



IEA Bioenergy

Technology Collaboration Programme



Biomass feedstock supply chains and future markets

Regional transitions in existing bioenergy markets

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IEA Bioenergy Conference - setting-up-regional-biohubs-to-enhance-biomass-mobilisation

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Technology Collaboration Programme

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Background - IEA Bioenergy Task40

Task40 in the 2010s:

Sustainable biomass markets and international bioenergy trade to support the biobased economy

- International bioenergy trade
- Supply chains for large-scale, centralized energy applications
- Market creation of bioenergy carriers
- Market reports
- Individual working groups

Task40 in the 2020s:

Deployment of biobased value chains

- Biobased value chains for a bioeconomy
- Supply chains for centralized and de-central energy/materials
- Value creation for biogenic carbon carrier
- Science & innovation focus
- Intertask and strategic task projects

Regional transitions in existing bioenergy markets

Project overview and objectives

- **Activity 1: The interplay of local biomass sources and international tradeable biomass commodities**
 - Current and future bioenergy markets, insights from model-based scenario projections
 - Case studies:
 - Bioenergy market developments in Europe
 - The role of biomass in the chemical industry sector
 - Current and future biomass utilization in Germany
- **Activity 2: Strategies to increase the mobilization and deployment of local (endemic) low value heterogeneous solid biomass resources**
 - Mobilization strategies, their current status, opportunities, and barriers for local low value and heterogeneous biomass resources, clustered in three assessment levels:
 - the legislative framework,
 - market structures
 - technological innovation.
- **Activity 3: Adoption of bioenergy by existing biomass feedstock suppliers (agriculture, forestry)**
 - Farmer adoption of bioenergy feedstocks including agricultural residues and energy crops
 - Detailed Agent Based model (ABM), including spatial explicit land data and farmer's characteristics
 - Case study for agricultural biomass: Colorado, Nebraska, Kansas (USA)
 - Case study for wood biomass: Georgia (USA)

Biomass feedstock supply chains and future markets

Different spatial and temporal scales

Level of detail

✓ Global, long-term targets (2050-2100)

- National, short/mid-term and targets (2030 – 2050)
- National determined contributions (NDCs)
- National Energy and Climate plans
- (National) policies

- Infrastructure
- Climate conditions
- Current and future markets

- Land use (current/future)
- Soil characteristics
- Water availability

Global/world regions

(Pan-) National

State/district

Local/ site-specific

Quantitative assessment tools

- Integrated Assessment Models (IAMs)
- Global energy system / general or partial equilibrium models

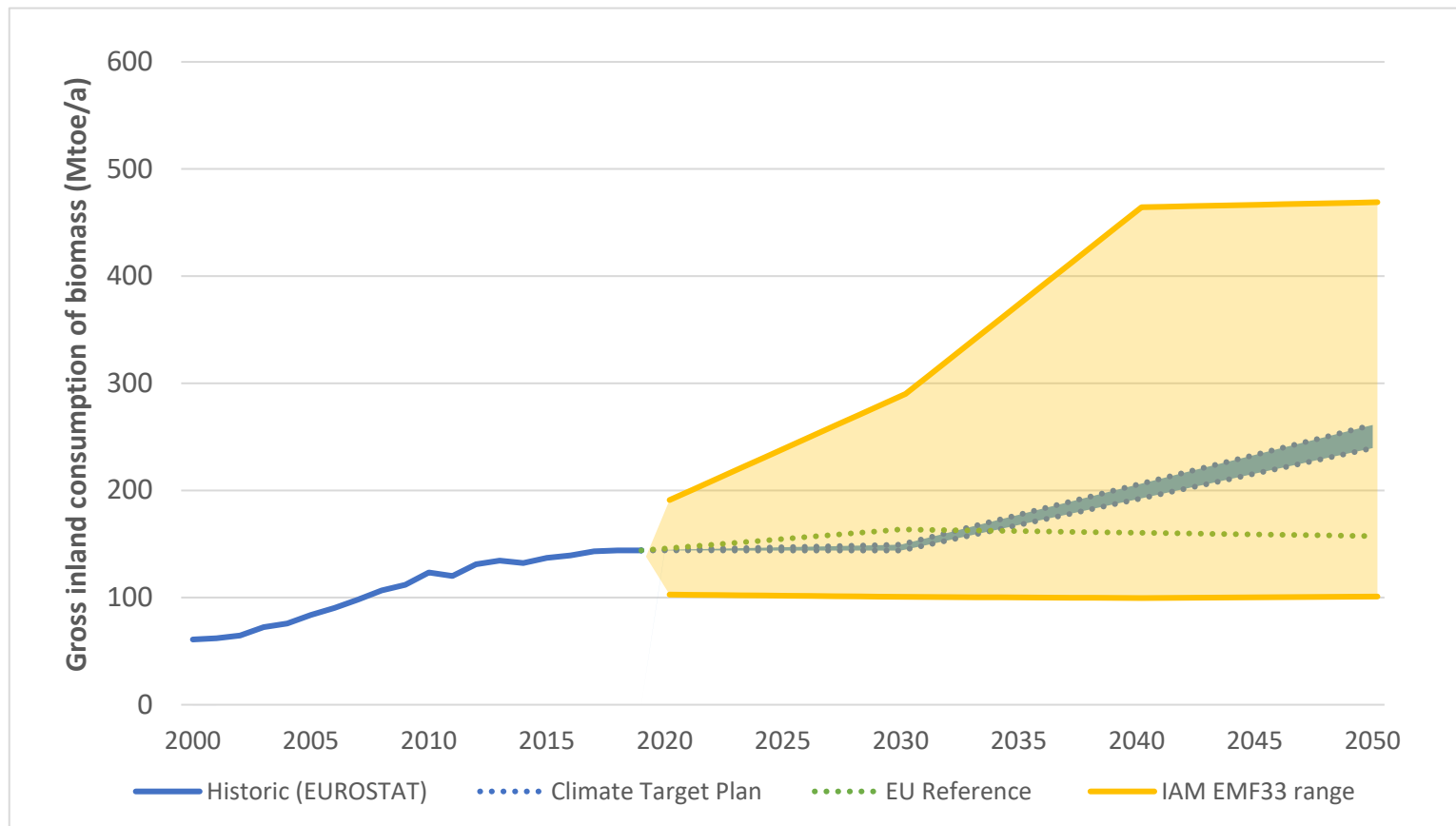
- Regional and national model-based scenario analysis
 - Energy transition pathways
 - Bioenergy deployment

- Supply Chain Management, e.g.:
 - Location analysis
 - Infrastructure planning
 - Transport network analysis
- Agent based modelling
- High resolution (land use) modelling

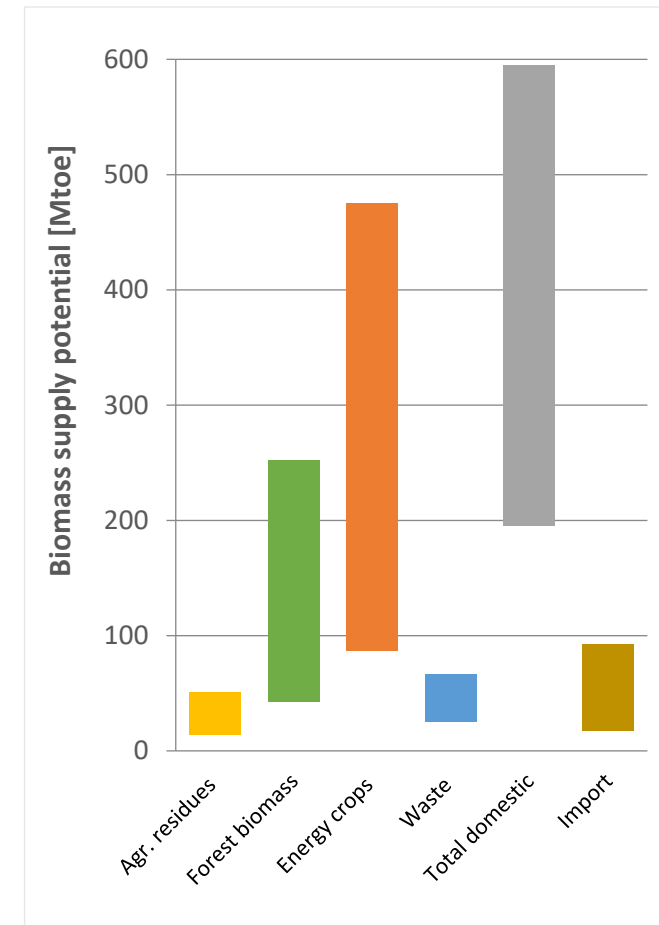
Challenge: provide actionable insights for planners of the (bio-)energy transition

Development of biomass demand in the European Union

Historic and future gross inland consumption of biomass in the EU27+UK, 2000 – 2050.
Projections of PRIMES and EMF33 participating IAMs



Ranges in EU Biomass supply potential in 2050, in EU biomass resource assessments (2006 - 2017)



Sources: Energy Modelling Forum (EMF)33, IAMs: Mandley, S. J., et al. "EU bioenergy development to 2050." RSER 127 (2020): 109858.
EU PRIMES: EU SWD/2021/621 final, COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT REPORT

Future markets

Trends:

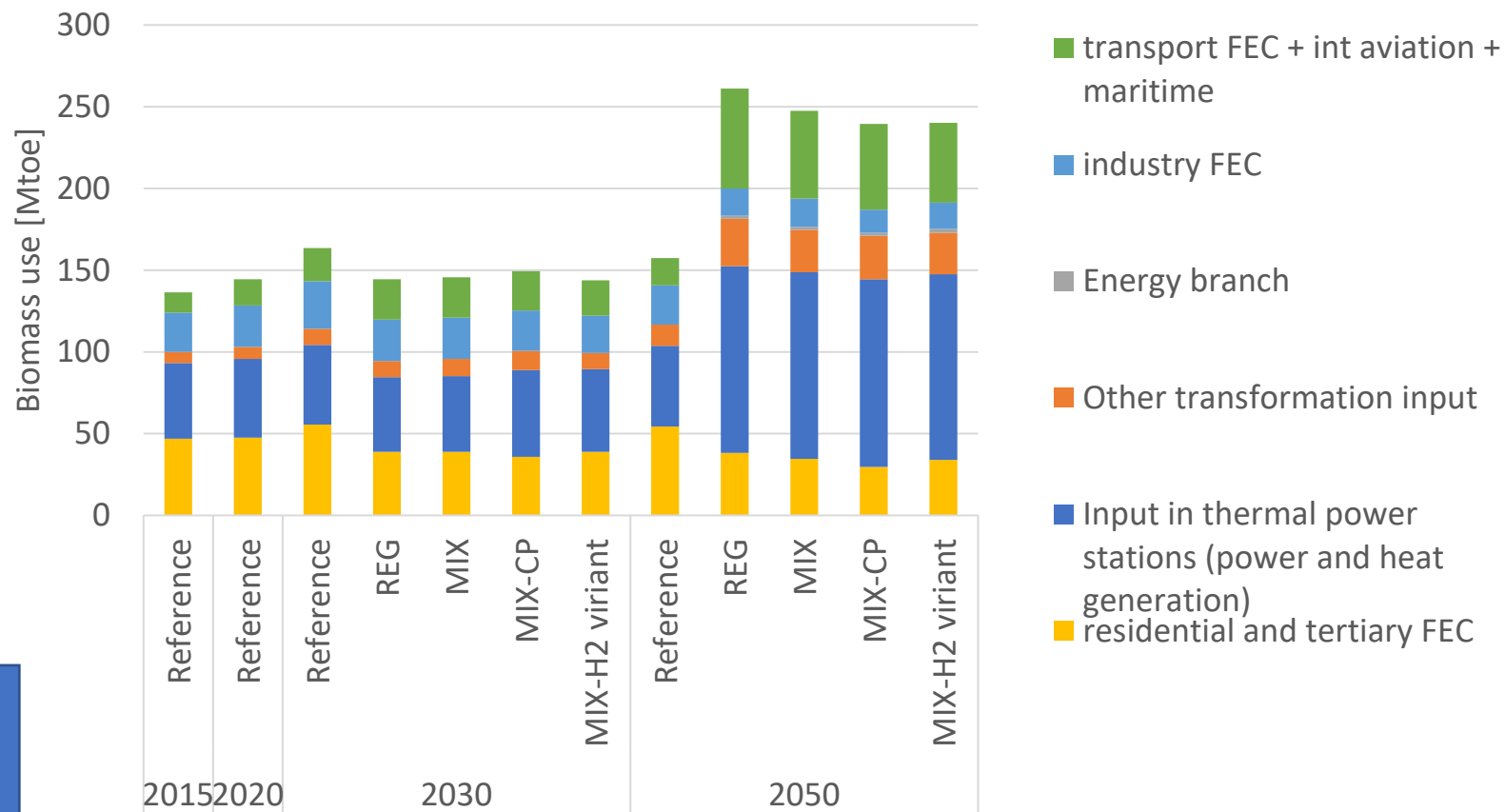
- A decrease in residential and tertiary sectors

Beyond 2030:

- Significant increase in thermal power stations
Deployment of BECCS
- Growth of high temperature industrial processes
- Advanced biofuels, especially in marine and aviation sectors

Reliable, cost-effective and sustainable lignocellulosic feedstock supply chains are essential for developing these new markets

Current and future bioenergy demand in the EU

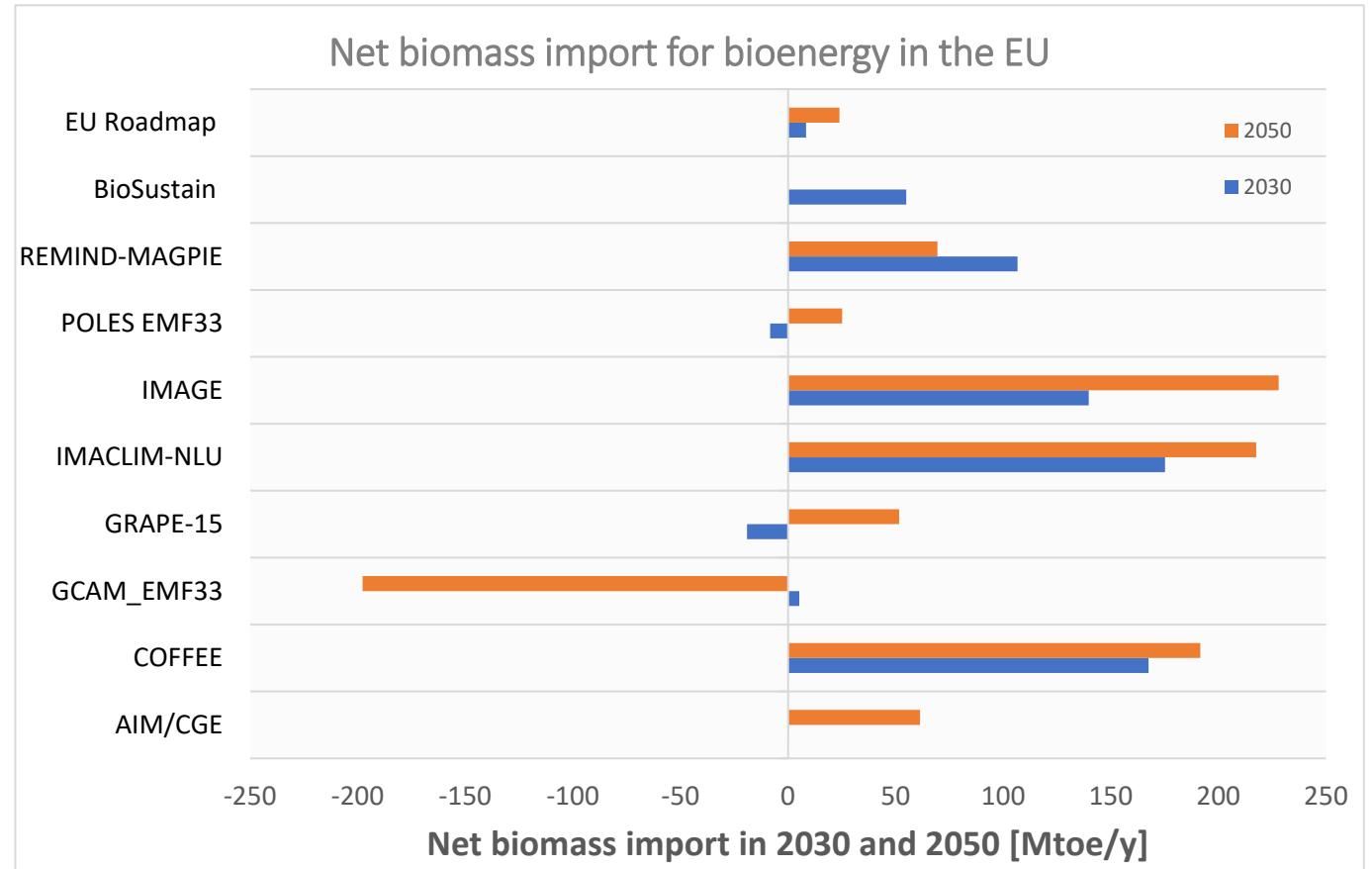


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International trade

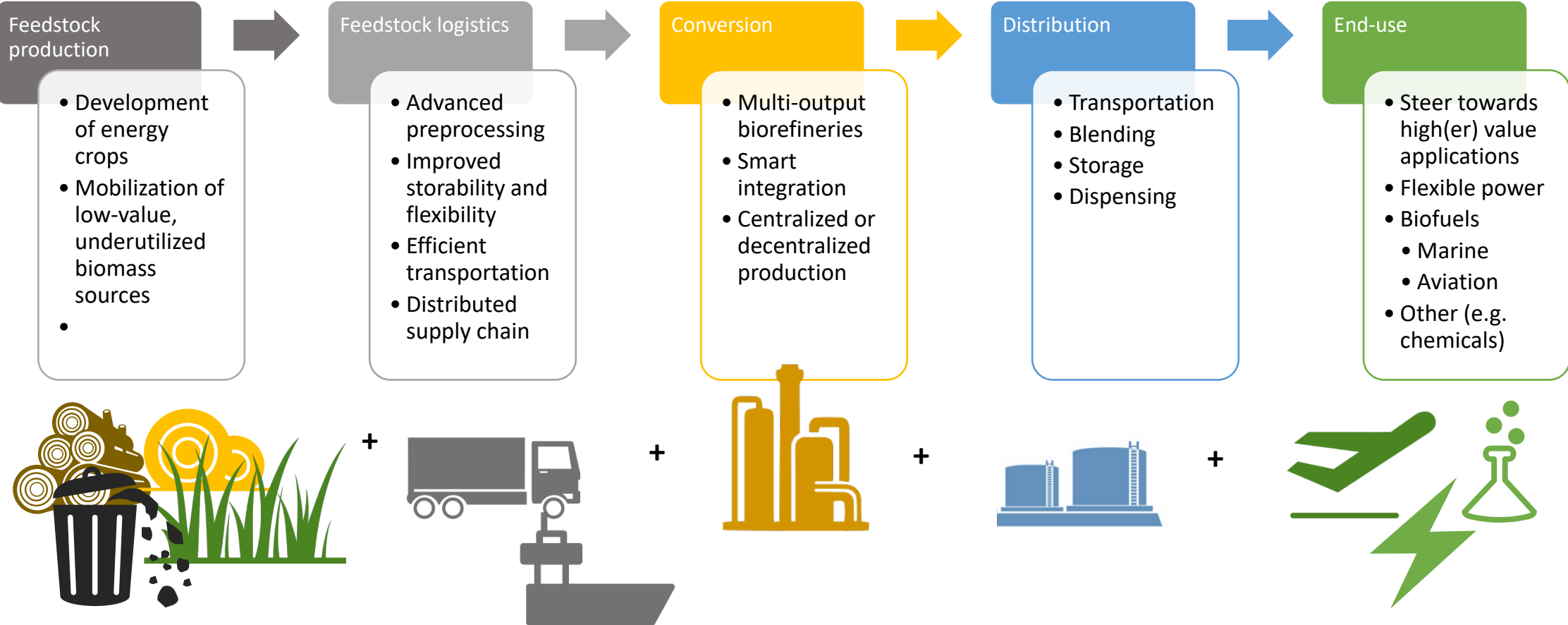
Main observations:

- Almost all model projections project net imports to the EU as a result of lower cost feedstock supply
- According to the IAM projections, 35% of primary bioenergy demand is met by imports (range 13–76%, excluding GCAM)
- This is larger compared to the EU Energy Roadmap 2050 (7.5%) and EU CTP projections.



Mandley, S. J., et al. "EU bioenergy development to 2050." RSER 127 (2020): 109858.

The logistical challenges, and experience from biomass mobilization strategies of developed markets and existing infrastructure remains underexplored.



Conclusions

- Biomass has a significant role in meeting climate targets, but its position in the energy system will likely change.
- There is a clear aim on the supply side to increase the use of low-value, underutilized biomass sources. On the demand side, to steer towards high(er) value applications, including flexible power generation, high-temperature heat, aviation and shipping, and biobased materials and chemicals.
- Also bioenergy with carbon capture and storage or utilization, or BECCS/U is expected to play a substantial role in climate change mitigation.
- Despite a clear direction, the transition pathway towards high-value applications, the logistical challenges, and experience from biomass mobilization strategies of developed markets and existing infrastructure remains underexplored.
- The Regional Transitions project analyzes future biomass market developments to identify possible logistical challenges and explores strategies to increase the mobilization and deployment of local (endemic) low-value heterogeneous solid biomass resources and new energy crops in the changing market.

Thank you for your attention

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