

SP1 - Bioresources, Climate and Economics

Status and Workplan 2021

Francesco Cherubini (NTNU), Rasmus Astrup (NIBIO), Torjus Bolkesjø (NMBU)

SP1 long-term vision

Quantify the resource availability, **climate change mitigation** benefits and market potentials for a **large scale deployment of biofuels in Norway**.

The analysis will integrate resource supply, climate, and economic dimensions for **individual value chains and a larger Norwegian system level**

This long-term vision will be achieved through:

- Analysis of different bioresource utilization scenarios from forestry
- Environmental sustainability analysis of the most relevant value chains for biofuel production in Norway
- Developing a business model for market penetration and profitability of biofuels in Norway

WP structure in SP1

WP1.1 Bio-resource availability and management (Rasmus Astrup – NIBIO)



Map forest bioresources in Norway and physical attributes of forest structures under different management strategies

WP1.2 Climate and environmental assessment (Francesco Cherubini – NTNU)



Climate benefits of biofuels under the complex variety of climate agents associated with biofuel production

WP1.3 Policy and Economics (Torjus Bolkesjø – NMBU)



Understand the economic and policy conditions required for the development of a next generation bio(fuel)-economy in Norway



WP1.1 Bio-resource availability and management (Dr. Rasmus Astrup – NIBIO)

Annual Workplan 2021:

- Analyze the current future wood biomass resource availability at a regional scale in Norway and assess impacts on optimal localization of new forest based industry (jointly with WP 1.3.)
- Collaboration with Biozin on how to be design sustainable supply chains for Åmli plant

Deliverables:

- One scientific papers on the topics describes in the planned activities sections submitted
- Four meetings with user partners



WP1.2 Climate and environmental assessment (Francesco Cherubini – NTNU)

Annual Workplan 2021:

- Updated life-cycle inventory models for different feedstocks (national and international) and process simulations of novel technologies (inputs from other WPs and stakeholders)
- Integration of the value chain with advanced climate and environmental impact models to assess mitigation potentials and sustainability effects of biofuels in Norway
- Application to a relevant case-study for Norway: can biofuels still have a role for climate change mitigation in the road transport sector under high electrification trends?

Deliverables:

- One scientific article on biofuels role for climate change mitigation in road transport in Norway
- One scientific article on the improved assessment framework
- Webinar to present the highlights and main implications of a key novel publication from the WP
- Broader dissemination to general public and scientific community through participation to key workshops and conferences in the field (IEA Bioenergy)



WP1.3 Policy and Economics (Torjus Bolkesjø – NMBU)

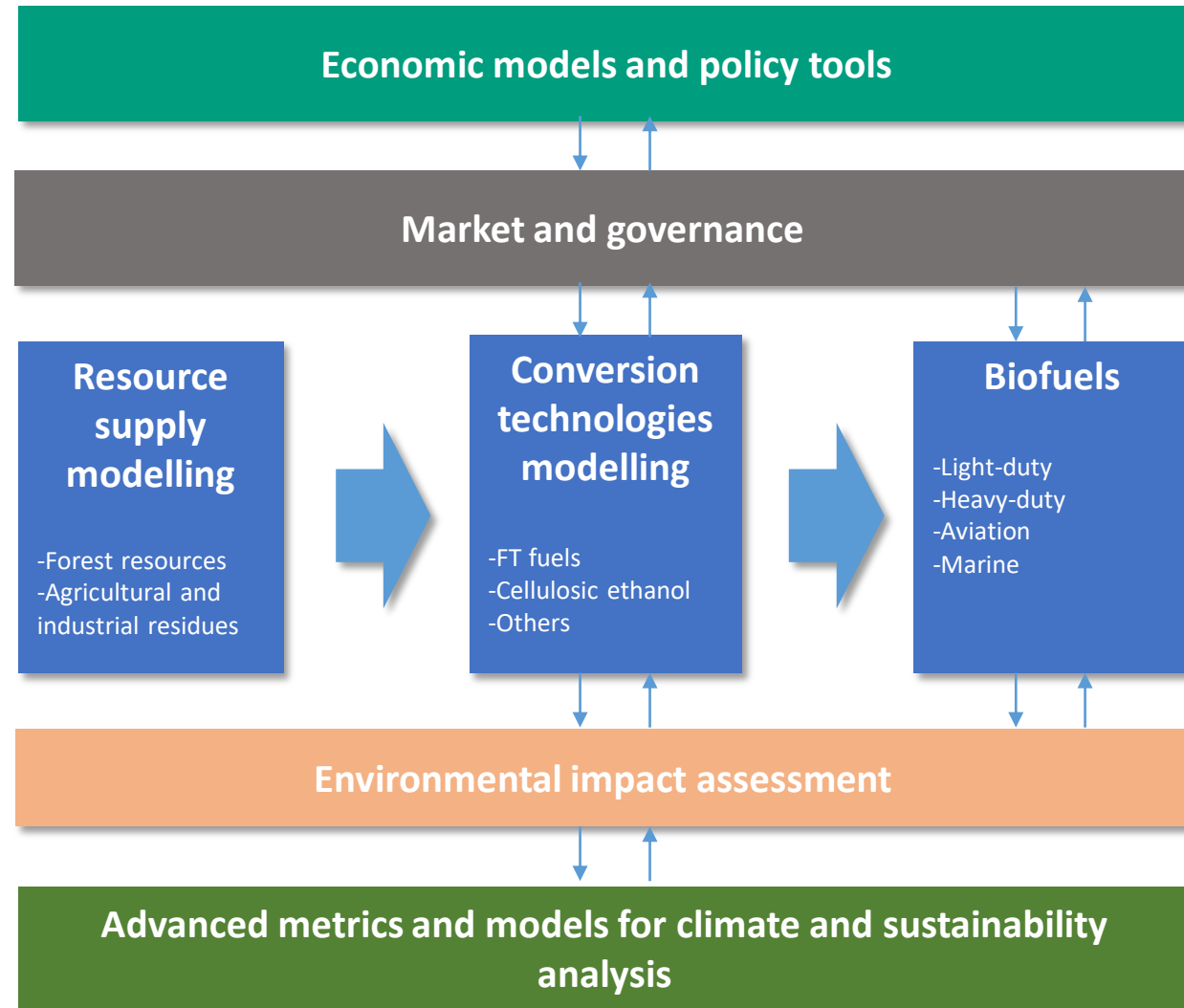
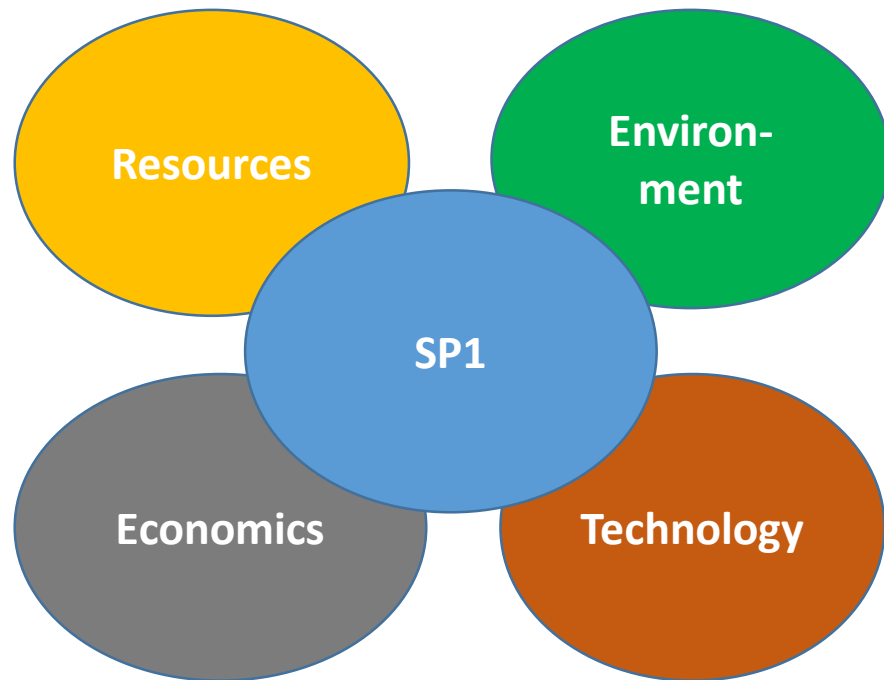
Annual Workplan 2021:

- Analyze the current future wood biomass resource availability at a regional scale in Norway and assess impacts on optimal localization of new forest based industry (jointly with WP 1.1.)
- Develop scenarios for transportation modes and technologies in Norway towards 2050 and based on these scenarios estimate substitution effects for biofuel use.
- Include techno-economic modelling of BECCS for large scale bioenergy installations as options in the economic analysis models.

Deliverables:

- Two scientific papers on the topics describes in the planned activities sections submitted
- Two presentations in national or international research seminars on the topics describes in the planned activities sections held
- Four meetings with user partners

SP1: Integrated modelling framework for assessment of biofuel deployment strategies in Norway



Key publications

WP1.2:

- Cavalett O. and F. Cherubini (2018) Contribution of jet fuel from forest residues to multiple Sustainable Development Goals, *Nature Sustainability* 1: 799–807.
- Cavalett, O., S. Norem Slettmo and F. Cherubini (2018). Energy and Environmental Aspects of Using Eucalyptus from Brazil for Energy and Transportation Services in Europe. *Sustainability* 10(11): 4068.
- Huang B., X. Hu, G.A. Fuglstad, X. Zhou, W. Zhao, F. Cherubini (2020) Predominant regional biophysical cooling from recent land cover changes in Europe, *Nature Communications*, 11: 1066.

• WP1.3:

- Jåstad, Eirik Ogner; Bolkesjø, Torjus Folsland; Trømborg, Erik; Rørstad, Per Kr.. Large-scale forest-based biofuel production in the Nordic forest sector: Effects on the economics of forestry and forest industries. *Energy Conversion and Management* 2019 ;Volum 184. s. 374-388
- Jåstad, Eirik Ogner; Bolkesjø, Torjus Folsland; Trømborg, Erik; Rørstad, Per Kristian. The role of woody biomass for reduction of fossil GHG emissions in the future North European energy sector. *Applied Energy* 2020 ;Volum 274
- Jåstad, Eirik Ogner; Bolkesjø, Torjus Folsland; Trømborg, Erik; Rørstad, Per Kr.. Integration of forest and energy sector models – New insights in the bioenergy markets. *Energy Conversion and Management* 2021 Volume 227

Spin-off and associated projects (11)

- WP1.1:

- PLATON – a PLATform for Open and Nationally Accessible Climate Policy Knowledge. NFR

- WP1.2:

- Novel high-performance polymers from lignocellulosic feedstocks (GreenPolymers) – EEA
 - Life cycle effects from removing hazardous substances in sludge and plastic through thermal treatment (SLUDGEFFECT) – NFR
 - Biofuels in deep sea shipping for climate change mitigation (Bio4-7Seas) – NFR
 - Advancing biofuel pathways with regional climate change implications (BIOPATH) – NFR
 - Bioenergy's role in a sustainable future: An assessment of environment, technology, supply chains and uncertainty (BEST) – NFR
 - Accelerating Carbon Capture using Oxyfuel Technology in Cement Production (AC2OCem) – ACT

- WP1.3:

- Enable – Enabling the Green transition in Norway - NFR
 - NorENS – Developing the Norwegian energy system in the European energy transition– NFR
 - Nordic Clean energy Scearios 2020 – Nordic Energy Research
 - BalticBiomass4Value - Interreg

Innovations

- WP1.1:
 - New model for assessing the potential biomass supply from thinning forest stands
- WP1.2:
 - New method for assessing biofuel deployment in terms of contributions to achieve SDGs (synergies and trade-offs)
- WP1.3:
 - Coupling of economic models for the energy and forest sector enabling an analysis of the competition and synergies in the forest-based sector value chains

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Task 45 is a new task under IEA Bioenergy with its first triennium of activities during 2019-2021. The objective of Task 45 is to identify and address critical issues related to the climate and other sustainability effects of bioenergy and biobased products and systems. The aim is to promote sound development for bioenergy as an integral component of the overall bioeconomy. This objective will be achieved by providing analyses that support well-informed decisions by land owners, communities, businesses, governments and others. A key goal is to increase understanding of the environmental, social and economic impacts of producing and using biomass for bioenergy, within the broader bioeconomy. A central aspect concerns the development and application of science-based methodologies and tools for assessing the effects of biobased systems.



The use of forest biomass for climate change mitigation: dispelling some misconceptions

IEA Bioenergy, August 2020

Recent articles and statements in the media¹ and ² raise concerns over the climate effects of using forest biomass for bioenergy. As some statements seem to reflect misconceptions about forest bioenergy, IEA Bioenergy here provides a brief overview of key facts about the use of forest biomass for climate change mitigation.

Main interactions with stakeholders and value chains

- Potentially with all value chains as SP1 deal with resources, sustainability, climate, and economics
- Process inventory, mass and energy balance, and emissions of the most promising value chains (through SP5)
- Interactions with stakeholders are key to customize research outputs to the main relevant value chain
- Value chains: potentially open to all, but research/industry partners shall
 - Identify a limited set of specific novel conversion technologies that emerge as prominent from Bio4Fuels
 - Prioritize one value chain (feedstock/conversion technology/biofuel application) over the others

SWOT Analysis – Bio4Fuels

STRENGTHS	WEAKNESS
<ul style="list-style-type: none"> • Competence/ teams/researchers • Cooperation <ul style="list-style-type: none"> • Internal • International • Networking <ul style="list-style-type: none"> • EU • Bio4Fuels days • Research/infrastructure <ul style="list-style-type: none"> • Relevance • Quality • Industry/commercialization <ul style="list-style-type: none"> • Commercial and Public partners • Links to investments i Norway • Economy/strategy/support 	<ul style="list-style-type: none"> • Communication <ul style="list-style-type: none"> • Internal • External • Focus of Research Activities <ul style="list-style-type: none"> • Too broad Scope • Greater focus • Interaction with Industry <ul style="list-style-type: none"> • Not enough • More active engagement • Organisation <ul style="list-style-type: none"> • Too large • Potential for more interactions between WPs
OPPORTUNITIES	THREATS
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SWOT Analysis – Relevance for SP1

STRENGTHS	WEAKNESS
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**Thank you for your
attention**