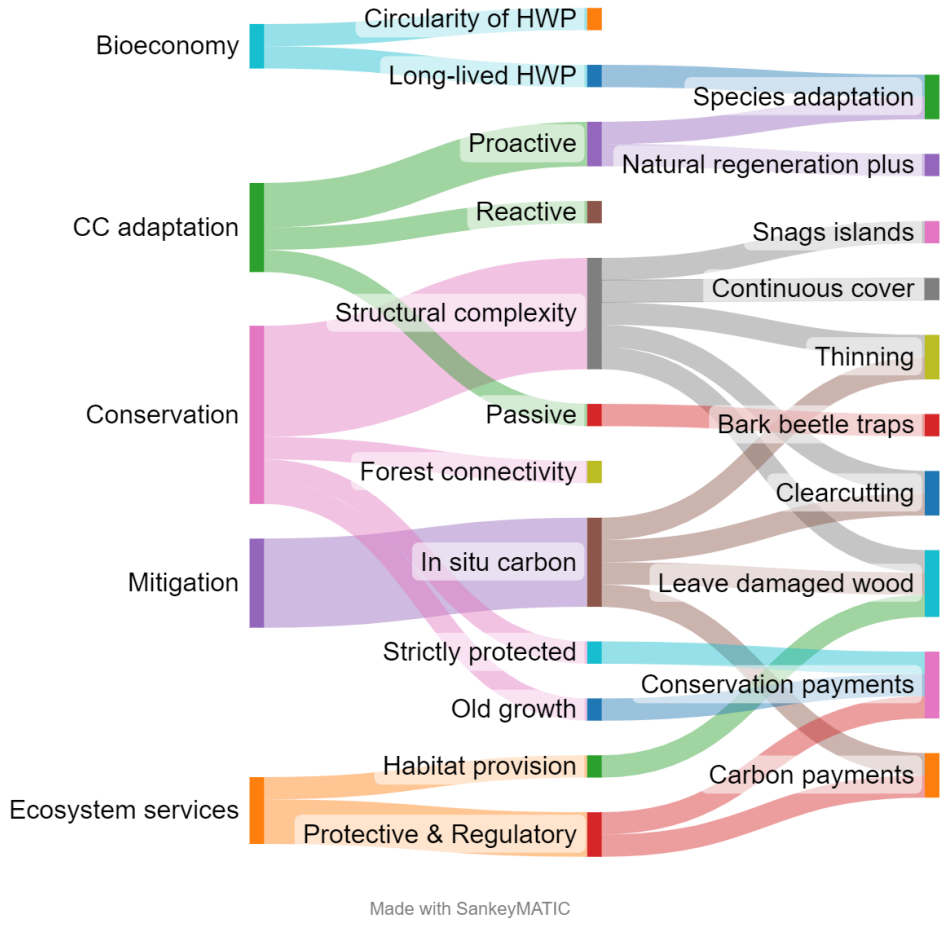

Figure A.3. Sankey diagram connecting goals, subgoals and measures in the nature-oriented storyline (above), and legend of the abbreviations (below).

Measure (short)	Description
Species adaptation	Promote species adapted to future climate (hardwood)
Bark beetle traps	Leave more damaged wood in forests and install traps for bark beetles
Natural regeneration plus	Promote natural regeneration but also assisted migration (e.g. Planting of non-local species)
Snags islands	Create snags islands
Continuous cover	Increase continuous cover forestry
Thinning	Increase thinning from above and reduce thinning intensity
Leave damaged wood	Leave more damaged wood in forests
Clearcutting	Reduce clearcutting systems
Conservation payments	Introduce payments for conservation
Carbon payments	Introduce payments for carbon