

The Role of Biological Sources as Energy Carriers in Slovakia

Policy Brief

Introduction

- The EU and Slovakia support renewable energy sources including biological sources (Directive 2009/28/EC, Directive EU 2018/2001, Slovak Act 309/2009).

The European Union and Slovakia have established a strong regulatory framework that promotes the development and integration of renewable energy, explicitly highlighting the role of biological sources. These directives, national laws and policy initiatives set binding targets, financial incentives, and sustainability criteria that encourage the expansion of bioenergy in the overall energy mix.

- Biological sources of energy include biomass, biogas, biomethane, biofuels, and other bio-based materials and are used in electricity and heat production, as well as in transportation through biofuels.

These diverse bio-based resources provide flexible energy options that can be applied across multiple sectors of the economy. Their use in power generation, district heating, and low-carbon transport strengthens energy security while supporting the transition to a more sustainable energy system.

- Bioenergy plays an important role in Slovakia's efforts to enhance energy security and reduce dependence on imported fossil fuels.

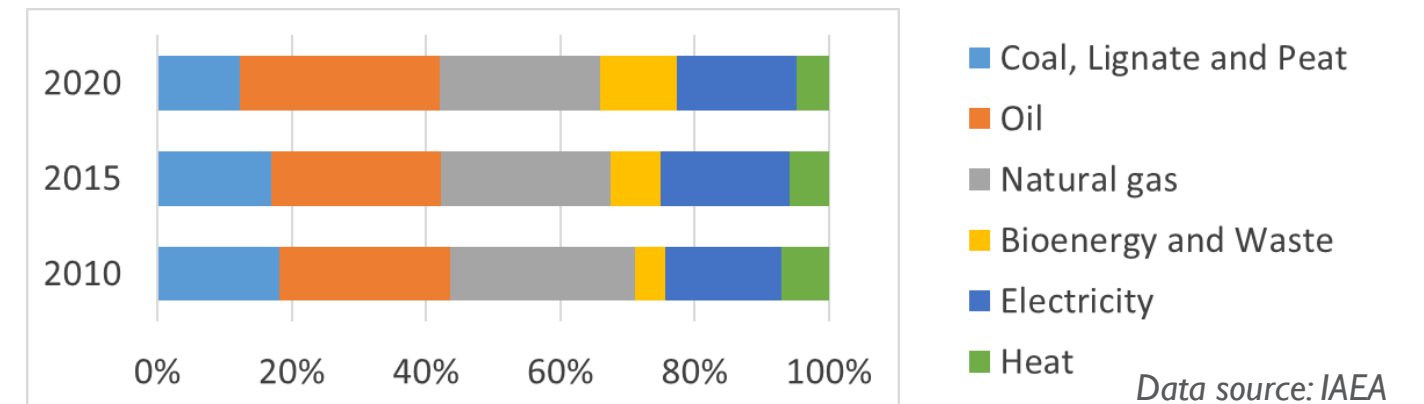
Because bio-based energy can be produced domestically from forestry residues, agricultural by-products, and waste streams, it strengthens national energy autonomy. Its integration into the energy system also supports regional development by creating local supply chains and job opportunities in rural areas.

Key Findings

- Slovakia is still dependent on fossil fuels and their imports.

Despite gradual progress in renewable energy deployment, Slovakia's energy system continues to rely heavily on natural gas and oil. As Slovakia does not have own resources, these fuels are imported from external suppliers. This dependency exposes the country to market volatility and geopolitical risks that can undermine long-term energy stability.

Energy sources in final energy consumption in Slovakia



- Rising prices of fossil fuels (as recently induced by the Russian-Ukrainian war) only marginally facilitate the transition to biological energy sources due to limited substitution possibilities, technological constraints and logistical barriers.

While higher fossil fuel costs provide some economic motivation to shift toward renewables, many bioenergy alternatives cannot yet fully replace conventional fuels at scale. Existing infrastructure limitations (system of pipelines), feedstock availability, and technology readiness slow the pace at which bio-based solutions can be integrated into the energy system.

- Slovakia has set a target of about 19.2% share for renewables in its gross final energy consumption by 2030, and expects growth especially in biogas / biomethane and hydropower.

Achieving this target will require targeted investments, supportive regulatory measures, and the expansion of sustainable feedstock supply chains. Biogas and biomethane, in particular, are seen as promising sectors due to Slovakia's agricultural potential and the possibility of integrating these gases into existing gas networks.

Policy Recommendations

- **Accelerate Support for Advanced Bioenergy:** provide incentives (e.g. grants, investment funds, green certificates) for energy production from biological sources, upgrades of technologies and infrastructure.

Strengthening financial support mechanisms can stimulate investment in modern bioenergy facilities, encouraging both large and small producers to expand capacity. Targeted incentives will also help accelerate technological upgrades, improve efficiency, and integrate advanced bioenergy solutions into existing energy systems.

- **Enforce Robust Sustainability Criteria:** ensure traceability of feedstock and compliance with EU sustainability rules, prioritize use of agricultural residues, forestry by-products, and organic waste.

Strict sustainability standards will help guarantee that increased bioenergy production does not compromise environmental integrity or compete with food production. Enhanced monitoring and feedstock traceability will ensure alignment with EU regulations while promoting the use of waste-derived and low-impact biomass sources.

- **Support Rural Bioenergy Cooperatives and Local Projects:** provide funding for farmer and community-owned bioenergy systems, offer training and advisory services to optimize feedstock production and management.

Empowering rural actors through cooperative models can strengthen local economies and create stable markets for agricultural by-products. Training and advisory programs will improve feedstock logistics, support sustainable land management, and increase the efficiency of small-scale bioenergy systems.

- **Develop a National Bioenergy Roadmap (2030–2050),** define clear goals for biomass, biogas / biomethane within the national energy mix.

A long-term roadmap will provide strategic clarity and guide coordinated investment across public and private sectors. Setting explicit milestones for biomass and renewable gases will support infrastructure planning, secure investor confidence, and align Slovakia's energy transition with EU climate objectives.

Conclusion

- Biological energy sources have the potential to play a transformative role in Slovakia's energy system. Their availability and climate mitigation benefits make them valuable energy carriers, particularly when integrated sustainably and efficiently. However, Slovakia should incentivize bioenergy, modernize infrastructure, enhance regulatory clarity, and ensure ecological safeguards. Bioenergy can simultaneously drive rural economic development, reduce fossil fuel imports, and contribute meaningfully to climate targets.

Bioenergy facts for Slovakia

Bioenergy sources:

- **Biogas (including biomethane):** produced from municipal waste, waste from wastewater treatment plants, and agricultural and livestock waste.
- **Biomass:** consists of wood, waste produced from its extraction and processing, and energy crops (maize, rapeseed).

Installed capacity of bioenergy sources (2024):	207 MW
Share of bioenergy in total electricity generation (2024):	4.9%
Number of facilities:	25 biomass power plants, 120 biogas plants

Source: Slovak Association of Sustainable Energy

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