UNECE

Food and Agriculture Organization of the United Nations

Work Area 2: Forest Sector Outlook Studies

Lia Fain, Jeff Prestemon

FORESTS

41st Joint UNECE/FAO Working Party on Forest Statistics, Economics and Management

27-29 March 2019, Geneva

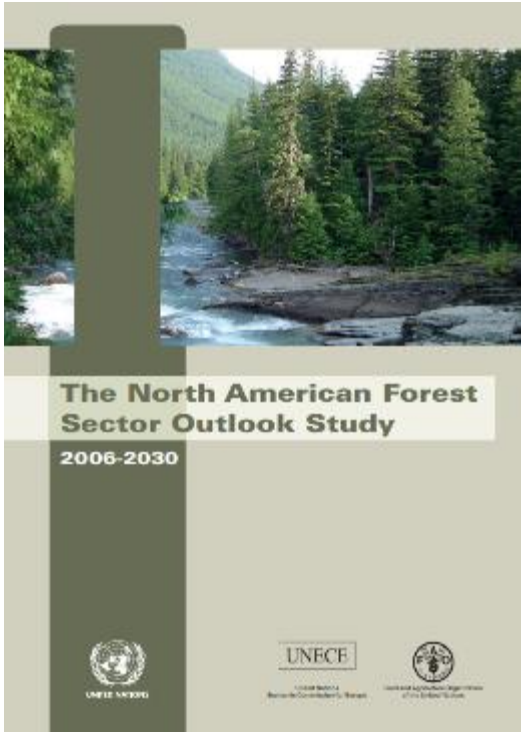
Session overview

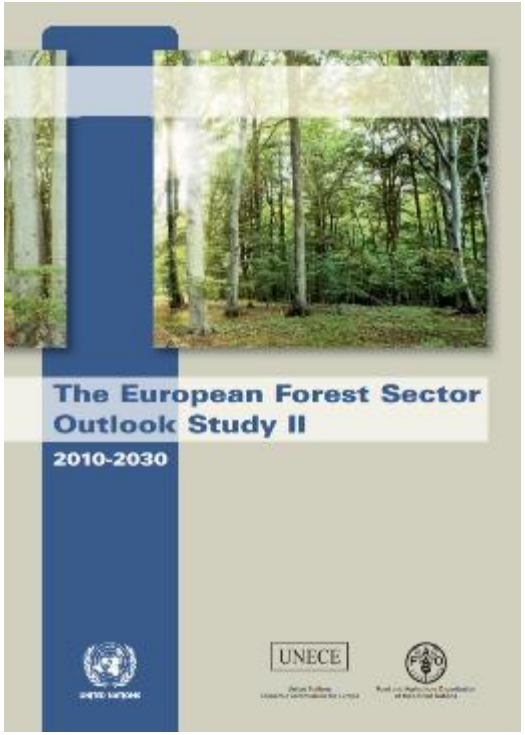
FORESTS

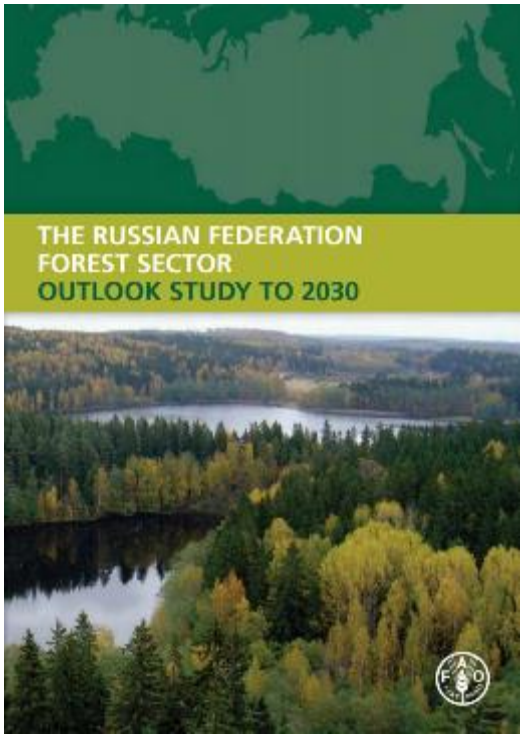
1. Background on the process
2. Results of scenario modelling
3. Interactive group session
4. Further guidance from the Working Party

UNECE/FAO Forest Sector Outlook Study

FORESTS





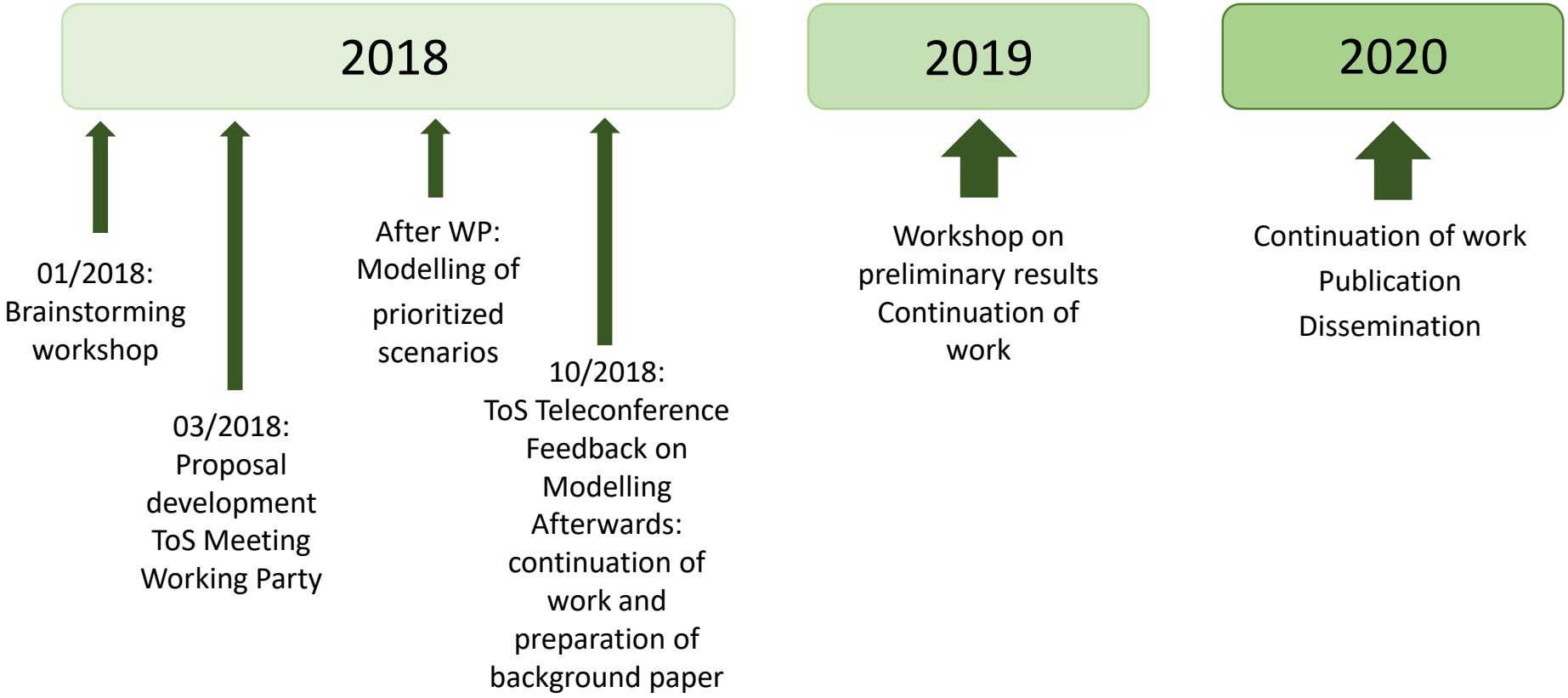


(FAO)

Process

FORESTS

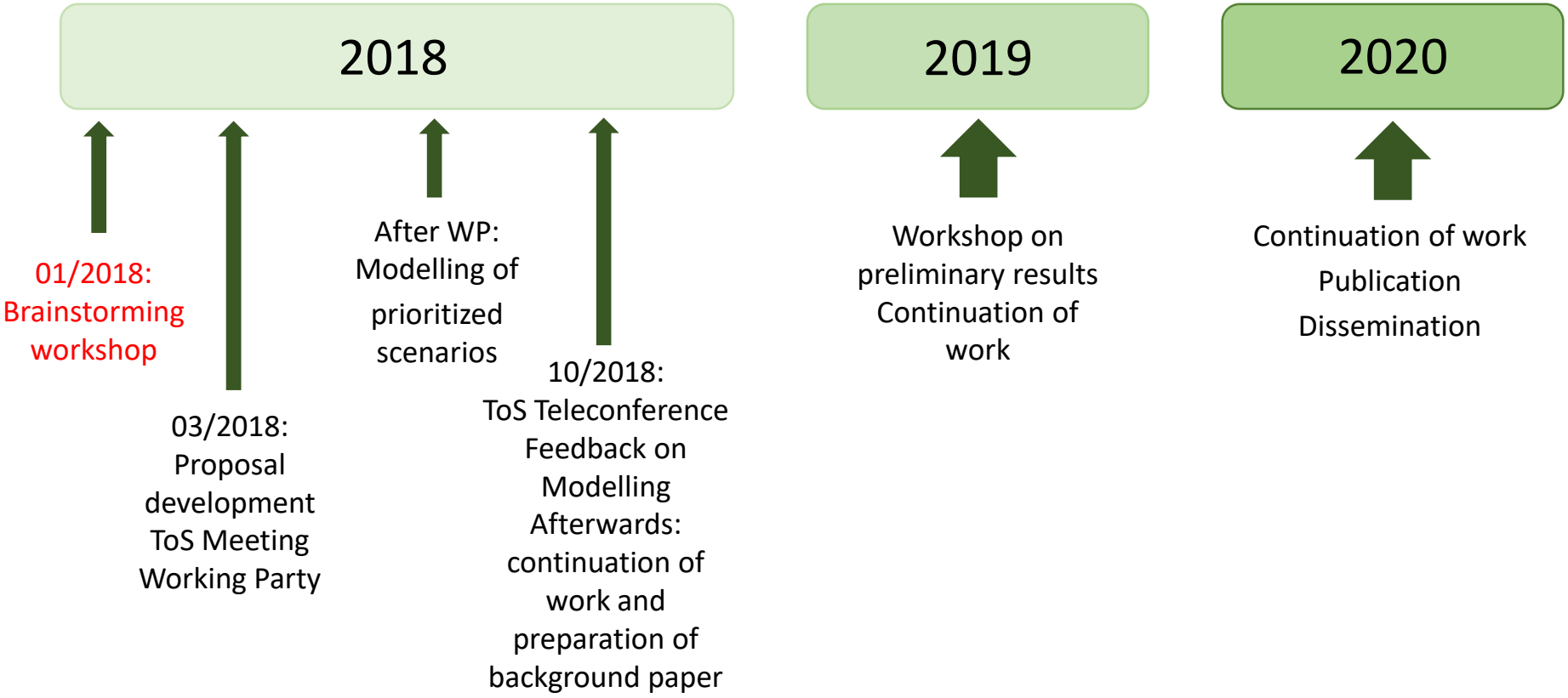
Rough roadmap for the next FSOS



Process

FORESTS

Rough roadmap for the next FSOS



Brainstorming Workshop Jan 2018

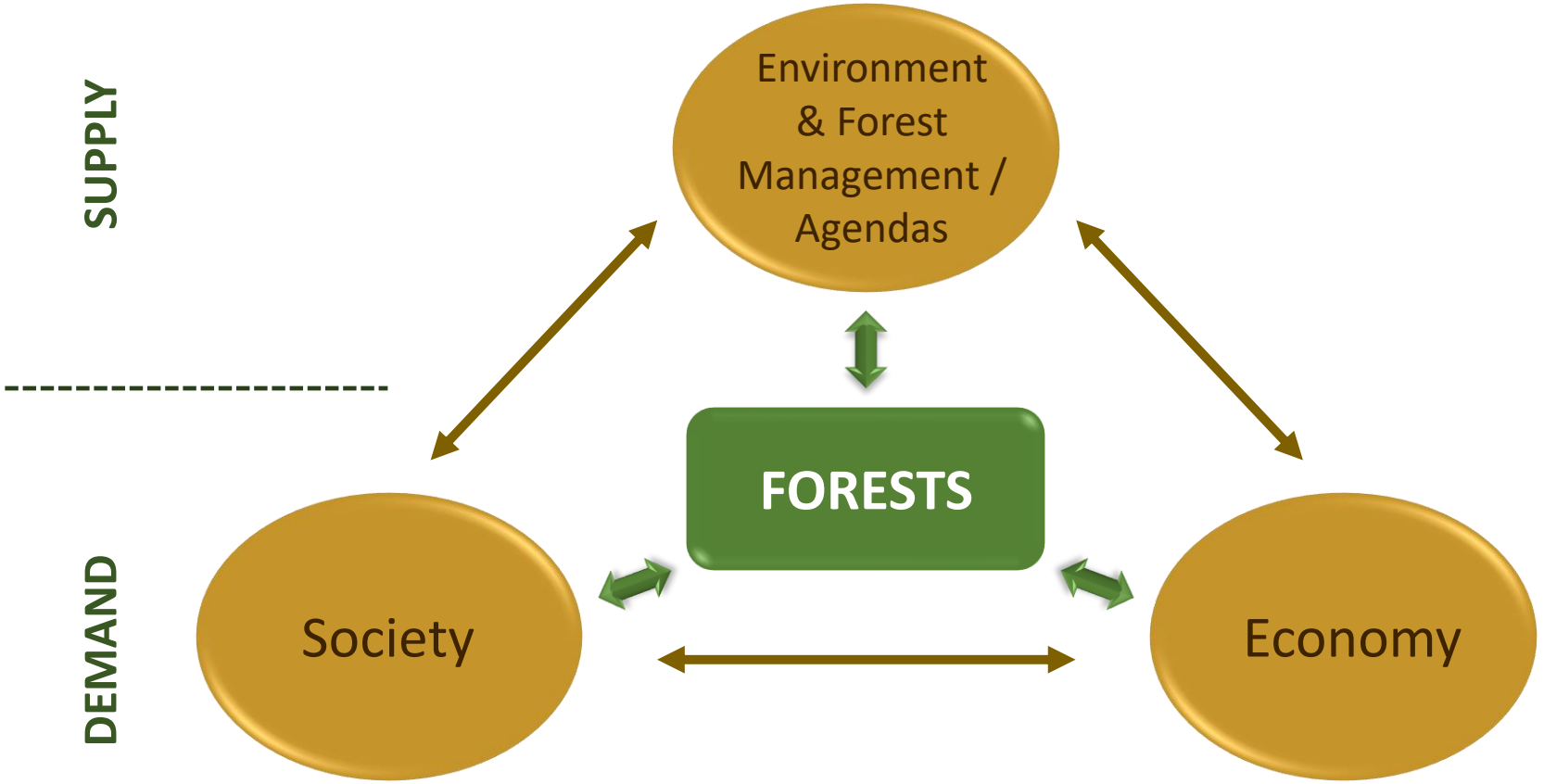
- 26 participants including representatives from ministries, forest agencies, research institutes, the private sector and international organizations
- **Objectives**:
  1. Brainstorm on main aspects and policy questions that ideally should be covered by the next FSOS
  2. Discussion on other related topics such as geographic coverage, time horizon, scenarios, modelling

Detailed results including the report on the meeting's web page:

https://www.unece.org/forests/outlookjan2018

Brainstorming workshop 01/2018

Forests in 2050?



Brainstorming workshop 01/2018

FORESTS

What could be significantly different with respect to forests and their products in 2050?

Environment & Forest Management / Agendas

- Climate Change
- Biodiversity
- Damage (insects, fires, etc.)
- Forest ownership
- National agendas
- International agendas (CC, SDGs, etc.)
- Regulations (nat./int.)
- …
- **???**

Society

- Preferences regarding:
  - Living
  - Furniture
  - Products (packaging)
  - Life style
- Building constructions
- Fashion
- Forest tourism
- Recreation / Health
- International agendas (SDGs etc.) / Regulations
- …
- **???**

Economy

- ECE economy
- World economy
- Trade
- Technologies (biorefineries etc.?)
- Energy
- Bioeconomy?
- World Politics
- International agendas (SDGs etc.) / Regulations
- …
- **???**

Brainstorming workshop 01/2018

FORESTS

Brainstorming workshop 01/2018

FORESTS

Aspect	Related policy questions
Sustainable Production and Consumption	Contribution of the ECE Region Forest Sector SPC (esp. in China, India, Africa)
Climate change	Forests as a contributor to tackle climate change (carbon sinks)? How could we increase resilience by adaptive management? What would be the productive capacity of different ECE region under changing climate?
Renewable Energy?	What is the potential contribution of forests in the ECE Region to increase the share and quantity of renewable energy?
The extent of natural disasters will increase	What are the consequences? What can be done to increase resilience and regenerate damaged forests?
The pressure to protect more forest will continue	How to maximize the benefit of forest protection, at the same time taking other ecological services into account? How to arrange for compensation to forest owners?
Wood production in ECE will be strongly affected by non- ECE demand	What would be the effect of the increased demand on forest management? What will be the effect of increased planation forestry outside the ECE?
The demand for certified products will increase?	Will the market accept the cost of the certification process?
Consumer attitude change towards environmentally friendly products	What would be the consequence?
Strong biorefinery industry	What would it mean for the use of hardwood species? Competition with pulpwood? Residues or more synergy?
A variety of use of wood fibres increase, increased demand	Wood market would integrate into others (fashion, chemical, nutrition…) What would be the consequence on wood supply and prices?
Land-use change	What would be the consequence?

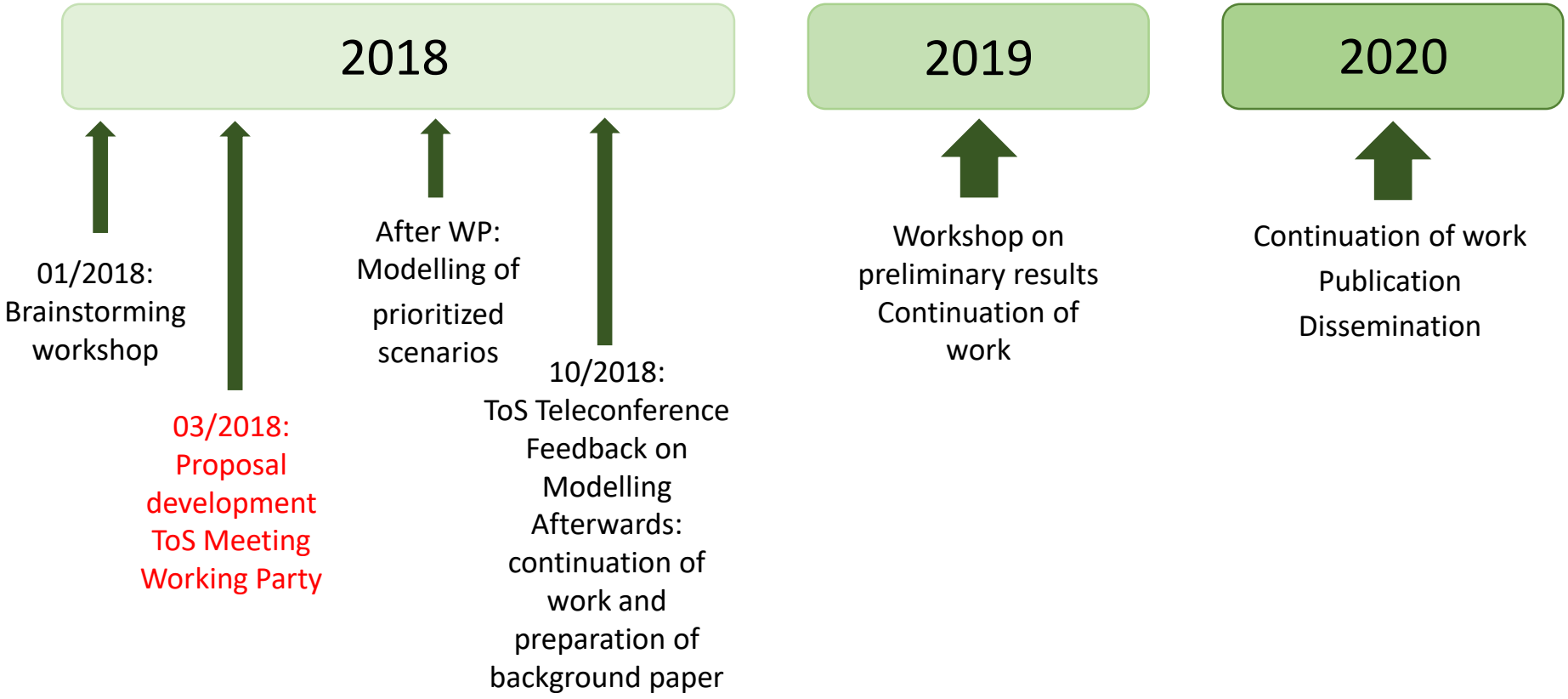
Brainstorming workshop 01/2018

FORESTS

Aspect	Related policy questions
Employment	How will the forest sector contribute to employment outside of large cities? Is there are shortage of labour supply? What will be the consequence?
Emergence of new energy sources	Would wood remain a competitive energy source? What would be the impact on profitability?
Lack of stability in the regulatory framework – at all levels	How would this impact investment? How to avoid the damaging impact on competitiveness in particular due to different regional regulations?
Payment of Ecosystem Services will become more widespread	Who will be paying? What will be the impact on costs? What will be the impact on forest management practices? What will be the impact on supply?
Environmental costs are more fully taken into account including with the help of life-cycle considerations	How will this affect perceptions of competitiveness? How will non-financial reporting at the sector level support comparability? How will this affect decision by forest owners?
The circular economy becomes more dominant as a policy framework (e.g. EU's circular economy package (re-use, recycling, etc.)	How to deal with transparency issues in this framework? How to address conflict? What would be the consequence?
Disruptive events (e.g. significant economic collapse) including events linked to climate change	What would be the impacts on the supply and demand sides? In the presence of long horizon investment cycles?
Wider development of biotechnology?	What new material / possibilities will emerge? How will competition shape within and between sectors? How will competition be affected by reliable and transparent information?
GDP development	What will be the consequences for the forest sector?
Wood species for industry demand 2050	How can a fitting forestry structure be set up today?
Policy-induced significant reductions in wood products trade volume shifts countries to greater self-sufficiency?	What would be the consequence for ECE countries that import and export wood products?

Process

Rough roadmap for the next FSOS



Draft proposal for the next FSOS 02/2018

FORESTS

General aspect	Policy questions	Reference Scenario / Variables to compare	Possible alternative scenarios
Climate Change	What is the potential of UNECE forest sector for climate change mitigation? What can the UNECE forests contribute?	Carbon sequestration and avoided emissions in forests and wood products under a normal economic growth scenario = reference scenario (no change in forest land)	CC1: Potential of carbon sequestration in wood construction; assumption: significant increase in wood construction (UNECE and/or worldwide) CC2: Potential of carbon sequestration in traditional wood products; assumption: (policy-driven) significant increase in demand for wood products (UNECE and/or worldwide) CC3: Potential of carbon sequestration in new products based on wood fibres; assumption: technological advances that allow a significant increase of use of wood fibres CC4: Potential of carbon sequestration through (re-)forestation; assumption: policy-driven, significant increase of forests area in the UNECE region (e.g. Bonn challenge) CC5: Maximising carbon sequestration by changing silvicultural methods (update to the EFSOS II scenario "Maximising biomass carbon") CC6: Potential of climate change mitigation through substitution in the energy sector through an increased use of wood energy CC7: Combination of the above – what is the maximum that could be achieved given competing demands for wood products (possibly looking at Climate Smart Forestry)
	How will UNECE forests be affected by climate change? How will adaptation look like?	Supply of forest resources under current forest growth scenario (no further climate change)	CC7-CC10: Differences in supply of forest resources under the four representative concentration pathways (RCPs) from the IPCC 5th Assessment Report (possibly looking at resilience as well)
Structural Changes	How would different demand changes affect the UNECE forest product market?	Demand and prices for wood products under reference scenario	SC1: Massive increase of demand for wood constructions – within UNECE – and outside (especially China); closely linked to calculations for CC1 SC2: Significant increase of demand for wood-fibres for textiles and other products; closely linked to calculations for CC3 SC3: Significant economic collapse (whole world and/or specific countries/regions) SC4: Successful development of an alternative energy source and thus drastic decrease in demand for wood energy

Draft proposal for the next FSOS 02/2018

FORESTS

			SC5: Significant decrease of demand for print and paper with simultaneous increase of demand for packaging SC6: Significant increase of biorefineries.
	How would different supply changes affect the UNECE forest product market?	Supply and prices for wood products under reference scenario	SC7: Significant increase of forest plantations outside of UNECE (e.g. Africa and/or Asia) SC8: Significant increase of natural disasters
	What would be the effect of massive restrictions to trade on the UNECE forest product market?	Supply, demand and prices under reference scenario	SC9: Trade between countries and/or regions is significantly restricted
Green Economy & SDGs	What are opportunities and challenges regarding green jobs?	Employment under the reference scenario	GS1: Effect of a significant increase of technology in forest employment (qualitative analysis) GS2: Effect of a significant decrease of qualified labour supply (qualitative analysis)
	What is the potential of the Payment of Ecosystem Services	What are current examples of PES	GS3: Effects of a wide-spread use of PES (qualitative & quantitative analysis)
	What is the potential contribution of UNECE forests and forest products to the achievement of the SDGs	SDG achievement under the reference scenario	GS4: Effects of a specific focus on the achievement of certain SDG targets (qualitative analysis)

ToS meeting 03/2018

FORESTS

Possible scenario	Technical feasibility
Climate change mitigation (different aspect: potential carbon sequestration in wood construction and other wood products, different silvicultural methods, reforestation, substitution in energy (wood energy) and combination of the previous)	Feasible with a set of models
Climate change adaptation	Country-based review (no or little modelling involved)
Upcoming market scenarios (China, Africa)	Feasible, based on SSPs
Growth of specific products (construction, fibres, biorefineries)	Feasible
Economic disturbances	Feasible
Significant increase of forest plantations outside of UNECE	Feasible

ToS meeting 03/2018

FORESTS

Possible scenario	Technical feasibility
Impact on forest product market by significant increase of natural disasters	Feasible
Impact of trade barriers (increase or decrease)	Feasible
Potential of Payment for Ecosystem Services	Not feasible as a full outlook scenario; parts could be covered (carbon payment), and current case studies be added
Employment	Not feasible as a outlook scenario, could potentially be a "post-analysis" on all scenarios
SDGs	Not feasible as a outlook scenario, could potentially be a "post-analysis" on all scenarios; labor-intensive
Circular Economy/Cascading-use of wood	Difficult to define well as a scenario, could be a "post-analysis" on all scenarios

Detailed report of the meeting with annex on scenarios

http://www.unece.org/index.php?id=48024

Input from the Working Party 03/2018

FORESTS

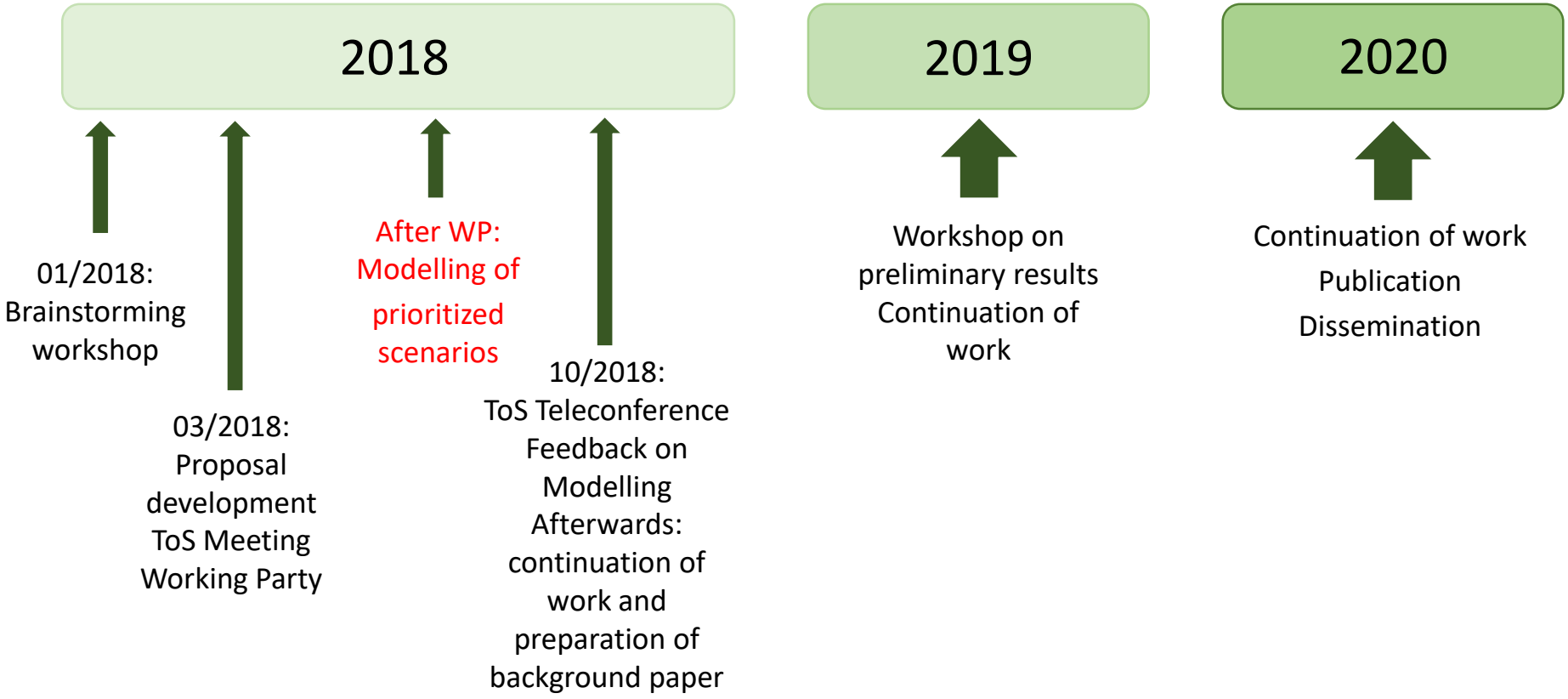
Possible scenario	Average priority
Climate change mitigation CC	2.8
Growth of specific products (construction, fibres, biorefineries) SC	2.8
Climate change adaptation CC	2.6
Upcoming market scenarios (China, Africa) SC	2.6
Economic disturbances SC	2.6
Impact on forest product market by significant increase of natural disasters CC	2.4
Nature conservation	2.4
Impact of trade barriers (increase or decrease) SC	2.2
Potential of Payment for Ecosystem Services	1.8
SDGs	1.8
Circular Economy/Cascading-use of wood	1.8
Employment	1.6

UNECE Food and Agriculture Organization of the United Nations

Climate Change = CC Structural Change = SC

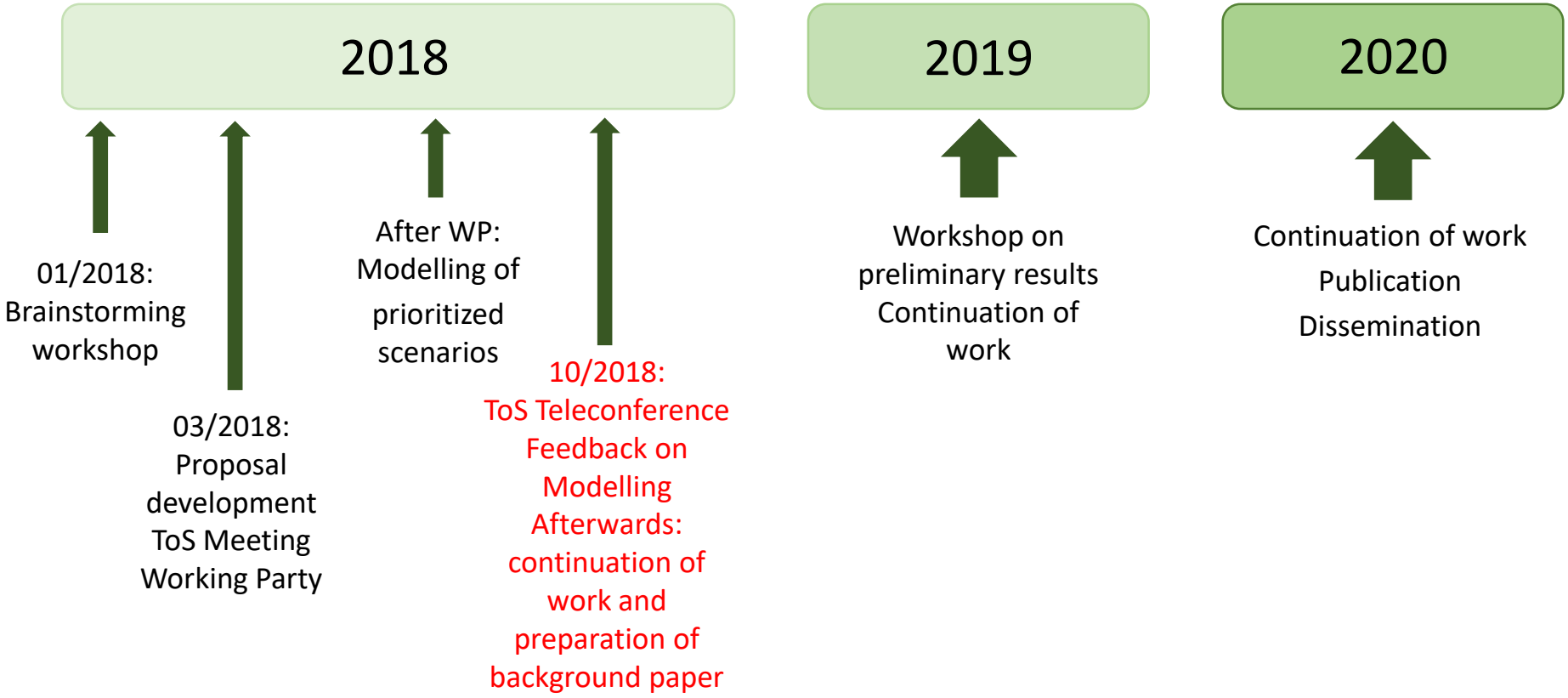
Process

Rough roadmap for the next FSOS



Process

Rough roadmap for the next FSOS



ToS Teleconference 10/2018

FORESTS

3) **Discussion**

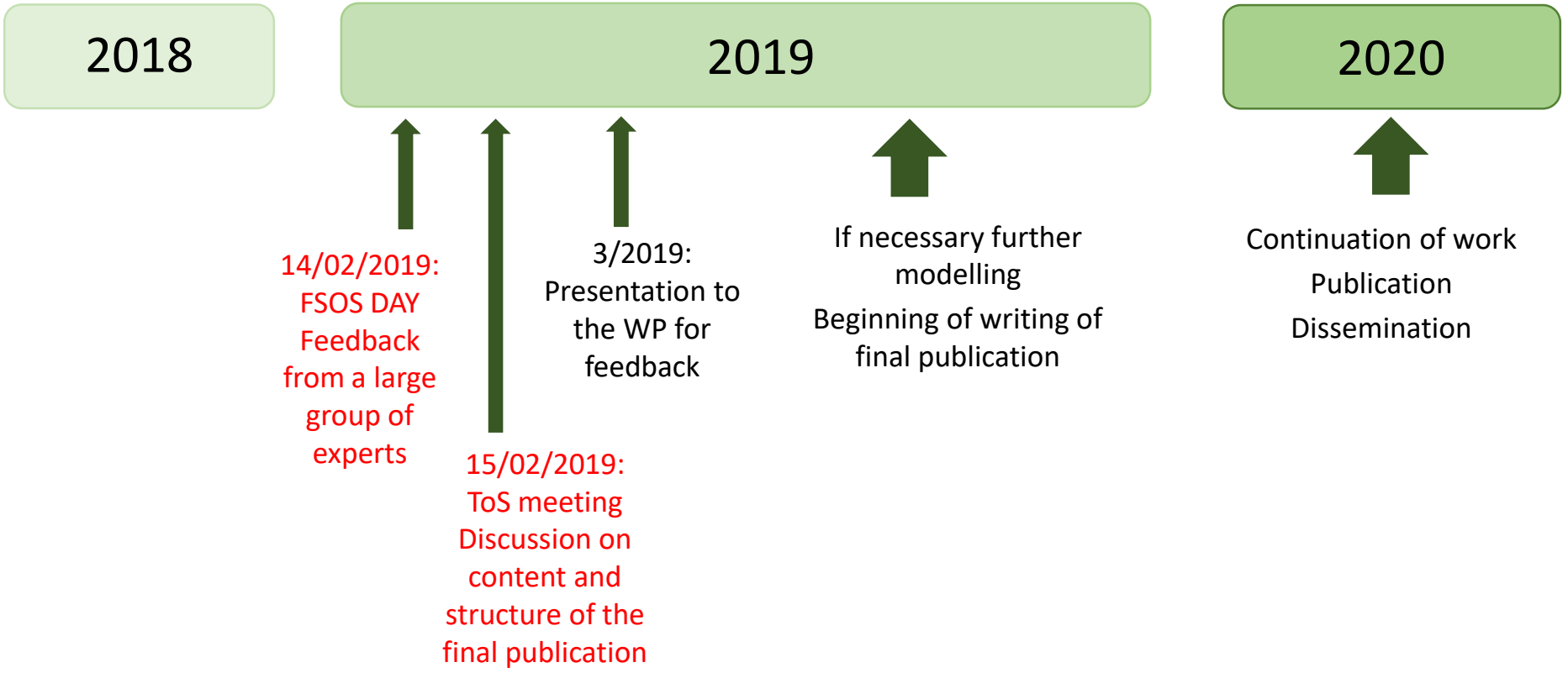
- Question: Are **silvicultural methods/forest management change** included in the calculations? Answer: Areas of natural and planted forests and timber stock quantities are aggregate, summary variables defining current and projected forest conditions; consideration of policies and management practices that could enable achievement of the levels of these summary variables at the country and multinational levels could be part of the narrative accompanying discussion of the silvicultural and management implications of various scenarios.
- Question: How is **energy** included? Answer: It only enters through fuelwood; no focus was put on energy as this was a focus area of the last set of FSOS studies (European and North
- time.
- Question: Are **residues and recycling material usage** considered? Answer: The model considers it for the paper sector, not for the others. The GFPM has a recovered paper as a modelled product category. The current version of the GFPM specifies that the maximum recovery rate of recovered paper is 80%. The actual recovery, within this range, is determined by the input-output coefficient (unit of recovered paper used to produce per

Detailed report on the discussion:

http://www.unece.org/index.php?id=50524

Process

Rough roadmap for the next FSOS



FSOS Events in Koli, Finland

14 Feb: Workshop *"Exchange of Experiences in Forest Sector Outlook Studies and Related Work"*

- Over 60 participants including representatives from research institutions, governments and international organizations
- Presentation on different outlook-related work on the national and international level
- Presentation of the results of the US modelling team and interactive feedback session afterwards

FOREST SECTOR OUTLOOK STUDY III: CURRENT STATUS & FUTURE PLAN

Jeffrey Prestemon[1], Prakash Nepal[2]

[1]Project Leader and Senior Scientist, USDA Forest Service, Southern Research Station, Forest Economics and Policy Unit, Research Triangle Park, NC

[2]Research Assistant Professor, Dept. of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC

41st session of the Joint ECE/FAO Working Party on Forest Statistics, Economics and Management
Geneva, Switzerland
March 27-29, 2019

Recommended special scenarios

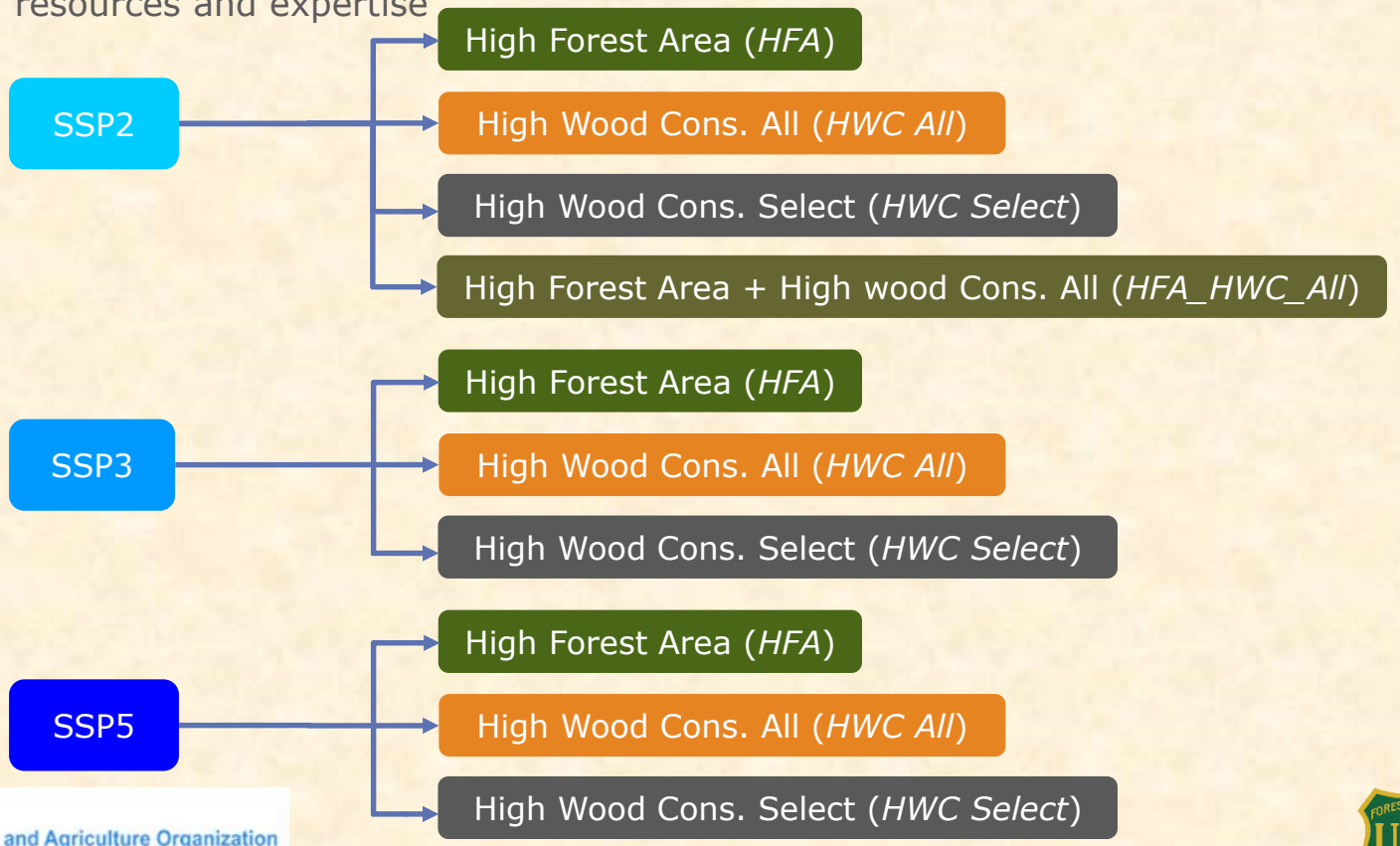
Recommended alternative scenarios incorporating high priority questions
The potential of C sequestration in wood products due to
1. Assumed increases in wood construction in the UNECE region or globally 2. Assumed increases in demand for traditional wood products in UNECE regions or globally 3. Assumed technological advances allowing a significant increase of wood fibre use (new products)
The potential of climate change mitigation through
4. (Re-) forestation due to assumed policy driven sig. increase of forest area in the UNECE regions 5. Changing silvicultural methods (update to the EFSOS II scenario "maximizing biomass carbon") 6. Substitution in the energy sector through an increased use of energy/ wood substitution for nonwood 7. A combination of above scenarios to determine the maximum carbon sequestration
8. Differences in supply of forest resources under the four representative concentration pathways
9. A sig. increase in demand for wood in construction within UNECE region or outside (esp. China)
10. A sig. increase in demand for wood-fibres for textiles and other products
11. A sig. economic "collapse" globally and/or in specific countries/regions
12. The successful development of an alternative energy source reducing the demand for wood energy
13. A sig. decrease in demand for printing & writing paper and increased demand for packaging paper
14. A sig. increase in biorefinery capacity
15. A sig. increase in forest plantations outside of the UNECE region (e.g., in Africa and/or Asia)
16. A sig. increase in the rate, severity, or extent of forest-based natural disturbances
17. The adoption of new and more highly restrictive trade barriers between countries and/or regions

FSOS III Background Report

- A background report on FSOS III was prepared describing:
  - The selected sets of reference and alternative scenarios
  - Projection methods
  - Projected forest and forest products sector outcomes for the UNECE
- The purpose of the report was to:
  - Provide transparent information on the scenario selection and modelling process
  - Ensure that most relevant forest sector policy debates in the UNECE are covered
  - Provide information for more detailed country-level forest sector and forest conditions projections and policy studies
  - Obtain feedback on the developed scenarios and modeling results
- The report was distributed to the FSOS ToS before the team meeting in Koli, Finland, 15 February 2019
  - Dr. Prakash Nepal presented the report at the meeting
  - Feedback on modeling work was collected from the meeting participants

Scenario development/selection

- 13 different scenarios were selected based on 3 criteria:
  - Availability of a global forest sector model that can model the majority of the recommended scenarios in an integrated way
  - Existence of past studies that could answer the recommended questions without new modelling
  - Availability of resources and expertise



UNECE Food and Agriculture Organization of the United Nations

Scenario description: Reference

- Reference scenarios
  - The reference scenarios were directly adopted from the IPCC-inspired five shared socioeconomic pathways (SSPs)
  - Results for only SSP2, SSP3, SSP5 are included in the report

Scenario	Assumption	Projected outcomes

SSP2	• "Middle-of-the-road" world vision
	• Forest products market drivers
	  • Income
	  • Total population
	  • Rural population density
	  • Labor per unit of forest area
	  • Total forest area
	  • Planted forest area
		• Total and planted forest areas
		• Forest stocks
		• Wood removals
		• Prices
		• Consumption
		• Production
		• Trade
		• Forest sector carbon sequestration

SSP3	• Poorer and less equal world • Market drivers: same as above	Same as above
SSP5	• Wealthier and more equal world • Market drivers: same as above	Same as above

UNECE Food and Agriculture Organization of the United Nations

Scenario description: Alternative

High Forest Area (*HFA*)

- Assumes global future efforts to mitigate climate change by policy driven significant increases in total forest area (planted + natural)
- Total forest and planted forest area increase by 10% by 2040, relative to the projected area in a reference scenario in 2040

High Wood Consumption in All Countries (*HWC All*)

- Represents assumed future worldwide structural changes in wood products demand for traditional and new wood products and increased use of wood fibre in biorefineries
- Sawnwood and panel products consumption double by 2040, relative to the projected consumption of those products in a reference scenario in 2040

High Wood Consumption in Selected Countries (*HWC All*)

- Assumes doubling of demand for structural and nonstructural wood products in six countries outside of the UNECE, by 2040, relative to demands in a reference scenario
- Six most populous non-UNECE countries: Brazil, China, India, Indon., Mexico, Pakistan

High Forest Area + High Wood Consumption in All Countries (*HFA_HWC_All*)

- Evaluates whether assumed increases in forest area coupled with increased wood product consumption would achieve max. C sequestration among selected scenarios

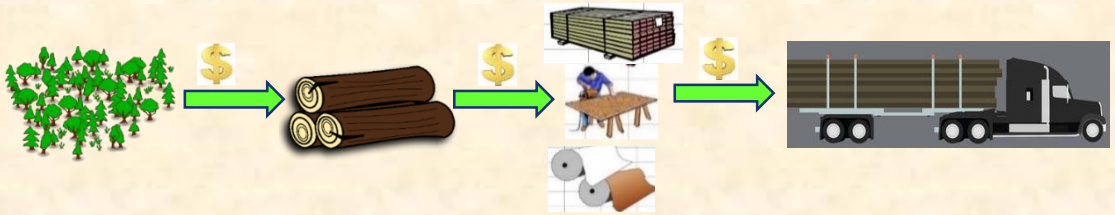
Scenario description: Alternative

- Existing studies can help answer three policy questions:
  - Impacts of trade barriers: Buongiorno and Johnston (2018)
  - Impact of forest plantations outside UNECE: Nepal et al. (in review)
  - Carbon benefits of wood substitution: Sathre and O'Connor (2010)
- Alternative approaches to modelling the effects of climate change:
  - Develop econometric models of forest growth; Forest growth=f(temperature, precipitation, CO_2 concentration), OR
  - Impute the effects of climate change on forest growth, based on existing studies
- The effects of future growth of wood fibres due to expanded demand by biorefineries will be assessed qualitatively
- Effects of assumed economic "collapse" can be gauged by comparing SSP3 outcomes with SSP2 or SSP5

UNECE Food and Agriculture Organization of the United Nations

Projection Methods: Forest Products Market

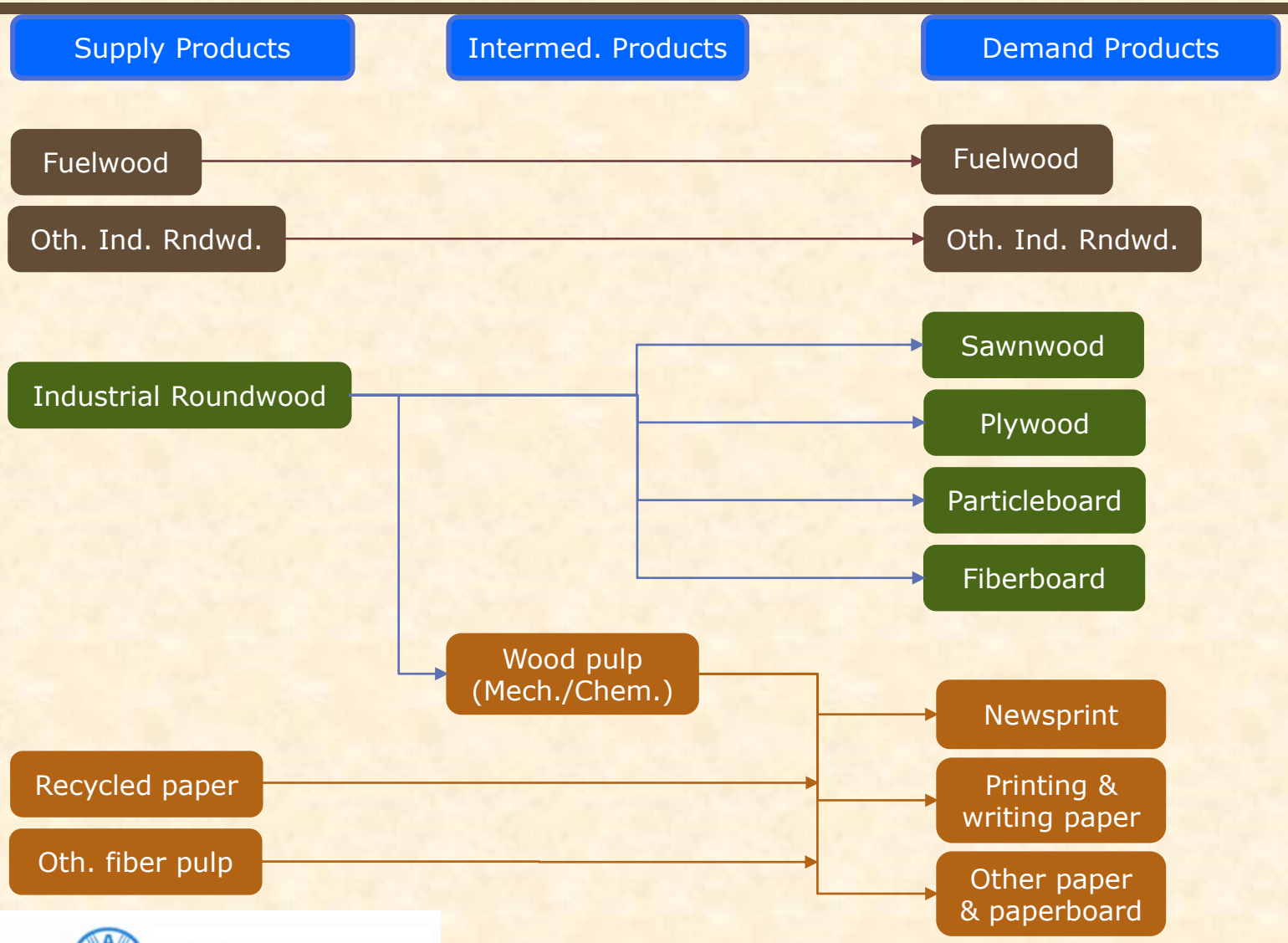
- Use of the Global Forest Products Model (GFPM)
  - Widely used peer-reviewed global forest sector model
  - Can model both demand and supply of forest products
  - Can model all UNECE subregions
  - Can model the majority of the recommended scenarios
  - Provides market equilibrium projections of timber harvests, prices, & quantities of 14 wood products produced, consumed & traded



  - Beginning year is 2014; projections are made to 2040
  - Augmentation to GFPM for FSOS III modelling
    - Updated the Environmental Kuznets Curve (EKC) model for total forest area
      - ➢ Projection driven by income and demographic variables (rural pop. density and labor/forest area)
    - Estimated the EKC model for planted forest area
      - ➢ Projection driven by income and demographic variables (rural pop. density and labor/forest area)

UNECE Food and Agriculture Organization of the United Nations

GFPM Modeled Commodities



UNECE Food and Agriculture Organization of the United Nations

Projection Methods: Forest sector carbon

- Carbon stored in above-and below-ground live biomass
  - Based on Johnston et al. (in press)
  - Relates to the projected changes in forest stocks
  - Based on estimated ratio of forest stocks and carbon pool data reported in the 2015 Global Forest Resource Assessment Report

- Carbon stored in harvested wood products

  - Based on Johnston et al. (in press)
  - Relates to wood products produced, consumed, and traded
  - Based on 2006 IPCC Guidelines for National GHG Inventories
  - The "production approach" is used (i.e., imported wood excluded)

UNECE Food and Agriculture Organization of the United Nations

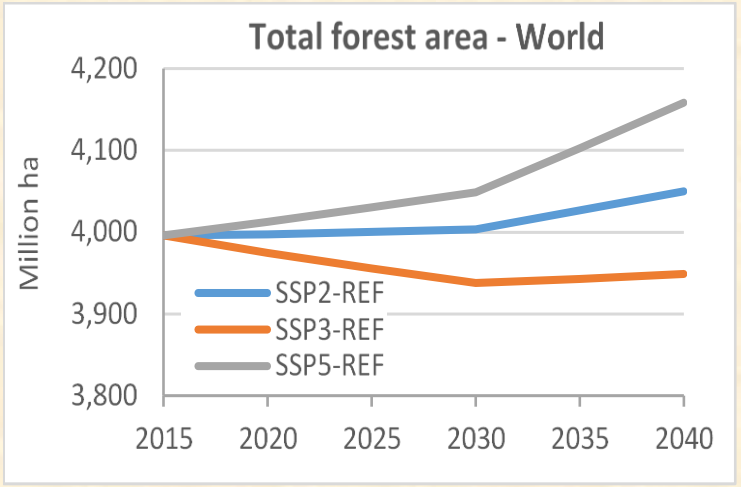
Preliminary Results: Reference Scenarios

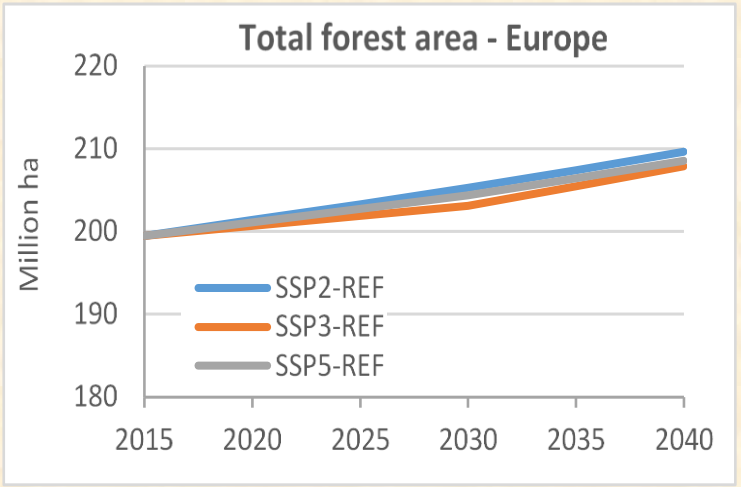
- Key outcomes

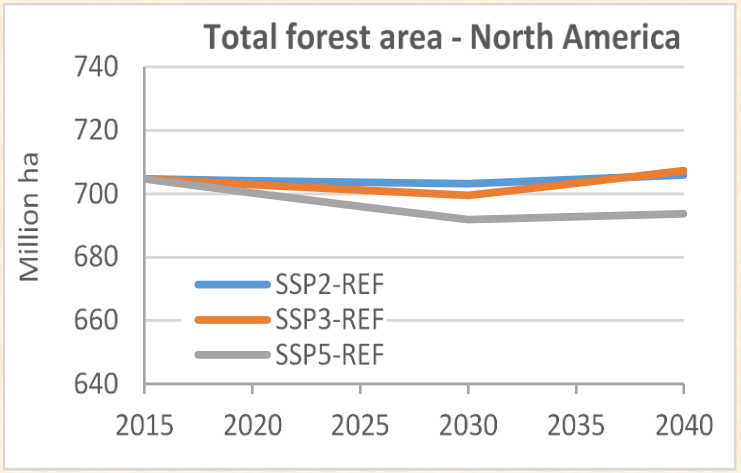
  - Comparing SSP2 and SSP5 against SSP3, we can conclude that wealthier and more equal worlds lead to:

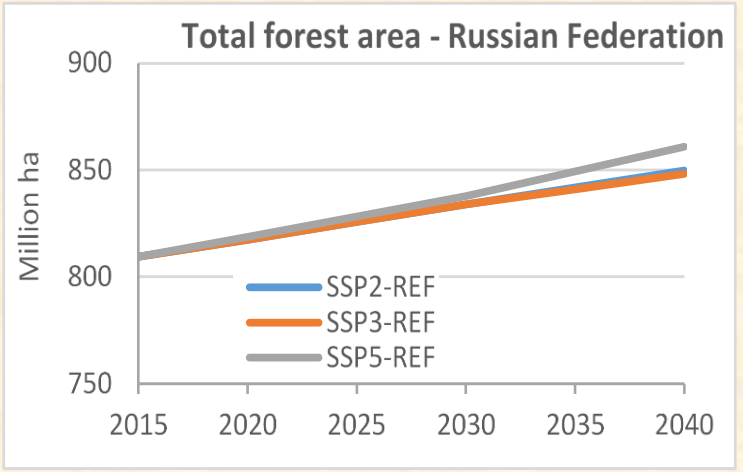
    - Higher planted forests
    - Higher forest products consumption
    - Higher forest product prices
    - Higher roundwood removals
    - Higher production and trade of manufactured wood products

Total Forest Area-Reference Scenarios





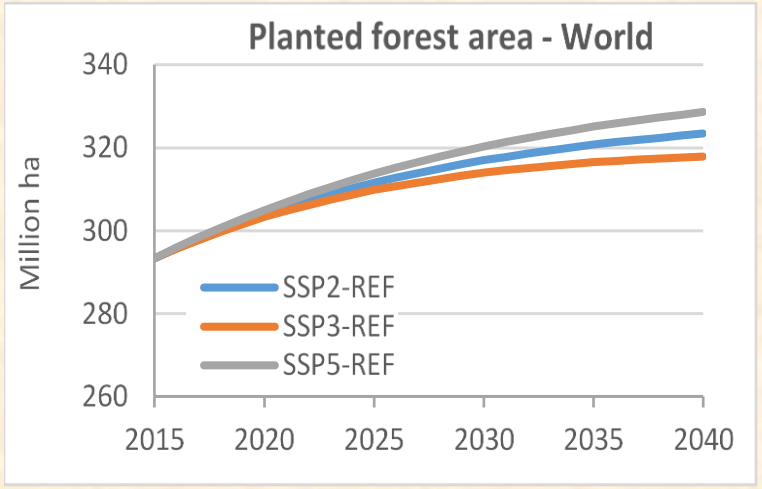


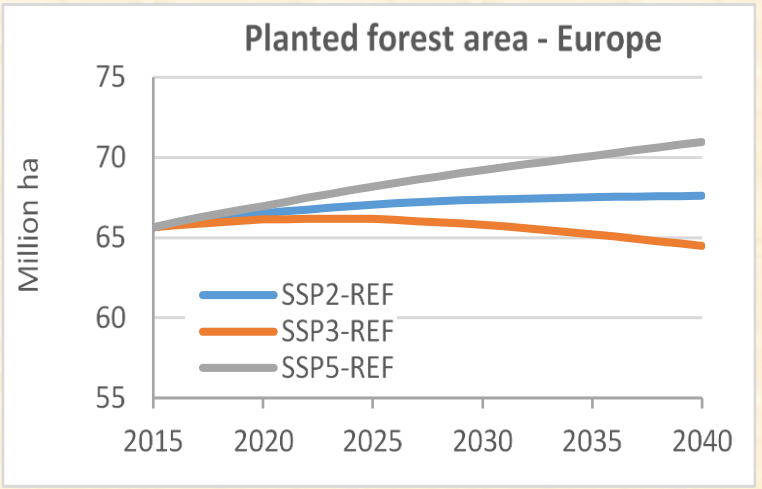


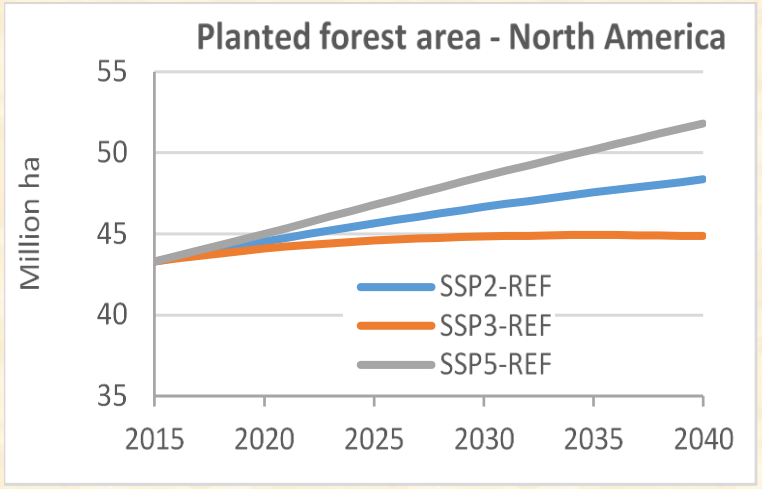
UNECE

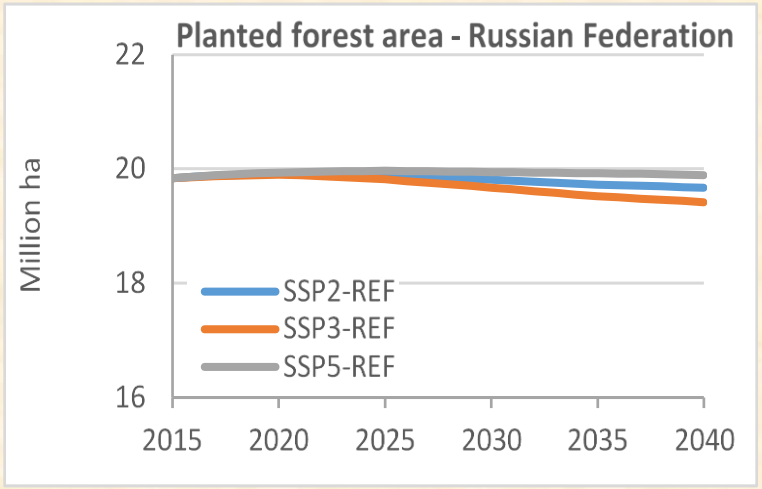
Food and Agriculture Organization of the United Nations

Planted Forest Area-Reference Scenarios





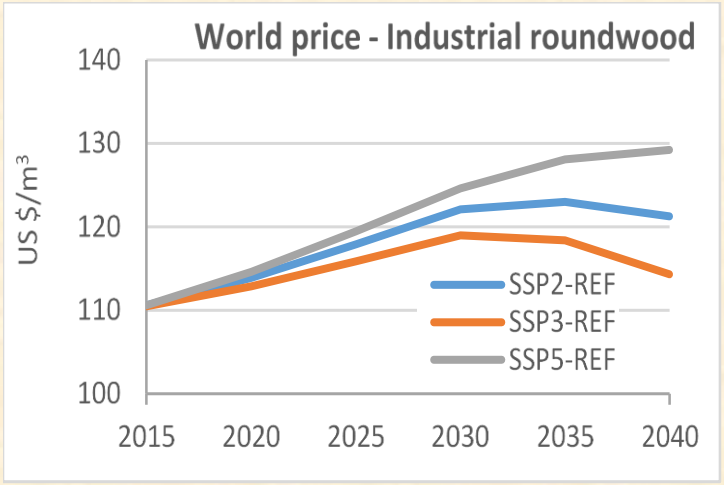


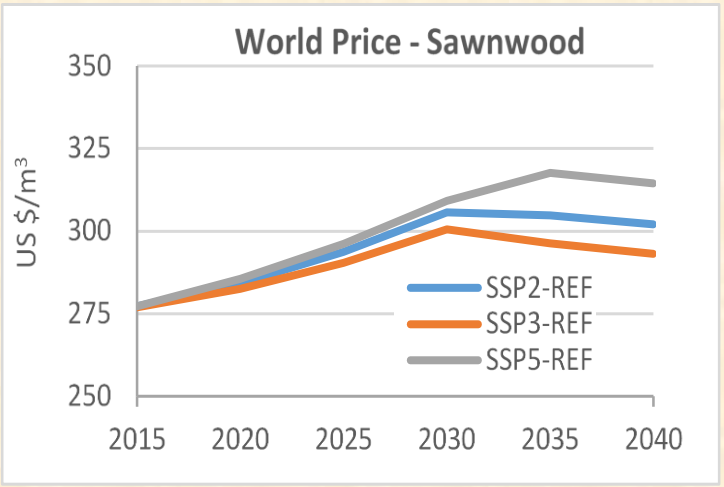


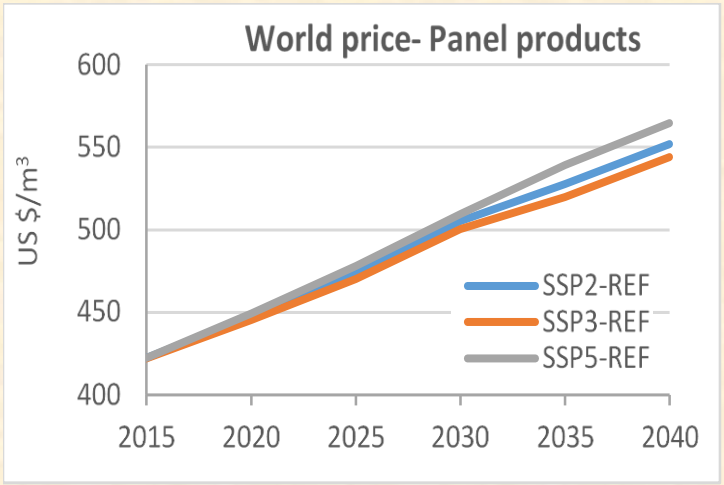
UNECE

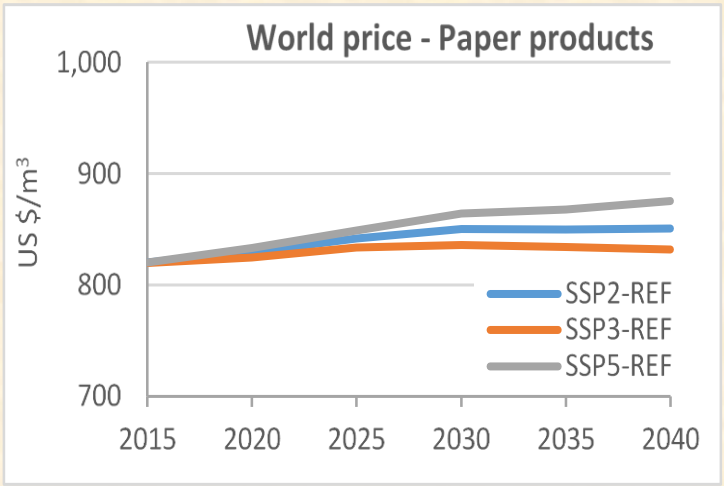
Food and Agriculture Organization of the United Nations

World Prices-Reference Scenarios





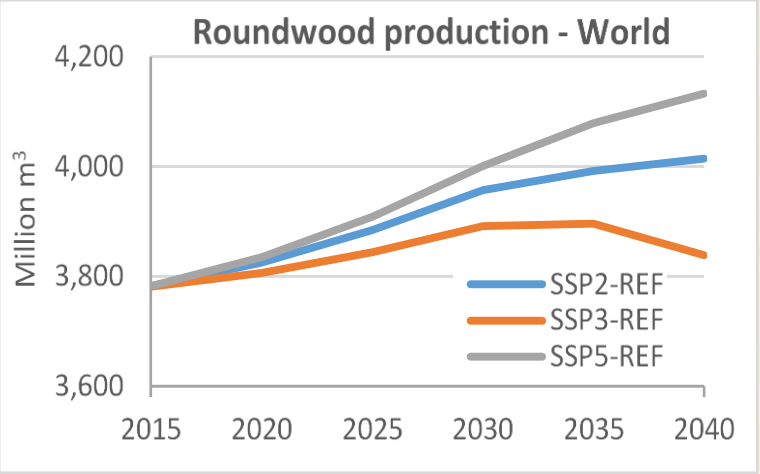


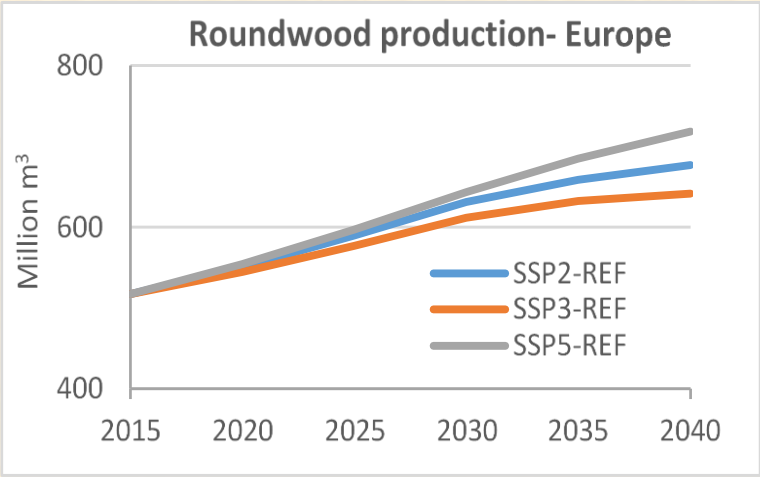


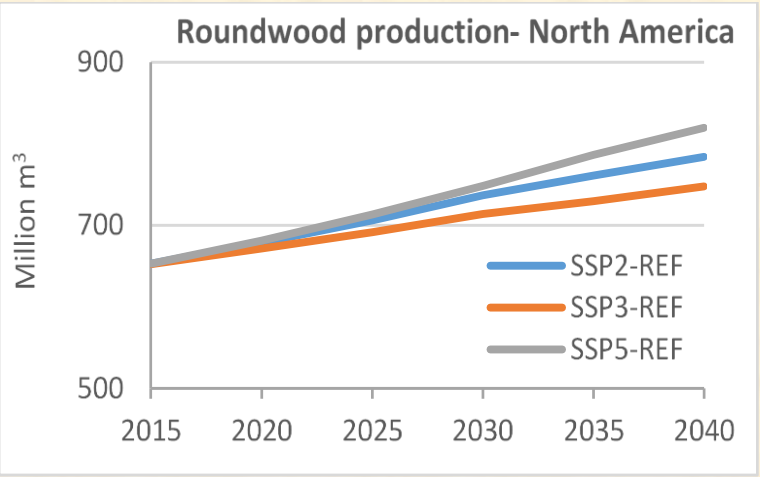
UNECE

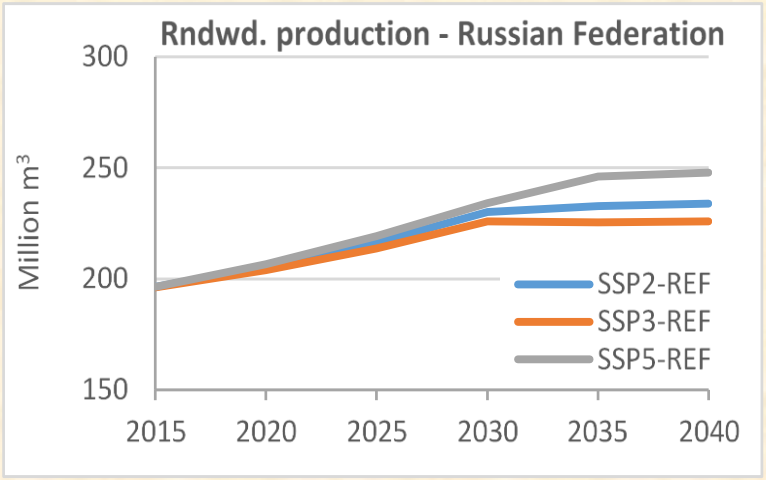
Food and Agriculture Organization of the United Nations

Roundwood Production-Reference Scenarios









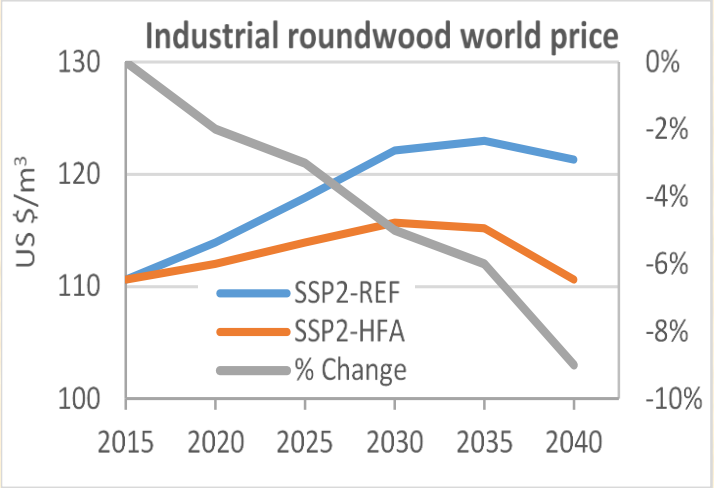
UNECE

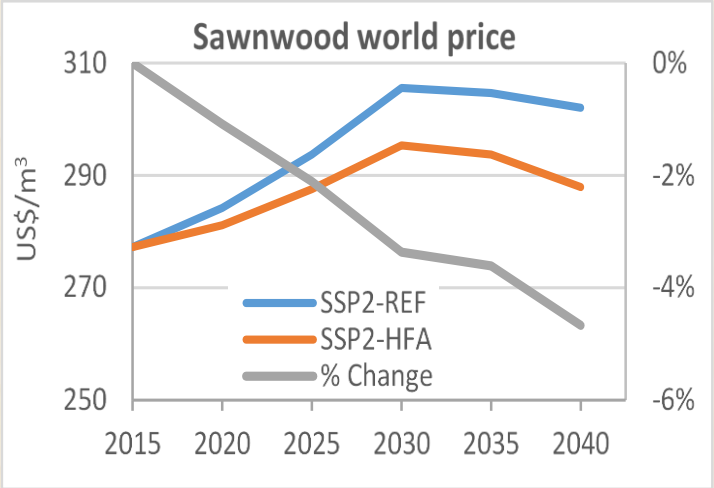
Food and Agriculture Organization of the United Nations

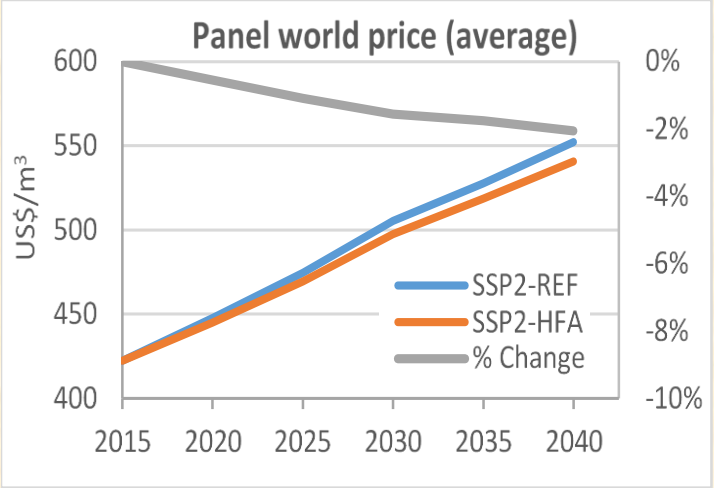
Results: High Forest Area Scenario

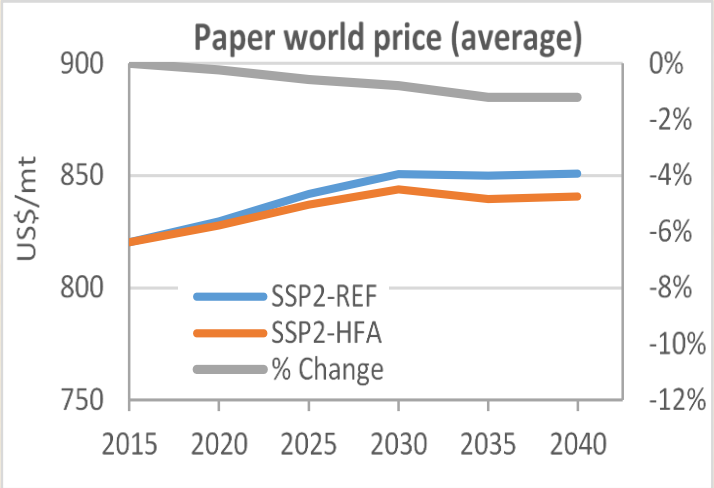
- Key outcomes (relative to SSP2 reference)
  - Increased forest stocks
  - Increased forest biomass carbon
  - Reduced product prices
  - Increased global forest products production
  - Production increased or decreased in individual countries/regions, depending on relative changes in comparative advantages in producing products
  - Increased carbon in wood products

World Prices: High Forest Area Scenario





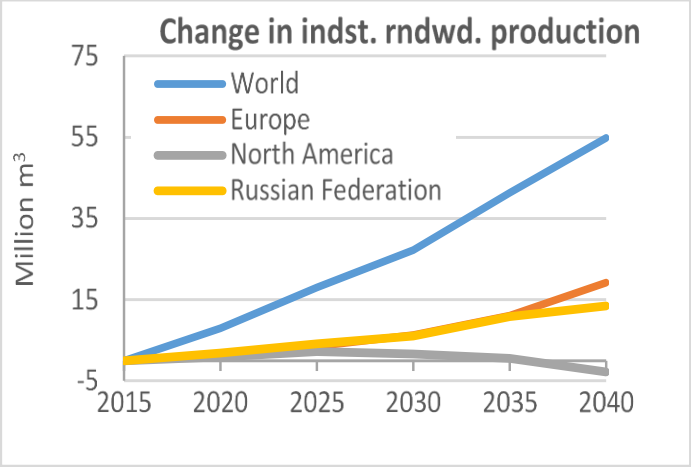


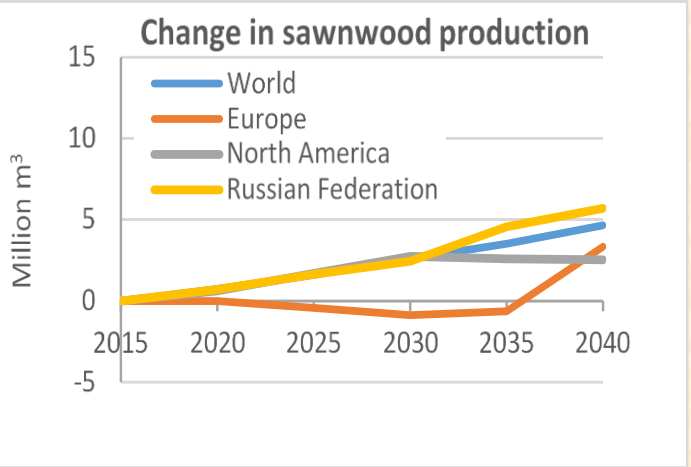


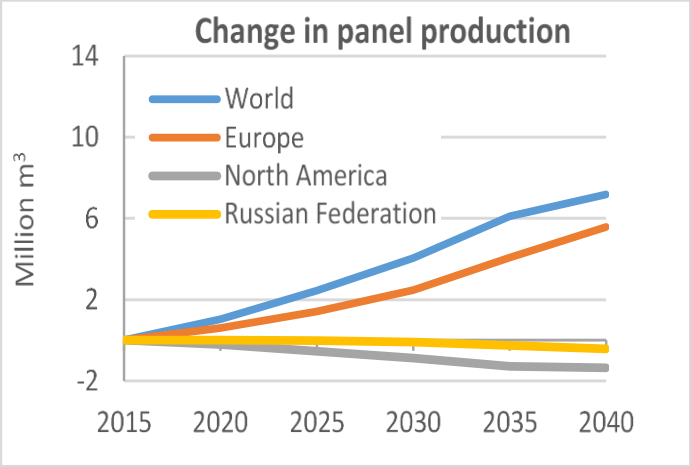
UNECE

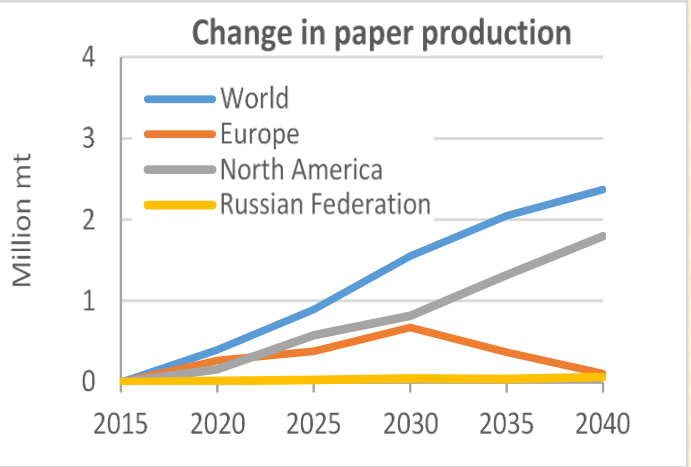
Food and Agriculture Organization of the United Nations

Production: High Forest Area Scenario









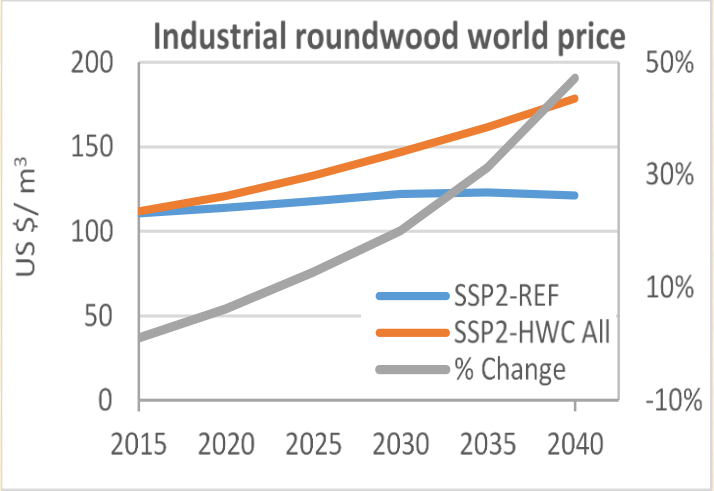
UNECE

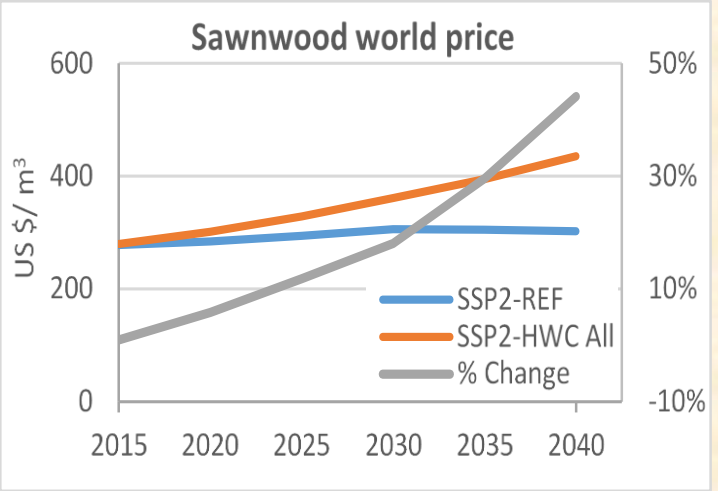
Food and Agriculture Organization of the United Nations

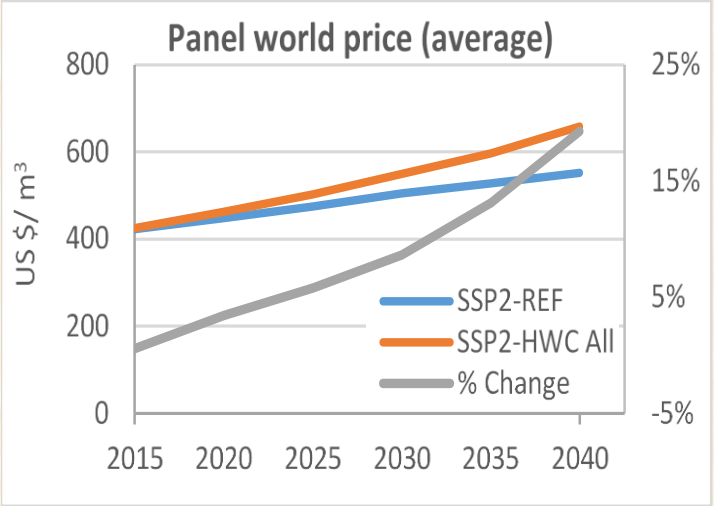
Results: High Wood Consumption in All Countries

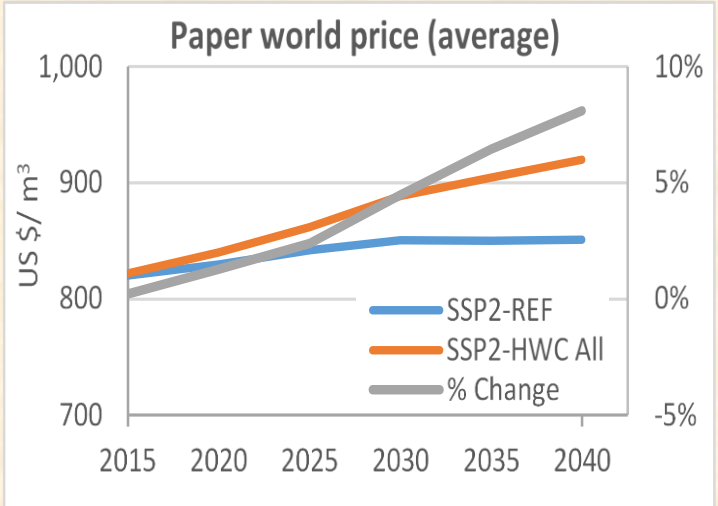
- Key outcomes (relative to SSP2 reference)
  - Reduced forest stocks
  - Reduced forest biomass carbon
  - Increased product prices
  - Increased global production and net exports, except for paper products
  - Increased carbon in wood products
    - But not enough to offset the loss in forest biomass carbon

World Prices: High Wood Consumption, All





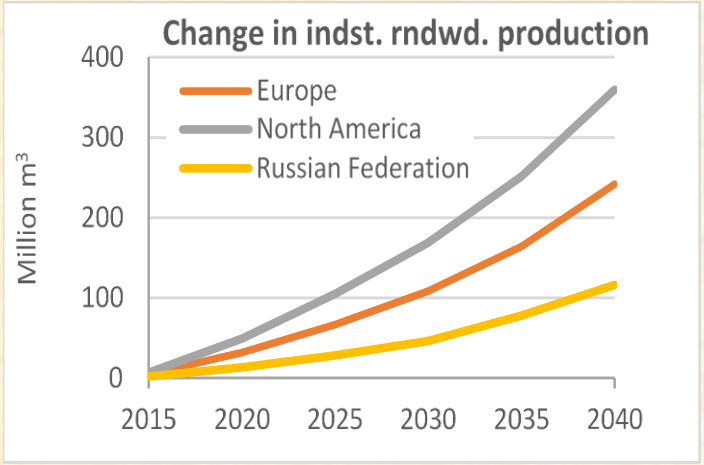


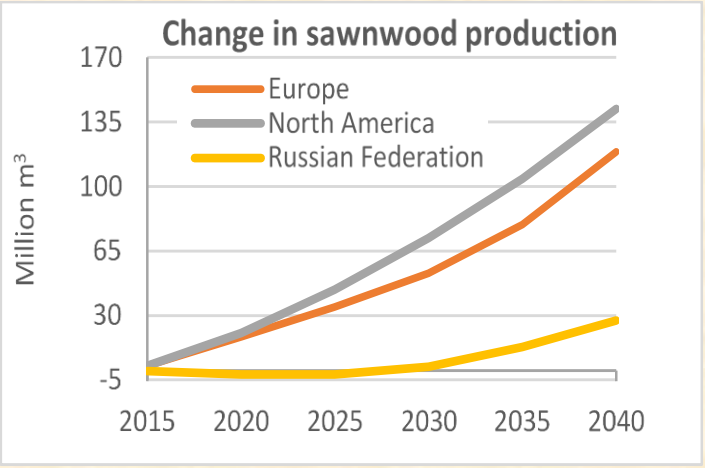


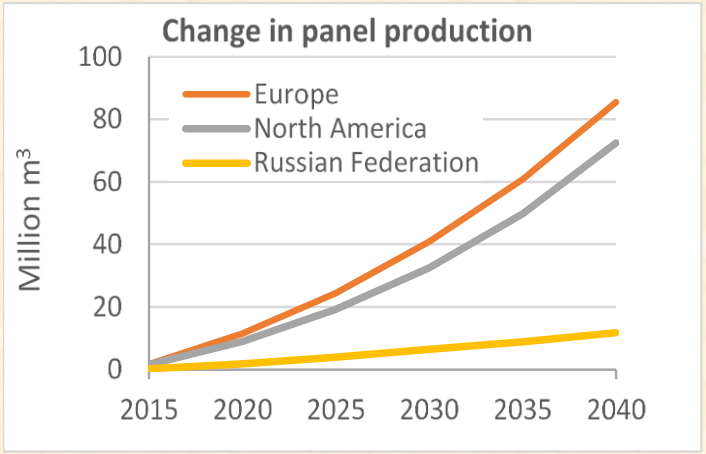
UNECE

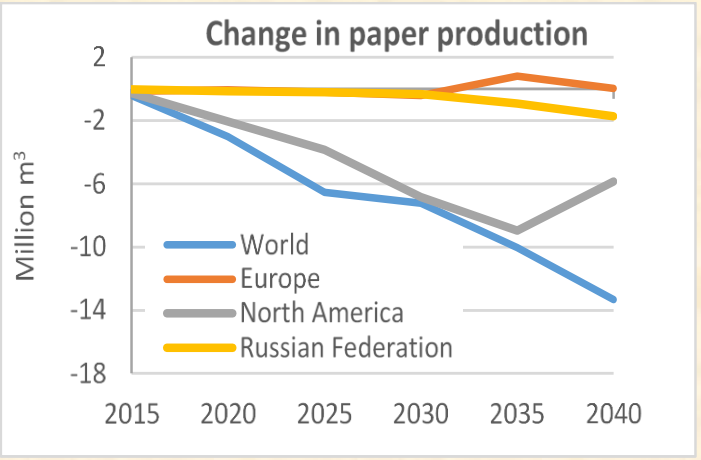
Food and Agriculture Organization of the United Nations

Production: High Wood Consumption, All





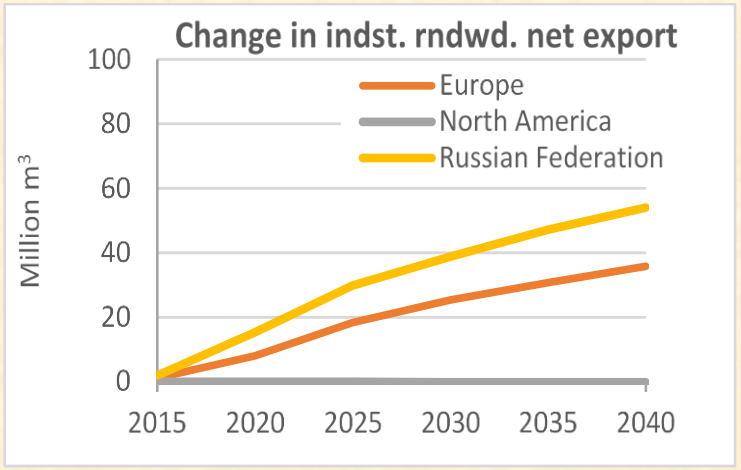


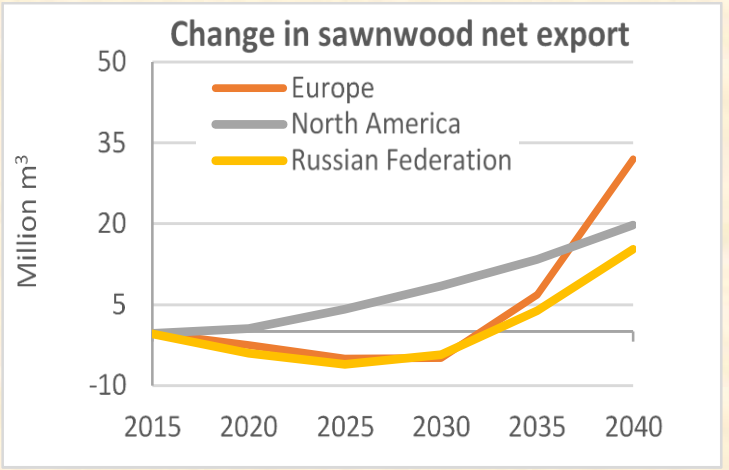


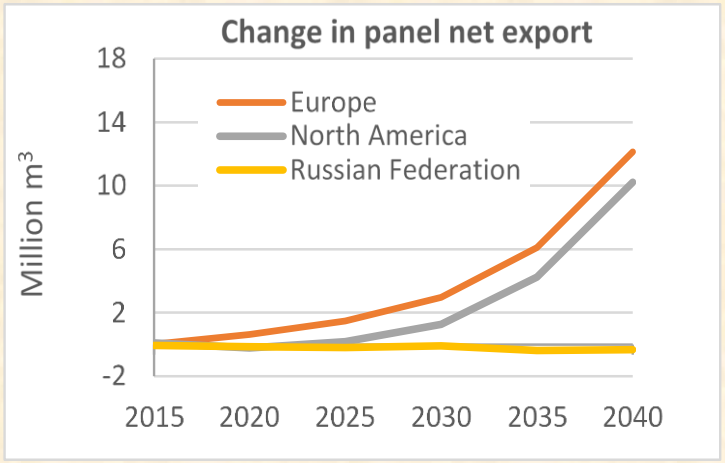
UNECE

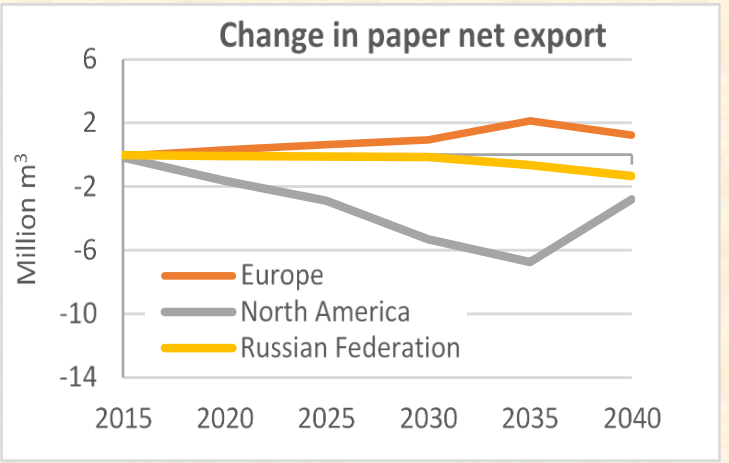
Food and Agriculture Organization of the United Nations

Net Export: High Wood Consumption, All









UNECE

Food and Agriculture Organization of the United Nations

Results: *HWC Select* and *HFA_HWC_All*

- High Wood Consumption in Selected Countries (*HWC Select*)
  - Projected effects were similar to the effects observed in the *HWC All* scenario, but of lesser magnitudes
    - Reduced forest stocks, reduced forest biomass carbon
    - Increased product prices
    - Increased global production, except for paper products
    - Increased carbon in wood products
    - Not enough to offset loss in forest biomass carbon

- High Forest Area+Wood Consumption in All Countries (*HFA_HWC_All*)
  - Projected effects were similar to the effects observed in the *HFA and HWC All* scenario, but of lesser magnitudes
    - Second highest C sequestration (after HFA)
    - Price decline smaller than in HFA
    - Production slightly greater than in HWC All

Conclusions

- An attempt to show how global forest sector modelling can provide the information needed to answer important policy questions
- Varying insights into the likely effects of future forest sector policy and market changes on forests and forest products sectors
- These effects are mainly related to projected changes in forest products prices, and by the associated impacts on
  - Wood removals, forest stocks
  - Production, consumption, and trade of solidwood and paper products in individual countries
- Projections suffer from inherent uncertainties
  - The projected trends and differences in outcomes between scenarios are still valid

UNECE Food and Agriculture Organization of the United Nations

Major comments/feedback

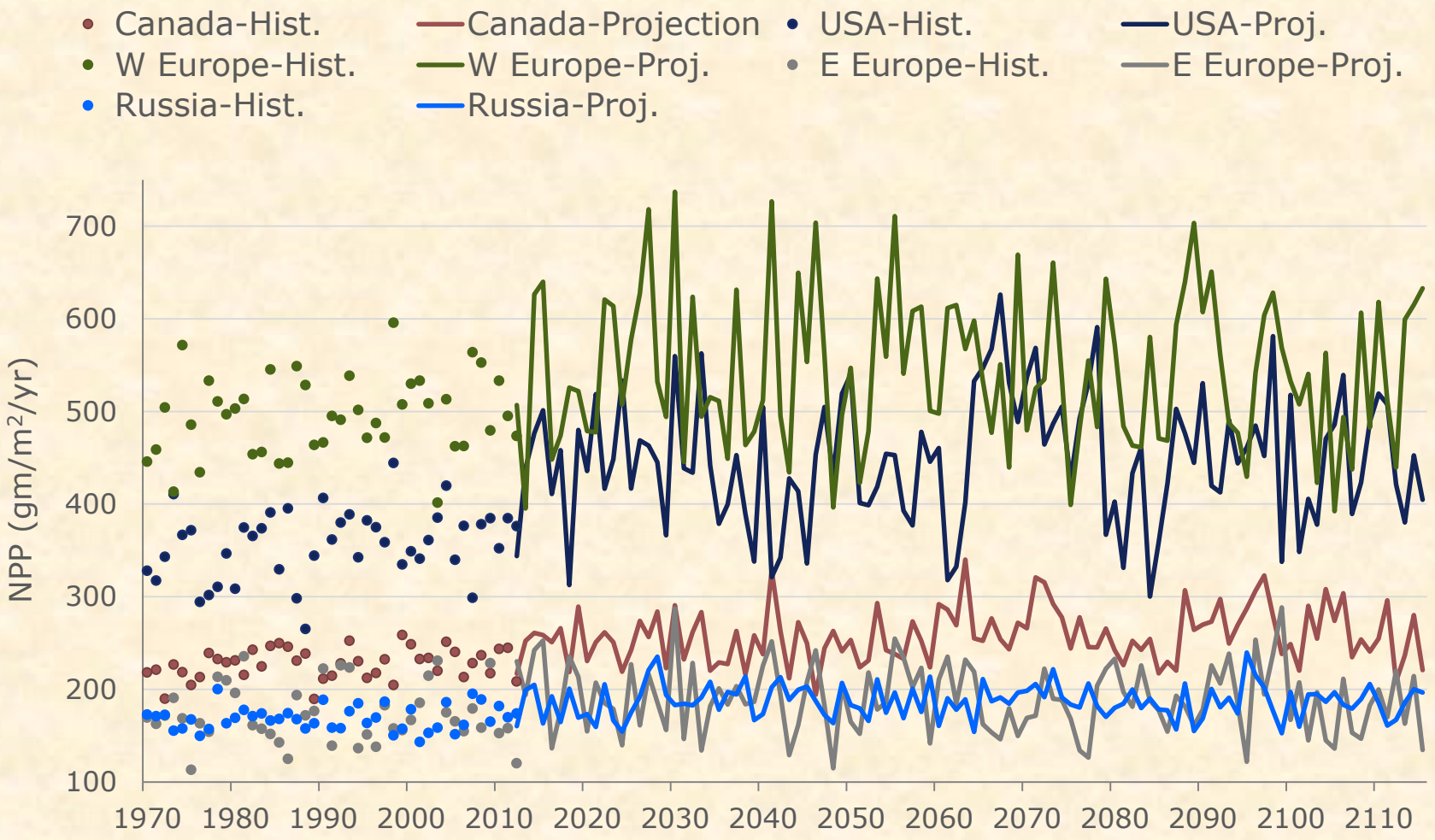
- GFPM's resource side is weak, do not rely on GFPM for detailed (e.g., age class, species) forest resources projections
  - New forest area is not available immediately for harvests
  - It's unlikely that forest in Europe will see increase in carbon flux in future (based on IIASA and EFI's representatives' view)
- Not all countries are likely to be able to have forest area increase
- What's the basis of a 100% increase in wood consumption?
- Wood substitution effect of Sathre and O'Connor is overestimate; use the latest study by Leskinen et al. (2018)
- It's important to model climate change effect on forest productivity
- Use one reference scenario (SSP2) and consider others as special scenarios
- Consider implementing decline of printing & writing paper but rising consumption of packaging paper

Further Action

- Collaborate with Dr. John Kim (USDA FS, Pacific Northwest Station) to obtain projected effects of climate change on forest productivity for GHG levels consistent with forcing at ~9.0 Wm^{-2} by the year 2100 (i.e., similar to RCP 8.5)
  - Global dynamic vegetation model (MC2)
  - Obtain projections for all GFPM countries
- Implement projected changes in forest growth in GFPM to evaluate the impacts on global forest products markets
  - Likely implement the climate-GHG related productivity shifts for only one SSP (e.g., SSP5)

UNECE Food and Agriculture Organization of the United Nations

Historical & Projected NPP: Policy 4.5 Scenario



UNECE

Food and Agriculture Organization of the United Nations

Thank you

Comments, questions?

Contact: Jeff Prestemon
jprestemon@fs.fed.us
919-549-4033

Contact: Prakash Nepal
pnepal@ncsu.edu
pnepal@fs.fed.us
919-549-4067

UNECE Food and Agriculture Organization of the United Nations

FSOS Events in Koli, Finland

15 Feb: ToS Meeting

Discussion on the final products of the FSOS with the following proposal:

1. **Technical FSOS methodology report**, which would describe in detail the assumptions, model and scenario set-up, which were used for the modelling of the FSOS scenarios.

2. **Web page for the FSOS results** which would contain all the results from the scenario modelling including for regions and individual countries.

3. **20-30 pages FSOS publication** directed to policy makers with interesting insights answering the main policy questions as decided by the Joint Working Party and deemed feasible by the Team of Specialists

FSOS Publication

Proposed content and structure

The UNECE sector in a changing world – potentials and challenges

1. **Short Introduction:** explaining major global trends
2. **Climate change chapter:** climate change mitigation and adaptation
3. **Structural changes chapter:** the effects of major economic changes and trends on the UNECE forest sector (with a focus on markets, prices etc.)

Climate change: policy questions

General aspect	Policy questions	Reference Scenario / Variables to compare	Possible alternative scenarios
Climate Change	What is the potential of UNECE forest sector for climate change mitigation? What can the UNECE forests contribute?	Carbon sequestration and avoided emissions in forests and wood products under a normal economic growth scenario = reference scenario (no change in forest land)	CC1: Potential of carbon sequestration in wood construction; assumption: significant increase in wood construction (UNECE and/or worldwide) CC2: Potential of carbon sequestration in traditional wood products; assumption: (policy-driven) significant increase in demand for wood products (UNECE and/or worldwide) CC3: Potential of carbon sequestration in new products based on wood fibres; assumption: technological advances that allow a significant increase of use of wood fibres CC4: Potential of carbon sequestration through (re-)forestation; assumption: policy-driven, significant increase of forests area in the UNECE region (e.g. Bonn challenge) CC5: Maximising carbon sequestration by changing silvicultural methods (update to the EFSOS II scenario "Maximising biomass carbon") CC6: Potential of climate change mitigation through substitution in the energy sector through an increased use of wood energy CC7: Combination of the above – what is the maximum that could be achieved given competing demands for wood products (possibly looking at Climate Smart Forestry)
	How will UNECE forests be affected by climate change? How will adaptation look like?	Supply of forest resources under current forest growth scenario (no further climate change)	CC7-CC10: Differences in supply of forest resources under the four representative concentration pathways (RCPs) from the IPCC 5th Assessment Report (possibly looking at resilience as well)

FSOS Publication

Climate change chapter

Policy question	Aspects covered	How?	"Stories"
What is the potential of the UNECE forest sector for climate change mitigation? What can the UNECE forests contribute?	Potential of carbon sequestration/substitution effects: • in different wood products (construction, traditional products, new products) • through (re-)forestation • through silvicultural methods • wood energy	• Modelling results • Literature review • Results from EFSOS II • Information boxes	• What if China starts building every second house with wood? • What if Europe adopts a similar per-capita use of wood in buildings as the US? • What if we replace 30% of the textile market with wood-based fibres? • What is the carbon sequestration potential in the Bonn Challenge?

FSOS Publication

Climate change chapter

Policy question	Aspects covered	How?	"Stories"
How will UNECE forests be affected by climate change? How will adaptation look like?	• Increase of natural disasters • Adaptation strategies • Forest resilience • Effects on forest productivity	• Literature review • Country case studies • Modelling results • Information boxes	

Structural changes: policy questions

General aspect	Policy questions	Reference Scenario / Variables to compare	Possible alternative scenarios
Structural Changes	How would different demand changes affect the UNECE forest product market?	Demand and prices for wood products under reference scenario	SC1: Massive increase of demand for wood constructions – within UNECE – and outside (especially China); closely linked to calculations for CC1 SC2: Significant increase of demand for wood-fibres for textiles and other products; closely linked to calculations for CC3 SC3: Significant economic collapse (whole world and/or specific countries/regions) SC4: Successful development of an alternative energy source and thus drastic decrease in demand for wood energy SC5: Significant decrease of demand for print and paper with simultaneous increase of demand for packaging SC6: Significant increase of biorefineries.
	How would different supply changes affect the UNECE forest product market?	Supply and prices for wood products under reference scenario	SC7: Significant increase of forest plantations outside of UNECE (e.g. Africa and/or Asia) SC8: Significant increase of natural disasters
	What would be the effect of massive restrictions to trade on the UNECE forest product market?	Supply, demand and prices under reference scenario	SC9: Trade between countries and/or regions is significantly restricted

FSOS Publication

Structural changes chapter

Policy question	Aspects covered	How?	"Stories"
How would different demand changes affect the UNECE forest product market?	Effects of • Significant demand increase for different wood products (construction, new products, biorefineries) • Economic disturbances • Significant decrease of demand for print and paper with simultaneous increase of demand for packaging	• Modelling results • Literature review	• What if China starts building every second house with wood? • What if Europe adopts a similar per-capita use of wood in buildings as the US? • What if we replace 30% of the textile market with wood-based fibres? • What would happen if we see an economic collapse

FSOS Publication

Structural changes chapter

Policy question	Aspects covered	How?	"Stories"
How would different supply changes affect the UNECE forest product market?	• Increase of forest plantations outside of UNECE (e.g. Africa) • Significant increase of natural disasters	• Modelling results • Literature review • Case studies	• What if Africa massively invests into forest plantations? • What if we see an massive increase of forest fires, insects etc.?

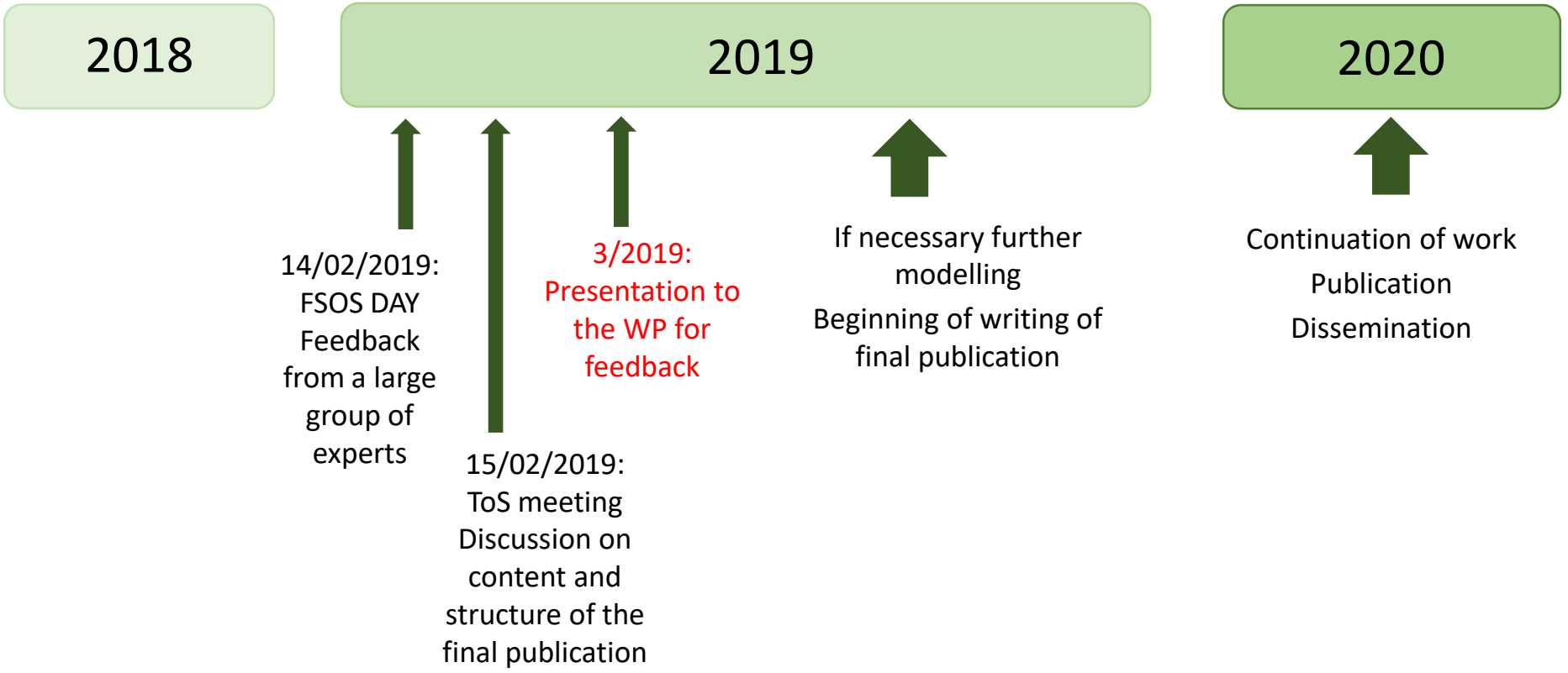
FSOS Publication

Structural changes chapter

Policy question	Aspects covered	How?	"Stories"
What would be the effect of massive restrictions to trade on the UNECE forest product market?	• Trade restrictions	• Literature review	

Process ahead

Rough roadmap for the next FSOS



Interactive group discussion

4 Questions (15min discussion time each)

1. What is your **assessment of the presented modelling results**?
2. Among the results, what do you think is **most important**, considering present and future policy choices?
3. What is your assessment of the **proposed outputs of the outlook study**, i.e. methodology report, web page with all the results and publication orientated at policy makers?
4. What kind of **research is undertaken in your country or organization** which could feed into the final publication, in particular regarding climate change adaptation?

Guidance from the Working Party

FORESTS

The Working Party is invited to:

a) Inform the secretariat about current or planned activities in member States regarding outlook studies;

b) Provide feedback to modelling results;

c) Discuss the proposed outputs of the Forest Sector Outlook Study;

d) Discuss possible inputs to the publication, in particular on climate change adaptation;

e) Provide guidance regarding structure and content of the final FSOS publication;

f) Consider supporting this Outlook Study through in-kind and financial contributions;

g) Inform the secretariat about capacity building needs;

h) Advise on future work of the Team of Specialists on Forest Sector Outlook, including the extension of its mandate.

UNECE

Food and Agriculture Organization of the United Nations

Thank you!

FORESTS

Lia Fain
UNECE/FAO Forestry and Timber Section
27-29 March 2019, Geneva

Jeff Prestemon
UNECE/FAO ToS on Forest Sector Outlook
27-29 March 2019, Geneva