

BIOENERGY



WHAT IS BIOENERGY?

The organic material from plants and animals, including their waste and residue, is called biomass. Combustion of biomass releases heat. This heat can be used to generate work and electricity. Biomass can be transformed into liquid and gaseous form of fuels by various chemical and biological processes, known as biofuels. **The term bioenergy is used to cover biomass and biofuels together.**¹

BIOMASS

Biomass is largely composed of organic material and water. It is essential that biomass is clearly assessed as either wet or dry matter mass, and the exact moisture content should be known. Various sources of biomass are listed below:

- Crop waste
- Microalgae
- Agricultural waste
- Purpose-grown grasses
- Forest residues
- Woody energy crops
- Municipal solid waste
- Urban wood waste
- Food waste

BIOFUELS

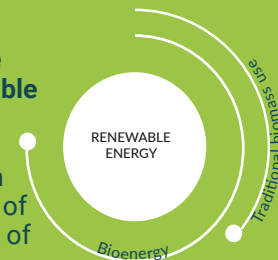
Biomass can be transformed by chemical and biological processes to produce biofuels, i.e. biomass processed into a more convenient form, particularly liquid fuels for transport. Examples of biofuels include:

- Methane gas
- Liquid ethanol
- Methyl esters
- Oils
- Solid charcoal



KEY FACTS

About **three-quarters of the world's renewable energy use is comprised of bioenergy**, with more than half of that consisting of traditional biomass use.

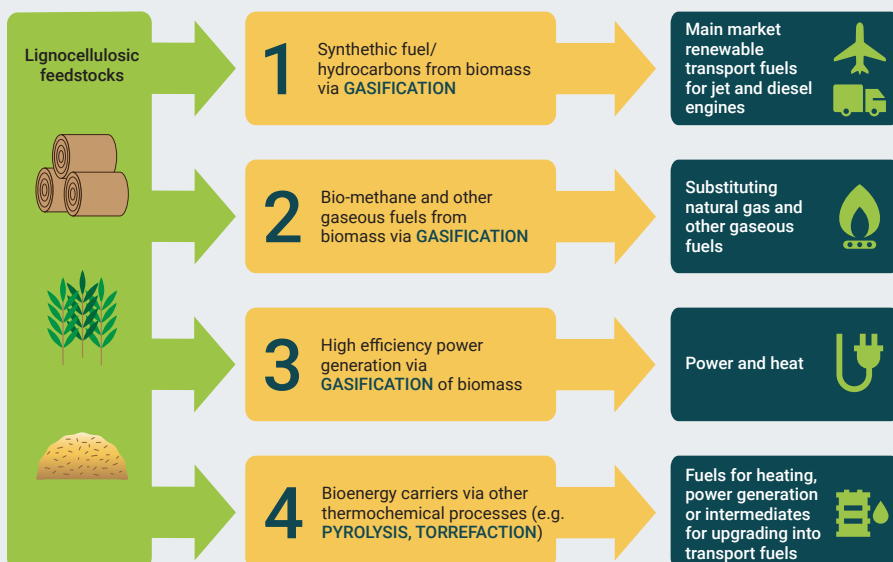


Biomass has the vital **potential to increase energy supply in crowded countries with growing demand**, such as Brazil, India, and China.

CLASSIFICATION OF BIOENERGY

Bioenergy can be classified based on the the biological methods and the chemical processes in order to produce the fuel.²

1 The thermo-chemical process consists of direct combustion, pyrolysis, and gasification methodologies. The figures show the flow of the process from raw material (biomass) to the end products.

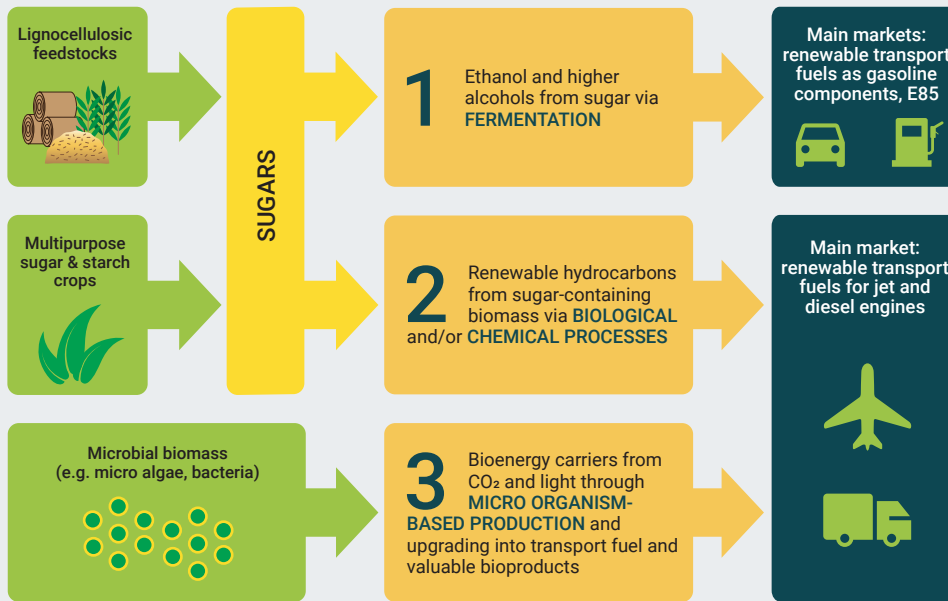


Source: European Biofuels Technology Platform

In 2015, bioenergy made up approximately **10 percent of total final energy consumption** and 1.4 percent of global power generation.³

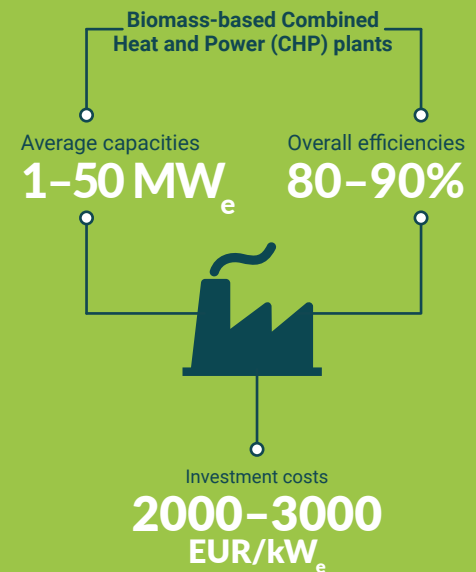


2 The bio-chemical process consists of aerobic and anaerobic digestion, and alcoholic fermentation processes.



Source: European Biofuels Technology Platform

KEY FACTS



Bioenergy, on the other hand, is an essential source of renewable energy, its **augmentation to final energy demand across all sectors is 5 TIMES HIGHER** than wind and solar PV combined, even when the traditional use of biomass is excluded.^{* 4}

* Traditional use of Biomass refers to burning biomass for cooking and to produce heat and energy. This includes burning of wood, collected from forests and use of cow dung cakes.

BIOMASS AND SUSTAINABILITY

This technology eliminates the use of fossil fuels, helping to reduce the carbon footprint. It creates jobs and growth in rural areas, reuses resources from other operations that result in recycling and waste disposal, decreases external reliance on fuel supply, and is an efficient technology available at a reasonable price.⁵

However, the topic of 'carbon neutrality' has been addressed in recent years with regard to the products of bioenergy produced from forest biomass. Scientific opinions diverge regarding the classification of biomass as carbon neutral.⁶

REFERENCES

1. "Bioenergy Basics," Energy.gov. Available at: <https://www.energy.gov/eere/bioenergy/bioenergy-basics>
2. Bioenergy: Technology Information Sheet, SETIS - Strategic Energy Technologies Information System, pp. 1-4. Available at: https://setis.ec.europa.eu/system/files/Technology_Information_Sheet_Bioenergy.pdf
3. "Bioenergy", Irena.org. Available at: <https://www.irena.org/bioenergy>
4. "Bioenergy", Iea.org. Available at: <https://www.iea.org/topics/renewables/bioenergy/>
5. "How biomass energy works?" Activesustainability.com. Available at: <https://www.activesustainability.com/renewable-energy/how-biomass-energy-works>
6. Forest biomass, carbon neutrality and climate change mitigation Göran Berndes, Bob Abt, Antti Asikainen, Annette Cowie, Virginia Dale, Gustaf Egnell, Marcus Lindner, Luisa Marelli, David Paré, Kim Pingoud and Sonia Yeh From Science to Policy 3, European Forest Institute, 2016. Available at: https://www.efi.int/sites/default/files/files/publication-bank/2018/efi_fstp_3_2016.pdf

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