Albania

Roadmap for lignocellulosic biomass and relevant policies for a bio-based economy in 2030

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What types of lignocellulosic biomass are included in the analysis?

Lignocellulosic biomass in this analysis includes:

- Forest biomass from primary forestry productions (fellings), primary field residues and secondary forest industry residues;
- Agricultural biomass from primary field activities;
- Biowastes and post consumer wood;
- Dedicated perennial crops.
The roadmap provides scientific evidence for policy, industry and regional stakeholders for the following issues:

- domestic, sustainable lignocellulosic biomass feedstock potentials at national/regional/local levels;
- resource and energy efficient value chains which are expected to be implemented at scale by 2030;
- Sustainability Risks;
- Key indicators per value chain;
- Policies that can facilitate uptake of indigenous lignocellulosic biomass;
- Recommended roadmap actions based on current good practices.
Key questions, addressed by S2Biom

- Where is biomass found?
- What is estimated sustainable potential by 2030?
- What are the sustainable potentials by biomass type and where can they be found?
- How do feedstocks perform in terms of sustainability risks?
- Which value chains have high resource and energy efficiency?
- What is the national policy landscape?
- What future policy interventions can be considered based on good practice?
Where is biomass found?

- The following slide presents a figure with total sustainable* occurrence of lignocellulosic biomass by region, presented in 1,000 dry tonnes per year

* The estimated potentials include sustainability criteria as required by the Renewable Energy Directive.
Total lignocellulosic biomass by region (in 1,000 tonnes)
Total lignocellulosic biomass by region & feedstock type

- Berat: 23%
- Tirane: 10%
- Shkoder: 8%
- Diber: 7%
- Fier: 7%
- Gjirokaster: 7%
- Elbasan: 7%
- Durres: 4%
- Korce: 13%
- Kukes: 7%
- Lezhe: 6%
- Vlore: 6%
- Tirane: 10%

By feedstock type:
- Agriculture: 36%
- Forest: 34%
- Dedicated crops: 19%
- Wastes: 11%
What is the availability per biomass type?

- Sustainable potential from residues, dedicated crops, biowastes and post consumer wood totals 2.15 million dry tonnes / year.
- Primary forestry production accounts for an additional 0.83 million dry tonnes / year.
- The following slide presents a graph of potential available lignocellulosic biomass by source, excluding primary forestry production.
Lignocellulosic biomass availability by source by 2030 (1,000 dry tonnes)
What are the sustainable potentials by biomass type and where can they be found?

- The following slides present maps of estimated sustainable potential lignocellulosic biomass by region and by main source, namely:
  - Forest (primary forestry production, field residues and secondary agricultural residues)
  - Agriculture (primary field residues and tree prunings)
  - Biowastes and post consumer wood
  - Dedicated perennial crops
- Annual sustainable potential up to 1.01 million dry tonnes
Agriculture

- Annual sustainable potential up to 0.32 million tonnes
Biowastes and post consumer wood

- Annual sustainable potential up to 0.57 million tonnes
Dedicated perennial crops

- Annual sustainable potential up to 1.07 million tonnes
# How do feedstocks perform in terms of sustainability risks?

<table>
<thead>
<tr>
<th>Feedstock</th>
<th>Sustainability risks (high- red; moderate- yellow; low- green)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Land use (LUC risk)</td>
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<tr>
<td>Primary forestry production</td>
<td>Stemwood from thinnings &amp; final fellings</td>
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<td>Primary forestry production</td>
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<td>Primary forestry residues</td>
<td>Logging residues from final fellings</td>
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<td>By-products and residues from food and fruit processing industry</td>
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<td>Biodegradable municipal waste</td>
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<td>Post consumer wood</td>
<td>Hazardous post consumer wood</td>
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<td>Miscanthus, switchgrass, giant reed, willow, poplar</td>
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Which value chains have high resource and energy efficiency?

- The following show value chains with relatively high efficiency in the following aspects:
  - Energy efficiency
  - Greenhouse gas emissions
  - Air quality
  - Technological maturity
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<th>Strength</th>
<th>Greenhouse gases</th>
<th>Air quality</th>
<th>Technological maturity</th>
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<tr>
<td><strong>Combustion at small scale including households</strong></td>
<td></td>
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<tr>
<td><strong>Strength</strong></td>
<td>High conversion efficiency with modern technology</td>
<td>Low fossil input in the value chain</td>
<td>-</td>
</tr>
<tr>
<td><strong>Weakness</strong></td>
<td>Older stoves have low conversion efficiency. Heat not always efficiently used.</td>
<td>-</td>
<td>High emissions from older wood stoves.</td>
</tr>
<tr>
<td><strong>Combustion at small-medium scale including buildings</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Strength</strong></td>
<td>High conversion efficiency</td>
<td>Low fossil input in the chain</td>
<td>-</td>
</tr>
<tr>
<td><strong>Weakness</strong></td>
<td>-</td>
<td>-</td>
<td>Emissions better than smaller scale but higher than natural gas.</td>
</tr>
<tr>
<td><strong>Combustion at medium scale, heat led</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Strength</strong></td>
<td>High conversion efficiency</td>
<td>Low input of fossil fuels; high GHG savings especially for Combined Heat and Power</td>
<td>Better control options for emissions</td>
</tr>
<tr>
<td><strong>Weakness</strong></td>
<td>-</td>
<td>-</td>
<td>Higher emissions than natural gas combustion.</td>
</tr>
<tr>
<td><strong>Biochemical - lignocell. hydrolysis and fermentation</strong></td>
<td></td>
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<tr>
<td><strong>Strength</strong></td>
<td>-</td>
<td>High GHG savings in case of process integration and limited fossil input.</td>
<td>Ethanol has low emissions as transport fuel.</td>
</tr>
<tr>
<td><strong>Weakness</strong></td>
<td>Around 50% conversion efficiency</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Value chains: wastes</td>
<td>Energy efficiency</td>
<td>Greenhouse gases</td>
<td>Air quality</td>
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<td>Waste incineration and energy recovery</td>
<td><strong>Strength</strong> Adding energy recovery to waste management improves its pathway; high efficiency if CHP</td>
<td>High GHG benefit, particularly compared to landfill (avoided methane emissions); energy recovery substitutes fossil fuels</td>
<td>If landfill is avoided, lower air emissions.</td>
</tr>
<tr>
<td><strong>Weakness</strong> Relatively low net energy output; auxiliary fuel may be required due to low calorific value of fuel</td>
<td>-</td>
<td>Issues in terms of emissions of waste incineration. Emission control is circa one third of project cost.</td>
<td>-</td>
</tr>
<tr>
<td><strong>Combustion at medium scale, heat driven</strong></td>
<td><strong>Strength</strong> &gt;85% conversion efficiency in case of heat only; 65-85% efficiency for CHP installations.</td>
<td>Low input of fossil fuels; especially in case of CHP GHG savings can be high</td>
<td>Better control options for PM emissions compared to small scale installations.</td>
</tr>
<tr>
<td><strong>Weakness</strong> -</td>
<td>-</td>
<td>Still higher PM emissions than natural gas combustion.</td>
<td>-</td>
</tr>
<tr>
<td><strong>Gasification &amp; CHP at medium scale - heat driven</strong></td>
<td><strong>Strength</strong> Up to 80% conversion efficiency, depending on heat only or CHP installations.</td>
<td>Low/no input of fossil fuels; especially in case of CHP GHG savings can be high</td>
<td>Low emissions of gas engine or turbine</td>
</tr>
<tr>
<td>Forest biomass</td>
<td>Cumulative energy demand (GJ inputs/GJ outputs)</td>
<td>Non-renewable energy requirement (GJ non-renewable inputs/GJ outputs)</td>
<td>Output service quality (€ outputs - € inputs (excl. biomass), per dry tonne of biomass input at plant gate)</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------------------------------------</td>
<td>---------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Households</td>
<td>Residential wood chips boilers - small scale (10-25 kW)</td>
<td>1.39 GJ/GJ</td>
<td>0.044 GJ/GJ</td>
</tr>
<tr>
<td>Services</td>
<td>Wood chip boilers-large size (50 kW)</td>
<td>1.24 GJ/GJ</td>
<td>0.039 GJ/GJ</td>
</tr>
<tr>
<td>Industry</td>
<td>CHP using solid biomass &gt; 15MW</td>
<td>2.79 GJ/GJ</td>
<td>0.088 GJ/GJ</td>
</tr>
<tr>
<td></td>
<td>CHP using solid biomass 0.5 - 15 MW</td>
<td>1.31 GJ/GJ</td>
<td>0.042 GJ/GJ</td>
</tr>
<tr>
<td>Agricultural biomass</td>
<td>Straw and agricultural residues for small scale local heating plants</td>
<td>1.39 GJ/GJ</td>
<td>0.089 GJ/GJ</td>
</tr>
<tr>
<td>Households</td>
<td>Straw and agricultural residues for CHP &gt; 10 MW</td>
<td>1.31 GJ/GJ</td>
<td>0.084 GJ/GJ</td>
</tr>
<tr>
<td>Industry</td>
<td>Direct co-firing coal process</td>
<td>1.21 GJ/GJ</td>
<td>0.030 GJ/GJ</td>
</tr>
<tr>
<td>Utility</td>
<td>Cellulose-EtOH</td>
<td>2.44 GJ/GJ</td>
<td>0.054 GJ/GJ</td>
</tr>
<tr>
<td>Bioethanol 2nd</td>
<td>Cellulose-EtOH</td>
<td>2.44 GJ/GJ</td>
<td>0.054 GJ/GJ</td>
</tr>
<tr>
<td>Industry/ Utility</td>
<td>anaerobic digestion &amp; medium scale CHP</td>
<td>2.00 GJ/GJ</td>
<td>0.007 GJ/GJ</td>
</tr>
<tr>
<td>Transport</td>
<td>anaerobic digestion + upgrading to methane</td>
<td>1.56 GJ/GJ</td>
<td>0.071 GJ/GJ</td>
</tr>
</tbody>
</table>
What is the national policy landscape?

- The following slides provide diagrams to illustrate how existing policies / measures support one or more of the following:
  - Biomass supply
  - Logistics
  - Conversion
  - Distribution
  - End use

- Policies / measures are categorised as: 1) Regulation, 2) Financing and 3) Information

* Policy mapping and respective recommendations are the result of intensive review but as the field is dynamic the authors appreciate there may be missing elements.
Current policy: forest

- Biomass Supply
- Logistics
- Conversion
- Distribution
- End Use

Green for Growth Fund

Law on Renewable Energy Sources – Grid Access

Albania Policy
- Law on Moratorium of protection of Forest – Implementation of Strategy of the Forest and Pastures

Western Balkans Sustainable Energy Direct Financing Facility

- Regulations
- Financing
- Information
Current policy: agriculture & dedicated crops

Albanian Policy
(i) enhancing farm viability and competitiveness of agriculture and food-processing, while progressively aligning with the EU standards; (ii) restoring, preserving and enhancing ecosystems dependent on agriculture and forestry; (iii) balanced territorial development of rural areas promoting social inclusion, poverty reduction and balanced economic development in rural areas; and (iv) transfer of knowledge and innovation in agriculture, forestry and rural areas.
**Current policy: wastes**

**Albanian Policy**
- Until 2020: Aims to prevent the growth of municipal waste
- Until 2015: Recycling/composting 25% of municipal waste
- Until 2020: Recycling/composting 55% of municipal waste
- Until 2025: Energy recovery of 15% of municipal waste
- Until 2025: Reduction of municipal waste in landfill by 90% that it is currently at approximately 30%;
What improvements can be made based on good practice*?

- The following slides illustrate selected policies from Member States that have had significant positive impact in promoting the use of lignocellulosic biomass.
- Based on this Good Practice, recommended new policies are shown (shaded boxes) to complement existing policies.

* Policy mapping and respective recommendations are the result of intensive review but as the field is dynamic the authors appreciate there may be missing elements.
Good Practice - Feedstocks

Biomass sourcing

Wastes
- AT: Waste management & Regulation on recycling of waste wood
- DE: Kreislaufwirtschaftsgesetz-KrWG - Waste disposal
- NL: strategic initiative for anaerobic digestion of MSW - organics

Forest biomass
- FI: private forest owners
- FI: forest certification
- BE: Subsidies for afforestation and forest management

Agricultural biomass
- AT: ÖPUL – Austrian Agri-environmental Programme: Tailored investment support with market sector focus
- DE: EEG - Feedstock bonus for plants using straw

Dedicated crops
- DE: ÖPUL – “Gemeinschaftsaufgabe Agrarstruktur und Küstenschutz” provides farmers with financial support for the cultivation of short rotation coppices.

Logistics

BE: VLAREM - collecting & treatment
- High impact
- Moderate impact
### Good Practice - End use sectors

#### Conversion
- **Heat**
  - **UK**: Renewable Heat Initiatives (RHI)
  - **AT**: Climate and Energy Fund-Subsidy scheme wood heating.
  - **NL**: Energy Investment Allowance (EIA), tax reductions for boilers
  - **ES**: BIOMCASA I & II, funding for efficient use of biomass
  - **DE**: repayment bonus from market program (MAP) and soft loans with low interest rates public sector bank KfW

- **CHP**
  - **AT**: Green Electricity Act & CHP Act: refines scales of applications and target specific sectors and biomass resource types and end uses.
  - **DE**: Renewable Energy Sources Act 2014 - Act (EEG 2014); Market premium (in EEG § 35); Flexibility premium for existing installations (EEG, § 54)
  - **UK**: Renewables Obligation (RO) scheme, based on green certificates favouring certain technologies

- **Transport biofuels**
  - **FI**: Act of Excise Duty on Liquid Fuels, a taxation system, in which each component of a liquid fuel is taxed separately, based on its energy content and carbon dioxide emission, meaning reduced taxation for biofuels

- **Biobased products**
  - **DE**: Federal Immission Control Act (BImSchG)
  - **UK**: Renewable Transport Fuel Obligation (RTFO) and certification system
  - **DE**: Energy Tax Act (EnergieStG) : It accounts for transport biofuels
  - **SE**: Swedish Research and Innovation Strategy for a Bio-based Economy

#### Distribution

#### End Use

- **High impact**
- **Moderate impact**
Recommended new policy*: forest

- Biomass Supply
- Logistics
- Conversion
- Distribution
- End Use

Green for growth fund: Subsidy scheme wood heating

Western Balkans Sustainable Energy Direct Financing Facility

- Forest Act: Elaborate on restrictions related to sustainability (e.g. concerning de-/ re-/afforestation).
- Regulation on recycling of waste wood
- Forest Certification

- Law on Renewable Energy Sources – Grid Access
- Combined Heat and Power Act
- Decree on feed-in tariffs: introduce premiums for specific diameters cuttings; thinnings, etc.
- Fixed premiums

- Standard containing emission limits for wood boilers

*Shaded boxes show recommended new measures
Recommended new policy: agriculture & dedicated crops

- **Biomass Supply**
- **Logistics**
- **Conversion**
- **Distribution**
- **End Use**

- Subsidies for Agricultural Production
- Green for growth fund: **Subsidy scheme heating with agricultural residues, pellets from crops**
- Western Balkans Sustainable Energy Direct Financing Facility
- Law on Renewable Energy Sources – Grid Access
- Biofuels Law
- Combined Heat and Power Act
- Decree on feed-in tariffs: **introduce premiums for agricultural residues and dedicated crops**
- Standards for agricultural biomass
- Fixed premiums
- Regulation on agricultural raw materials for biofuels and bioliquids
Recommended new policy: wastes

- Biomass Supply
- Logistics
- Conversion
- Distribution
- End Use

Waste Management Strategy

- Green for Growth Fund
- Law on Renewable Energy Sources – Grid Access
- Biofuels Law

Western Balkans Sustainable Energy Direct Financing Facility

Standards for biowastes

- Combined Heat and Power Act
  - Decree on feed-in tariffs: introduce premiums for biowastes
  - Fixed premiums

- Biomethane injection

- Regulations
- Financing
- Information
Conclusions

- Albanian regions have relatively good biomass availability. The national lignocellulosic biomass potential is around 2.15m dry tonnes / year (excluding primary forest harvest), with forest and agriculture sources significant.

- The existing policy framework is generally well developed, with several regulations and financing mechanisms for each sector.

- The study has recommended a number of new policies (and refinements to existing policies) that are based on Good Practice and can further facilitate mobilisation of lignocellulosic biomass for a bio based economy by 2030.
Further reading

- [www.s2biom.eu](http://www.s2biom.eu)

- [www.biomass-tools.eu](http://www.biomass-tools.eu)  
  - *click* in main menu on ‘Biomass chain data’  
  - ‘Biomass characteristics’

- [www.biomass-tools.eu](http://www.biomass-tools.eu)  
  - *click* in main menu on ‘Data downloads’
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Maps: DLO Altera, 2016