

What you need to know about...

1 The opportunities, limits and trade-offs to using bioenergy-based power and heat to deliver energy security

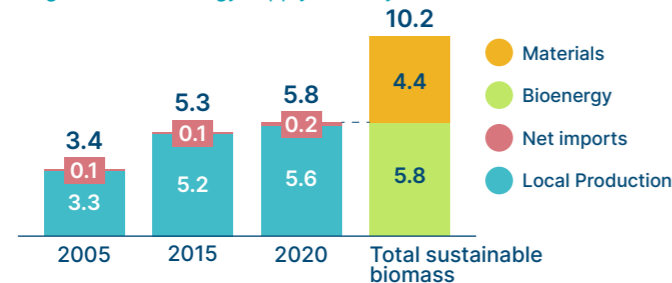


What is the role and potential of biomass in Europe?



1 Biomass is mostly produced locally and used in both energy and material applications.

Origin of EU bioenergy supply - in EJ/yr



- Bioenergy in Europe is traditionally from forestry residues, but recent growth in supply comes from agricultural residues and municipal & industrial wastes.
- Just 5% of EU bioenergy is imported, around half of which is from Russia and Ukraine.

2 But not all biomass is good biomass - its development should come from sustainable low-carbon sources only.

Criteria that sustainable biomass must meet:

No competition with other critical uses of land

No deforestation or peatland conversion

Target degraded land, with little plant growth

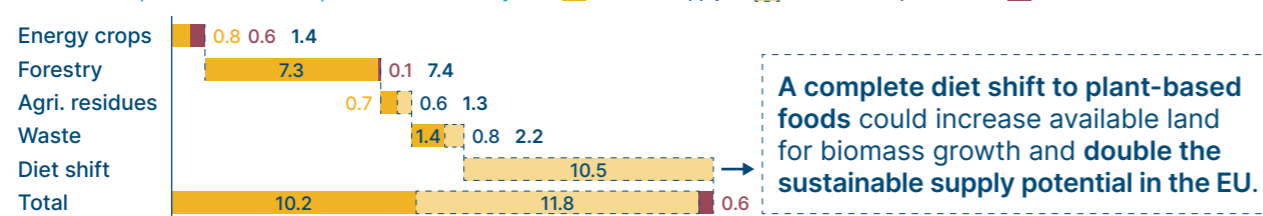
Respect growth periods which will delay supply

Close-to-zero emissions collection transportation and processing

No environmental or social harm

3 Additional sustainable potential is limited. Further potential could be unlocked if diets change.

Current and potential biomass production - in EJ/yr



A complete diet shift to plant-based foods could increase available land for biomass growth and double the sustainable supply potential in the EU.

This sustainable potential could be unlocked but physical limits and uncertainties exist.

There are physical and biological limits to the growth of biomass potential:

- Growth times (1-10,000 yrs)
- Land availability and indirect land-use change
- Food security and competition with crops
- Biodiversity loss
- Soil quality
- Carbon cycling

Additional sustainable potential could be unlocked through:

Short-term

Long-term

- Improved collection of household and agricultural biowaste
- Improved material circularity, shifting biomass demand from material to energy applications
- Reduced meat and dairy consumption, which takes up ~100 times more land to produce 1 kilocalorie than plant-based alternatives
- Growth in available forestry biomass from reforestation efforts

Degree of certainty

○ Low

● High

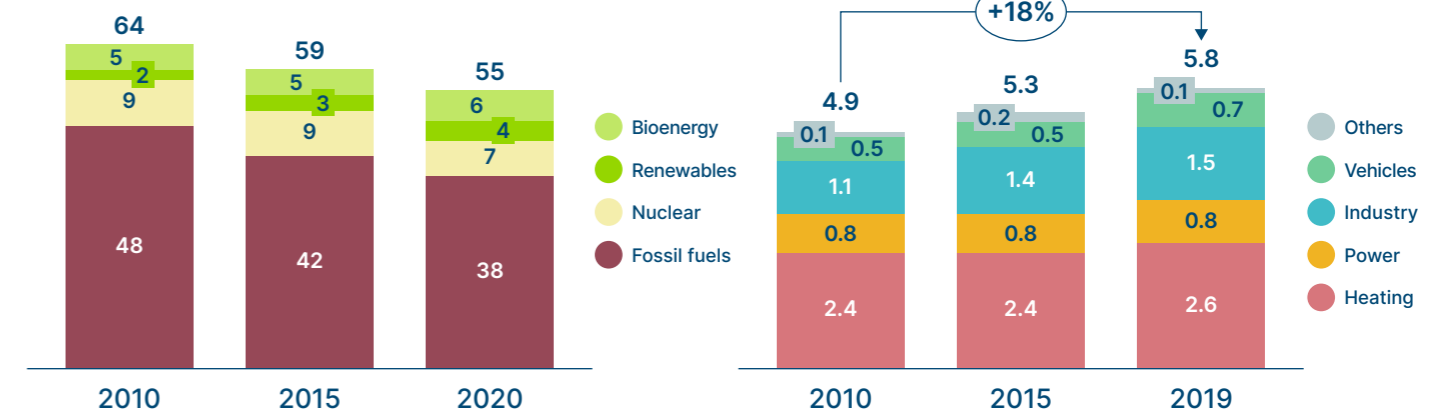
How is bioenergy used in Europe?



1 Policy support has driven bioenergy to become the #1 source of renewable energy in Europe but other renewables are now catching up.

Primary energy mix of the EU - in EJ/yr

Use of bioenergy in the EU - in EJ/yr

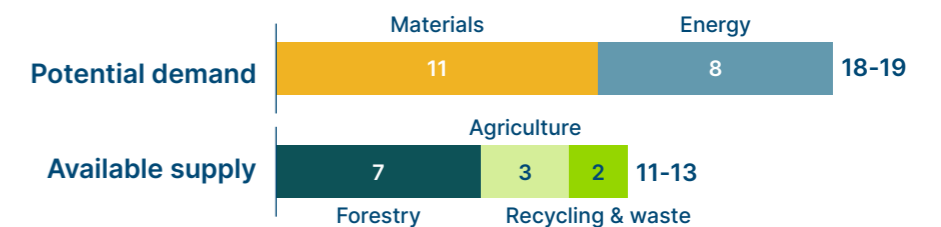


Bioenergy can act as a direct low-carbon substitute to fossil fuels because of its similar chemical composition to that of hydrocarbons.

The growth in bioenergy demand has been driven by biofuel mandates in transportation and the increase in power production.

2 But because bioenergy is so useful, future potential uses are likely to exceed sustainable supply limits.

Demand and supply for biomass in 2050 - In EJ/yr

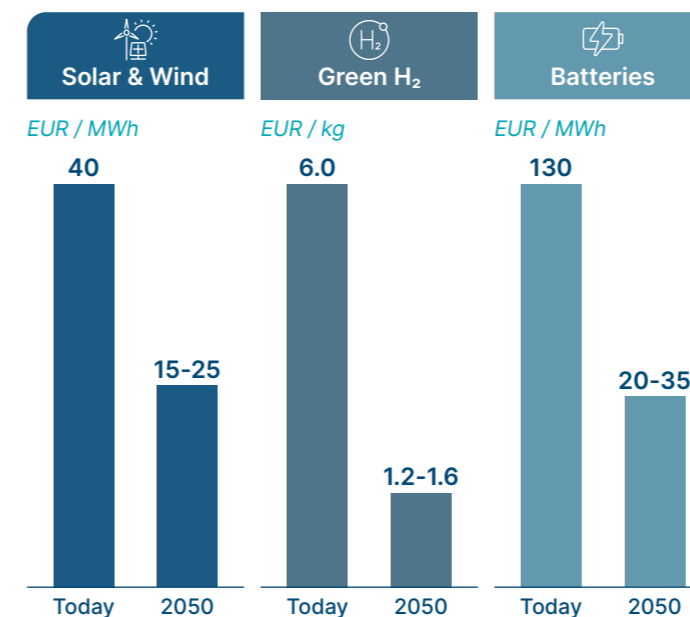


How to reprioritise and optimise the use of bioresources?



Bioenergy use is already becoming less relevant in some sectors as the costs of renewables and batteries fall.

The use of bioresources must be prioritized and shifted to uses where decarbonisation alternatives are unavailable or expensive.



Priority level

- Use first as a material or feedstock
- Use for energy when the alternative is far behind e.g. shift production and use to aviation biofuels
- Phase out bioresources from easy-to-electrify sectors such as light duty transport
- Limit use when competitive alternative could scale in next decade
- Use residual biomass supply for local or niche uses or Carbon Dioxide Removals