



**ETIP** *Bioenergy*

European Technology and Innovation Platform



**THE IMPORTANCE OF  
BIOENERGY IN ACHIEVING  
THE EUROPEAN ENERGY  
TRANSITION**

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## Prepared by



Working Group 1 Biomass Availability and supply

## Layout by

**etaflorencia** \* **renewableenergies**

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# INTRODUCTION

The EU aims to be climate-neutral by 2050 – meaning an economy with net-zero greenhouse gas emissions. This objective is at the heart of the European Green Deal and in line with the EU's commitment to global climate action under the Paris Agreement. ETIP Bioenergy believes that sustainable bioenergy has a key role to play in reducing GHG emissions in the EU energy mix, while at the same time decreasing fossil fuel dependence. The promotion of bioenergy in the EU should be based on sound sustainability criteria, including the requirement to reduce GHG emissions significantly.

Biomass is an essential renewable energy source and is a key factor in reaching the current European climate targets set for 2020 and towards 2030, in which year 32% of the energy consumption within the EU is foreseen to originate from renewable energy sources. The EU Member States follow distinctive paths to meet these obligations, which are defined in national action plans referenced to the respective energy markets and available resources<sup>1</sup>. In 2018, the amount of renewable energy utilised within the EU amounted to 18.9% of total gross energy consumption<sup>2</sup>. With a share of almost 60% of all renewable energy, biomass constitutes the main renewable energy source within the EU<sup>3</sup>.

As part of the European Green Deal, the European Commission emphasised in the EU Strategy for Energy System Integration, which was presented on 8 July 2020, that biofuels will have an important role in transport subsectors where electrification is not feasible and which are thus difficult to decarbonise by other means, such as aviation, maritime or heavy-duty transportation. Renewable fuels, and especially biofuels, are key to reducing the carbon footprint in transport segments that will continue to rely on internal combustion engines and are complementary to new mobility modes that are expected to make a significant market impact. An integrated biobased technology development strategy (paired with exploiting synergies in combining biomass – BtX and electricity/power – PtX based technologies) will encourage processes of reaching energy targets on time, on track.

# 1. Key opportunities of bioenergy

## **BROAD SPECTRUM OF BIOMASS FEEDSTOCKS**

Europe offers a diverse portfolio of feedstocks that are produced as primary or secondary products from agriculture, forestry and waste sectors. While uncertainties remain on EU-domestic potentials, the common picture is that the Union has sufficient biomass at its disposal to reach its 2030 targets<sup>4</sup>.

## **CROP YIELD AND QUALITY TRAIT IMPROVEMENTS**

Both conventional and dedicated non-food crops will have significant yield and quality trait improvements during the next decades. This, in many cases, will enable them to have reduced iLUC and GHG emission implications on a value chain perspective, to adapt to marginal land conditions (drought, wetness, low fertility, etc.) while also producing more biomass per unit of land. In the discussion concerning the climate protection effects of biofuels, it often remains unnoticed that biofuels from biomass are co-products. Biofuel production is an integral part of the food and feed value chain in European agriculture.

## **IMPROVED SUSTAINABILITY PRACTICES**

For bioenergy applications, concrete sustainability criteria with strict principles have already been established and can set an example also for the food and feed sector. Sustainability criteria and independent third-party certification measures are essential to ensure a sustainable production and development of bioenergy carriers and a successful market roll-out. Policy makers and investors need assurance that environmental, social and economic risks, are addressed in order to support the development of a credible and accepted bioenergy supply.

## **RURAL DEVELOPMENT**

Using biomass feedstocks for bioenergy and biobased materials creates opportunities to strengthen rural areas and to establish new possibilities by maintaining jobs, value creation, community activities (e.g. bioenergy villages) and thus improving the overall economic and social participation and better quality of life for people (see also EU projects like [greenGain](#), [uP\\_running](#) or [BioVill](#))<sup>4</sup>.



*Credit: pixabay/ybernardi*

## 2. Role of bioenergy in the future

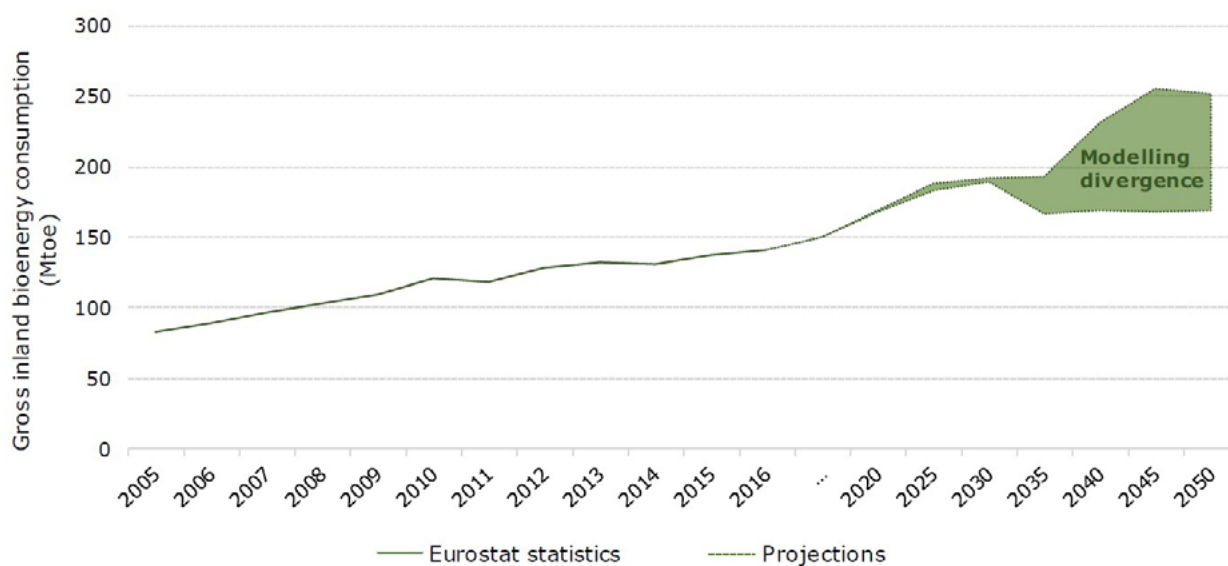
Bioenergy is key to achieving EU targets in terms of renewable energy by 2030 and beyond. According to the mitigation scenario of the European Commission, the gross inland bioenergy consumption by 2050 will amount to between 170-252 Mtoe<sup>5</sup>. Opportunities to increase the utilisation of bioenergy are seen e.g. in fields using agricultural residues, by-products and waste. Active mobilization of these feedstocks can significantly reduce the overall costs of biobased options and of meeting over climate targets<sup>6</sup>.

Also, further development of advanced lignocellulose-based fuel technologies is essential to meet biofuel ambitions, and development of integrated biorefinery systems is generally important<sup>6</sup>. The use of biogenic waste materials and the recycling of biobased products are essential components of a circular economy, and are therefore of great importance for a sustainable bioeconomy.

Bioenergy can also play a significant role as a flexible energetic carrier that balances power and heat systems, and thus, allowing for higher shares of renewable energy sources as wind and solar power. Hybridisation projects linking biofuels and renewable hydrogen production will play an important role<sup>7</sup>.

To reach the deployment of advanced biofuels and other renewable fuels, an integrated approach of strong policy measures, research, innovation and improved financing solutions, is necessary. The future focus should therefore not only consider e-mobility and electricity in terms of the transport sector. The combustion engine will be part of the energy transition and consequently, sustainable biofuels as well. Renewable fuels and especially biofuels can contribute in the short-term to reduce the carbon footprint in transport segments that will continue to rely on internal combustion engines, and are complementary to new mobility modes that are expected to make a significant market impact.

In addition to the current focus on electric and hydrogen vehicles, advanced drop-in type biofuels offer a “fast track” type option for decarbonising the transport sector. Aspects like the change out rate of the vehicle fleet, the need for new infrastructure, GHG emissions from power generation, and possible scarcity of some key materials for battery production as much as the uncertainty regarding the availability and cost of renewable electricity in the future, emphasise the continuing need for advanced biofuels in the transport sector within the next decade. A more constructive approach forward would be to identify and pursue the synergies between electro-mobility, hydrogen and biofuels.



Gross inland bioenergy consumption during the period 2005-2016 and projections until 2050 based on mitigation scenarios. Sources: Eurostat 2018 and EC DG JRC

### 3. Challenges

A sustainable utilisation of bioenergy requires that the overall life cycle of GHG emissions are well below those of fossil fuels. Therefore, aspects like the cultivation of biomass, transport, processing or potential changes of the carbon stocks need to be taken into account. The removal of biomass for energetic purposes might have impacts on biodiversity through the land use itself (e.g. management of forests or agricultural land) or by land use changes (e.g. deforestation). Wherever possible, the competition of certain types of biomass utilised to generate energy with other customers (e.g. pulp and paper or wood panel industries) should be avoided<sup>8</sup>.

Climate change poses challenges to European forestry and the biomass sector as a whole. In Southern Europe, droughts will be more common, reducing growth and increasing risk for fires.

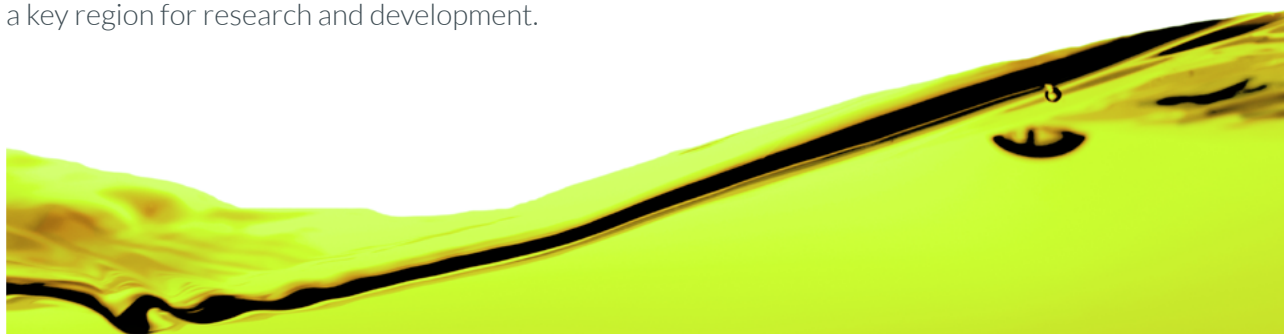
In Northern Europe, the increased temperatures will increase growth, however the risk of natural damages will increase causing conditions for logging and transport to deteriorate<sup>9</sup>.

ETIP Bioenergy published a Strategic Research and Innovation Agenda update in 2018<sup>10</sup>. It addresses legislation trends as well as the most current challenges in the field of bioenergy, such as the availability and sustainability of feedstocks, the acceleration of novel feedstocks, advanced conversion technologies and emerging markets (e.g. aviation, shipping). The document complements the Strategic Research and Innovation Agendas (SRIA) from other organisations on the same or related topics, such as the Biomass Panel of the European Energy Research Alliance (EERA).

### 4. Promotion of research, development and commercialisation

An adequate R&I policy is needed, which supports clear and ambitious targets, enables policy harmonisation backed by scientific evidence, and takes into consideration the time frame given by the Paris Climate Agreement. This policy also needs to assist in locating sustainable solutions to enlarge the resource base needed to provide sufficient volumes and a framework for concerted R&I efforts, including workable financing solutions. Even if the first production facilities for advanced biofuels are already running successfully, further process improvement cycles will be necessary to improve yields and achieve cost reductions. At the same time, research and development will continue to be essential to facilitate new technology developments. Public funding will have to support these activities to strengthen the role of Europe as a key region for research and development.

Consequently, R&D&D should be accelerated and prioritised to ensure that advanced biofuels can be used at the industrial level, and within the tight time constraints (i.e. before 2030). The SET-Plan Action 8 “Renewable Fuels and Bioenergy” Implementation Plan provides an excellent starting point<sup>11</sup>. It is important to note that the deployment of biofuels can only be pursued if the research within the different areas and aspects of biofuels is linked, and collaborated actions are implemented. Technology and market development need to go hand in hand. Future research funding should consider the global benefit offered by biofuels, but also local resources, environments and infrastructures, as well as a fully harmonised approach.



## NOTES

1. National energy and climate plans ([https://ec.europa.eu/energy/topics/energy-strategy/national-energy-climate-plans\\_en#:~:text=%20National%20energy%20and%20climate%20plans%20%28NECPs%29%20,national%20energy%20and...%204%20Documents.%20%20More%20](https://ec.europa.eu/energy/topics/energy-strategy/national-energy-climate-plans_en#:~:text=%20National%20energy%20and%20climate%20plans%20%28NECPs%29%20,national%20energy%20and...%204%20Documents.%20%20More%20))
2. Eurostat, 2020: Renewable energy statistics ([https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Renewable\\_energy\\_statistics#Consumption\\_of\\_renewable\\_energy\\_almost\\_doubled\\_between\\_2004\\_and\\_2018](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Renewable_energy_statistics#Consumption_of_renewable_energy_almost_doubled_between_2004_and_2018))
3. Calderón et al., 2019: Report Bioenergy Landscape (<https://bioenergyeurope.org/article.html/215>)
4. Panoutsou et al., 2019: Biomass supply and cost supply assessments. In: Opportunities and challenges for broadening biomass feedstock in Europe (<http://www.etipbioenergy.eu/images/ETIP-Bioenergy---Opportunities-and-Challenges-for-Broadening-Biomass-Feedstock-in-Europe.pdf>)
5. European Commission's Knowledge Centre for Bioeconomy, 2019: Brief on biomass for energy in the European Union ([https://publications.jrc.ec.europa.eu/repository/bitstream/JRC109354/biomass\\_4\\_energy\\_brief\\_online\\_1.pdf](https://publications.jrc.ec.europa.eu/repository/bitstream/JRC109354/biomass_4_energy_brief_online_1.pdf))
6. Londo et al. 2018: Lignocellulosic biomass for chemicals and energy: an integrated assessment of future EU market sizes, feedstock availability impacts, synergy and competition effects, and path dependencies (<https://onlinelibrary.wiley.com/doi/abs/10.1002/bbb.1926>)
7. Powering a climate neutral economy: An EU Strategy for Energy System Integration ([https://ec.europa.eu/energy/sites/ener/files/energy\\_system\\_integration\\_strategy\\_.pdf](https://ec.europa.eu/energy/sites/ener/files/energy_system_integration_strategy_.pdf))
8. Bogaert et al., 2017: Sustainable and optimal use of biomass for energy in the EU beyond 2020 ([https://ec.europa.eu/energy/sites/ener/files/documents/biosustain\\_report\\_final.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/biosustain_report_final.pdf))
9. Anttila et al. 2019: Improving practices for forest biomass supply and logistics. In: Opportunities and challenges for broadening biomass feedstock in Europe (<http://www.etipbioenergy.eu/images/ETIP-Bioenergy---Opportunities-and-Challenges-for-Broadening-Biomass-Feedstock-in-Europe.pdf>)
10. ETIP Bioenergy – Strategic Research and Innovation Agenda 2018 (<https://etipbioenergy.eu/about-ebtp/the-role-of-etip-bioenergy/strategic-research-innovation-agenda-sria>)
11. SET Plan Implementation Plan, Action 8: Bioenergy and Renewable Fuels for Sustainable Transport ([https://setis.ec.europa.eu/system/files/setplan\\_bioenergy\\_implementationplan.pdf](https://setis.ec.europa.eu/system/files/setplan_bioenergy_implementationplan.pdf))

### Background

The European Technology and Innovation Platform Bioenergy (ETIP Bioenergy) aims to contribute to the development of cost-competitive, innovative world-class bioenergy and biofuel value chains, to the creation and strengthening of a healthy European bioenergy industry and to accelerate the sustainable deployment of bioenergy in the European Union, through a process of guidance, prioritisation and promotion of research, technology development and demonstration.