Optimising the economic value of biobased solutions- competitive priorities and the role of governance

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Contents

- Biobased value chains
- Optimising the value of biobased solutions: value chain and competitive priority approaches to:
  - Understand the systems
  - Focus optimisation and improve governance
- Measure competitive priorities with robust measures
  - Indicators are critical; Life Cycle Thinking can be a supportive tool together with other approaches
- The role of governance
  - Policy science is strong & robust modelling capacities are available
  - Governance considerations: what next?
- Further information

In a nutshell:

- **Value chains** of biobased solutions **are complex**; **clear focus** is **essential** to improve performance.
- Defining **priorities** and using **appropriate metrics** can steer support towards interventions that will overcome challenges and improve performance.
- Policies are in place; further **coordination of interventions** that target challenges and are **integrated along the value chain** can help.
- **Governance must be inclusive**: institutions must reach out to global initiative, society, and collaborate with social movements

Biobased value chains

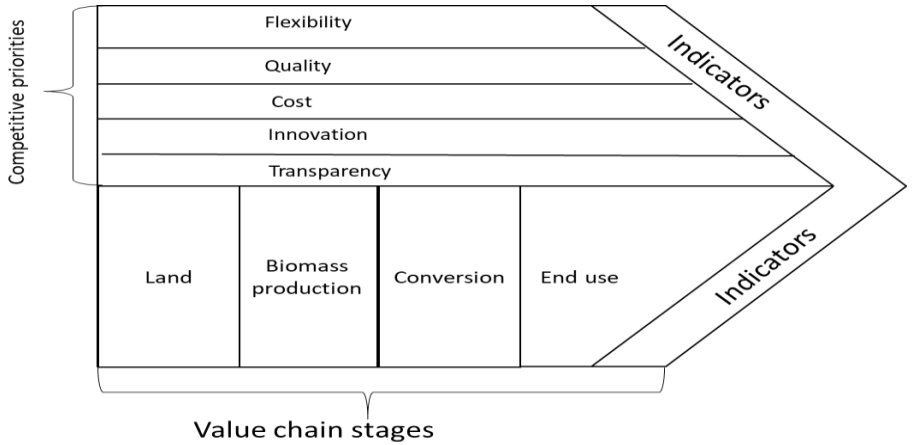
Increasingly varied & innovative

Imperative to comply with resource efficient and sustainable practices

Complex, open-ended or inconsistent, unrelated metrics

Lack of coherence in systems thinking to incorporate challenges

Individual stages within biobased value chains interrelate physical assets with market attributes; this cannot be fully addressed by single target optimisation



Porter, M.E., Competitive Advantage: Creating and sustaining superior performance. Vol. 167. 1985.

Panoutsou, Calliope & Singh, Asha (2020) A value chain approach to improve biomass policy formation. GCB Bioenergy 12 (7): 464-475 https://doi.org/10.1111/gcbb.12685

Value chain approach to address interconnectivity & **competitive priorities** to focus on challenges

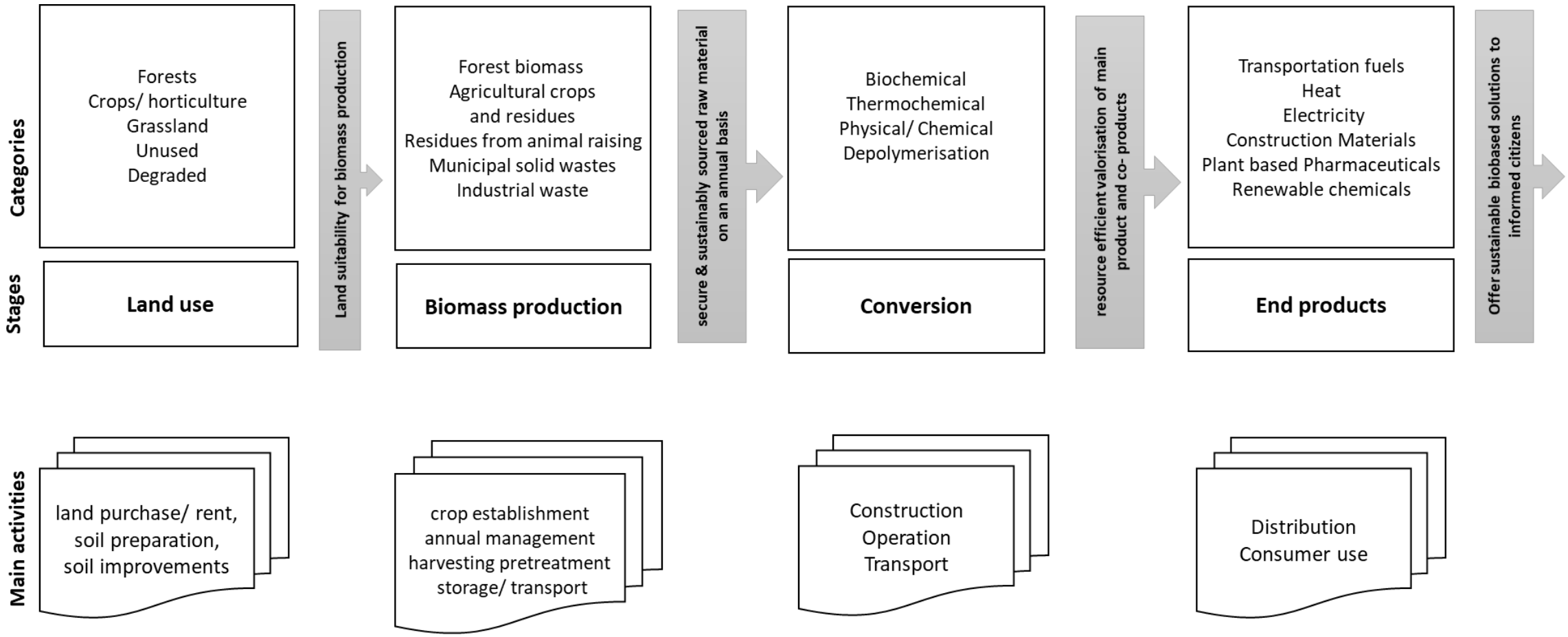
Understand the system: define key stages and underlying activities within biobased value chains; identify challenges that trigger major uncertainties; and explore competitive priorities to foster sustainability and resource efficiency.

Focus on economic, social and environmental **challenges**: propose metrics that are fit to measure performance, overcome challenges and steer focus on the competitive priorities within individual value chains.

Optimisation strategies to improve evidence, translate metrics to comprehensive messages, allow stakeholders to trace the rationale of any decision, and enable monitoring, future projections and comparisons.

Torjai, L., J. Nagy, and A. Bai. Decision hierarchy, competitive priorities and indicators in large-scale 'herbaceous biomass to energy supply chains. Journal of Biomass Bioenergy, 2015. 80: p. 321-329 DOI: https://doi.org/10.1016/j.biombioe.2015.06.013

Understand the ‘system’: value chain stages & activities



H. Yu, E. Román and W. D.Solvang. A Value Chain Analysis for Bioenergy Production from Biomass and Biodegradable Waste: A Case Study in Northern Norway. http://dx.doi.org/10.5772/intechopen.72346

Competitive priorities include:

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CHINESE ROOTS GLOBAL IMPACT

Global Transitions
Volume 2, 2020, Pages 60-75

Competitive priorities to address optimisation in biomass value chains: The case of biomass CHP

Calliope Panoutsou, Asha Singh, Thomas Christensen, Luc Pelkmans

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https://doi.org/10.1016/j.glt.2020.04.001

Flexibility: ability to expand or adjust capacity volume and adjust product design, range and variety

Ensure year- round biomass supply that can be adapted to local ecology and climate.

Adjust conversion pathways and scales to convert raw materials with variable qualities to energy, fuels and biobased products.

Quality: improving process and product performance and adherence to quality standards

Quality of raw materials, practices and end products are important for successful establishment and uninterrupted operation throughout the value chain lifetime.

Cost: production costs of goods sold as well as added-value generated

Competitiveness is related to individual stages costs; land use and biomass production account for 40-50%. Creating value with improved costs is important especially when highly innovative components are involved.

Innovation: raw material practices & conversion pathways

Innovation can define which value chain configurations perform best technically whilst being sustainable and resource efficient.

Transparency: system impacts, monitoring

Sustainability and avoidance of displacing other activities or product sectors.

Improve clarity and awareness of the benefits from their implementation.

Create trust among society.

Díaz-Garrido, E., M.L. Martín-Peña, and J.M. Sánchez-López, Competitive priorities in operations: Development of an indicator of strategic position. Journal of Manufacturing Science Technology, 2011. 4(1): p. 118-125 DOI: https://doi.org/10.1016/j.cirpj.2011.02.004

Saarijärvi, H., H. Kuusela, and M.T. Spence, Using the pairwise comparison method to assess competitive priorities within a supply chain. Industrial Marketing Management, 2012. 41(4): p. 631-638 DOI: https://doi.org/10.1016/j.indmarman.2011.06.031

Focus the assessment

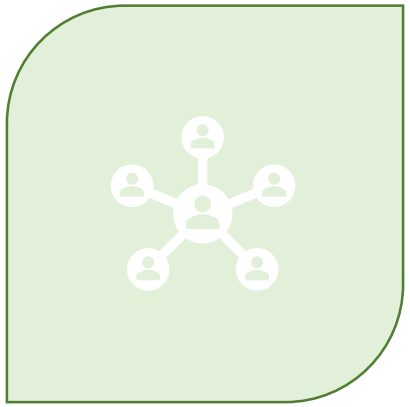
Define competitive priorities to address challenges by:
i) applying co-creation approaches,

ii) being inclusive of:
* global partnerships
* local communities
* social groups usually under-represented

	Challenges that trigger uncertainties for sustainability and resource efficiency	Relevant competitive priorities
Land use	Minimising competition with current land uses	Quality
	Avoid displacement of other land-based activities	Innovation
		Transparency
	Exploit low quality, marginal land	**Cost**
	Improve land quality and maintain soil organic matter	Quality
		Innovation
Biomass production	**Year-round, sustainable biomass supply**	**Cost**
	Competition for biomass feedstocks Biodiversity loss	Innovation
	Maintain low input and less intensive cropping practices	
	Safeguard low soil compaction and soil carbon	Flexibility
		Quality
	Maintain low emission levels or pollution discharge from pre-treatment Reduce the carbon footprint of storage & transport	Quality
Conversion	Site selection for the plant location	Innovation
	Access to technology	Quality
	Low emissions performance,	Flexibility
	Handling mixed volumes of feedstocks **Optimising synergies for valorisation of residues and co-products**.	**Cost**
End use	**Compatibility of the bio-commodities with processes and standards** **Replaceability and competition with existing infrastructure and distribution channels**	Quality
		Cost
	Awareness Public perception	Transparency

Measure competitive priorities with robust metrics:

ECONOMIC



SOCIAL

ENVIRONMENTAL

Economic value relates to:

- Affordability of land
- Biomass production and purchase costs
- Cost efficient conversion
- Market and price dynamics
- Local employment

The use of indicators appropriately is critical

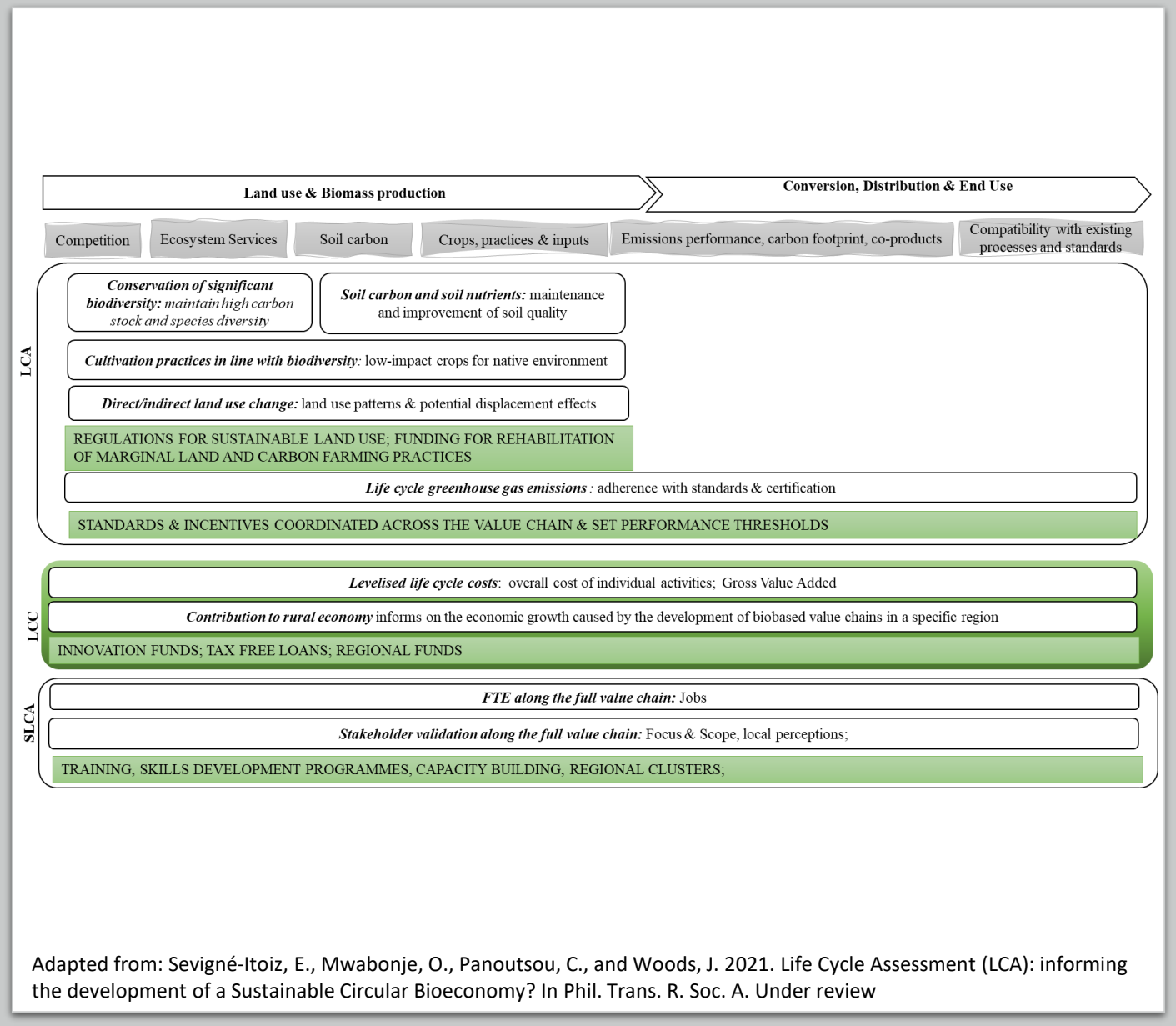
	Land use		Biomass production				Conversion			End use
Main activities / **Indicators**	Land acquisition	Soil management	Crop establishment & management	Harvest	Pre-treatment Storage Transport		Construction	Operation	Distribution	Consumer use
Levelised life cycle costs (€/tonne outputs)	Cost									
Technology readiness level for feedstock			Flexibility; Cost; Innovation							
Technology readiness level for conversion							Flexibility; Cost; Innovation			
Investments	Cost; Innovation						Cost; Innovation			
Gross Value Added										Cost; Flexibility
FTE along the full value chain (number of full-time jobs/tonne or GJ of end products)	Cost; Innovation									
Contribution to rural economy (€/tonne product)	Cost; Transparency									

Panoutsou, C., Singh, A., Christensen, T. (2020) Competitive priorities to address optimisation in biomass value chains: The case of biomass CHP, *Global Transitions*

Life Cycle Costing within Life Cycle Thinking is a useful tool

- Unit-cost approach across value chain stages but also assess the effects on societal welfare caused by exchanges that would otherwise not be accounted for (externalities).

- In biobased value chains this facilitates grouping of budgets costs, transfers and externalities, in each biomass supply and value chain stage and identification of respective physical and economic parameters.



Adapted from: Sevigné-Itoiz, E., Mwabonje, O., Panoutsou, C., and Woods, J. 2021. Life Cycle Assessment (LCA): informing the development of a Sustainable Circular Bioeconomy? In Phil. Trans. R. Soc. A. Under review

Martinez-Sanchez V., Kromann M.A, Astrup T.F. 2015. Life cycle costing of waste management systems: overview, calculation principles and case studies. Waste Manag 36, pp. 343-355. (DOI 10.1016/j.wasman.2014.10.033)

Many more approaches for optimisation of complex multidisciplinary biobased systems

- Techno-economic assessment (TEA),
- Market assessment,
- Systems modelling,
- Future studies,
- Case studies
- Behavioural characterization and expert elicitation

The role of governance

- More than sixty (60) countries with strategies.
- More than ninety (90) policy instruments with relevance to bioeconomy in EU.
- More than forty (40) modelling capacities providing evidence.
- European Green Deal & SDGs: win- win solutions for economic recovery and social resilience within safe planetary boundaries

More than sixty (60) countries with strategies.

Dietz, Thomas, Rubio, Karla, Börner, Jan. (2020): Designing Sustainability Governance for the Bioeconomy – a Global Expert Survey. International Advisory Council on Global Bioeconomy. Berlin, Germany.

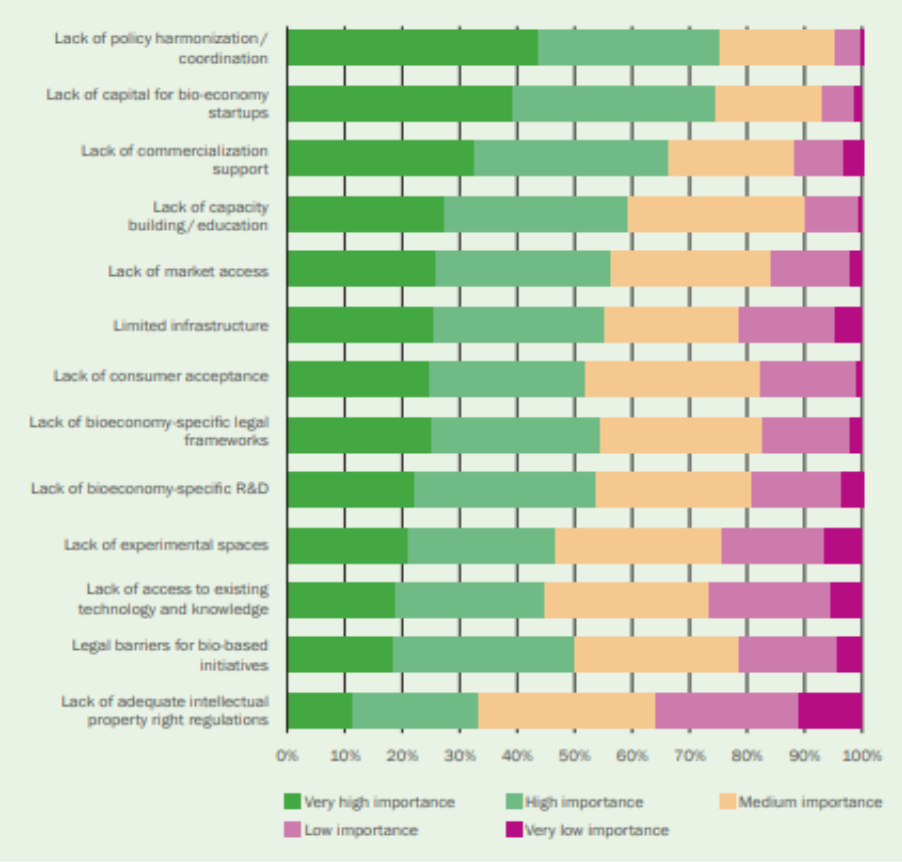


Figure 13: Importance of identified national governance gaps ("I don't know" < 15%, not shown)

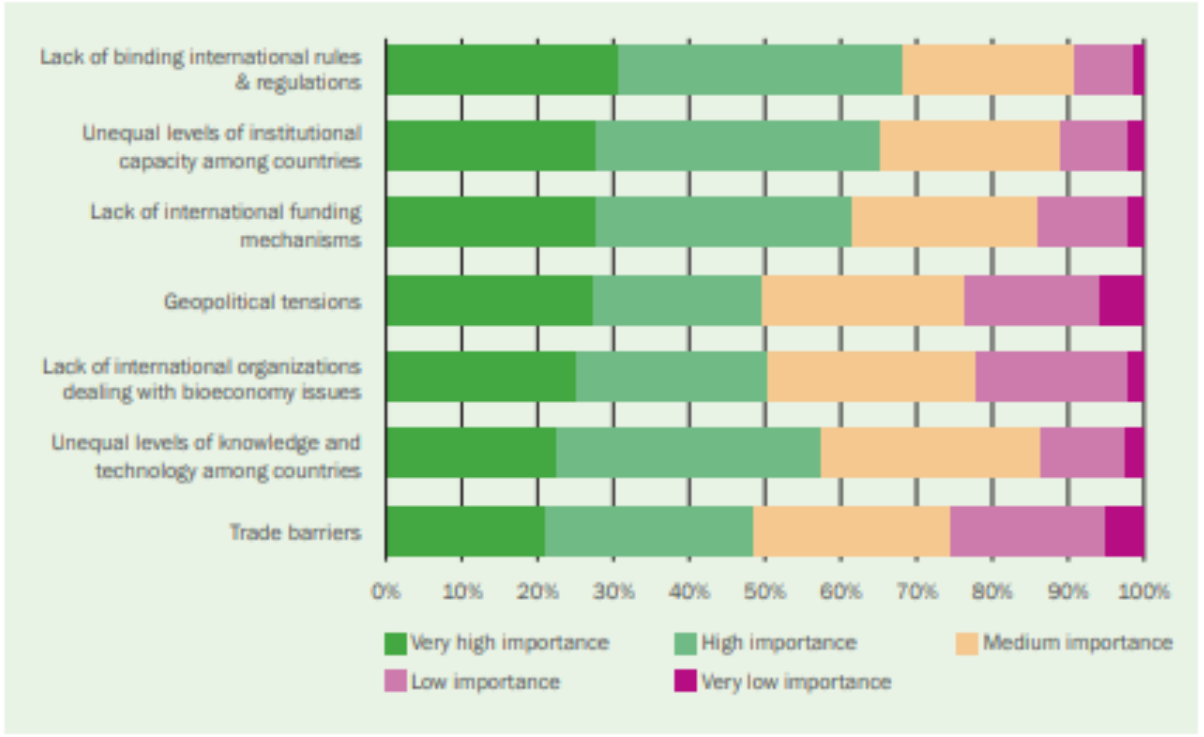


Figure 17: Importance of identified international governance gaps ("I don't know" < 15%, not shown)

Is the policy framework adequate (enabling & regulatory)?

- Out of almost 90 biomass, bioprocessing and biobased product policies reviewed, many are still not completely coherent with the core bioeconomy objectives and do not act in synergy.
- Only a few policy documents included the term bioeconomy in their content, however, they do enable/ reguate some of the objectives of the Bioeconomy Strategy.
- Need to complement existing policies with a mix of policy instruments, incl. financial, regulatory and information provisions which can improve coherence with European Green Deal, Circular Bioeconomy and Sustainable Development Goals (SDGs).

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Global Transitions
Volume 3, 2021, Pages 13-42

Policy review for biomass value chains in the European bioeconomy

Asha Singh, Thomas Christensen, Calliope Panoutsou

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https://doi.org/10.1016/j.glt.2020.11.003

More than forty (40) modelling capacities providing evidence.

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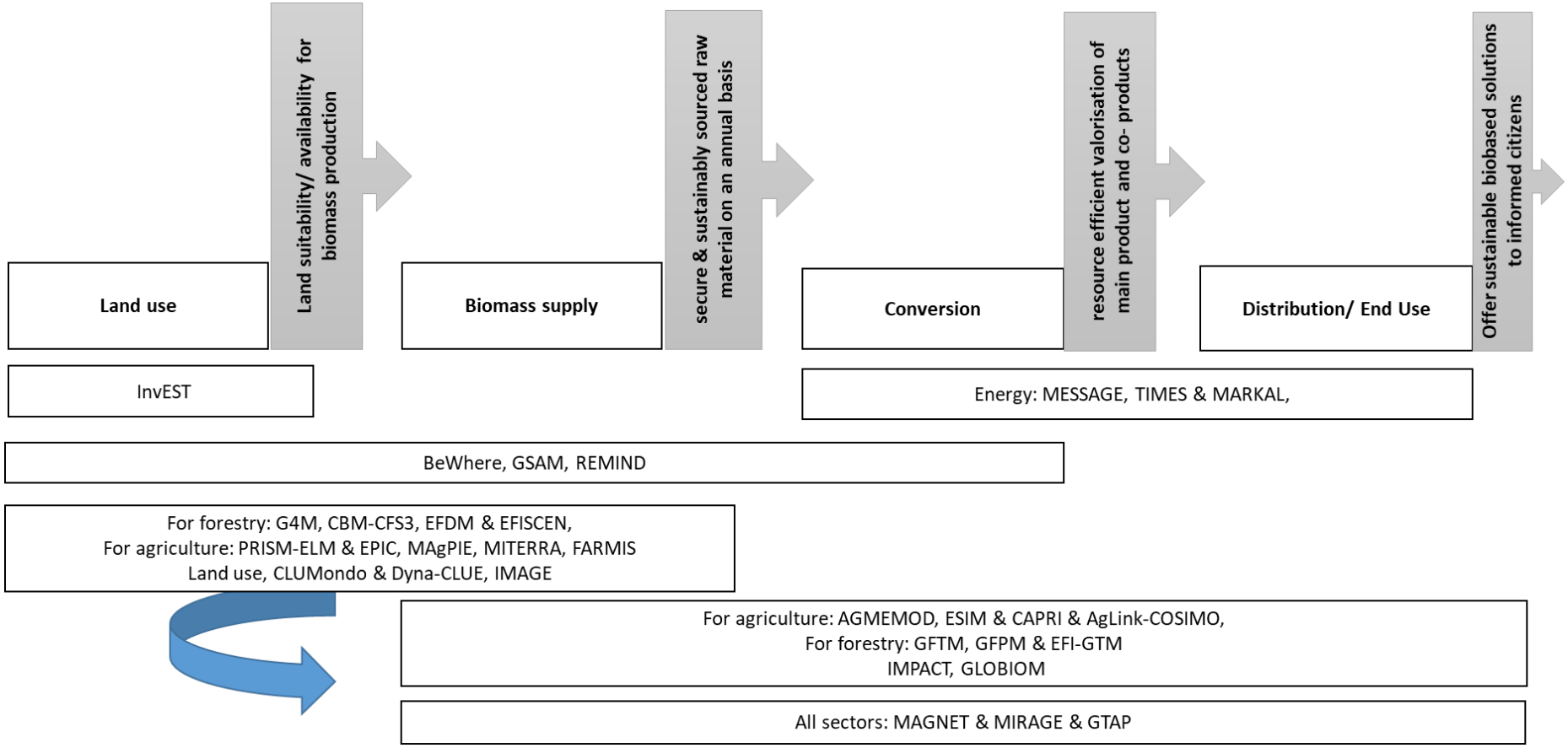
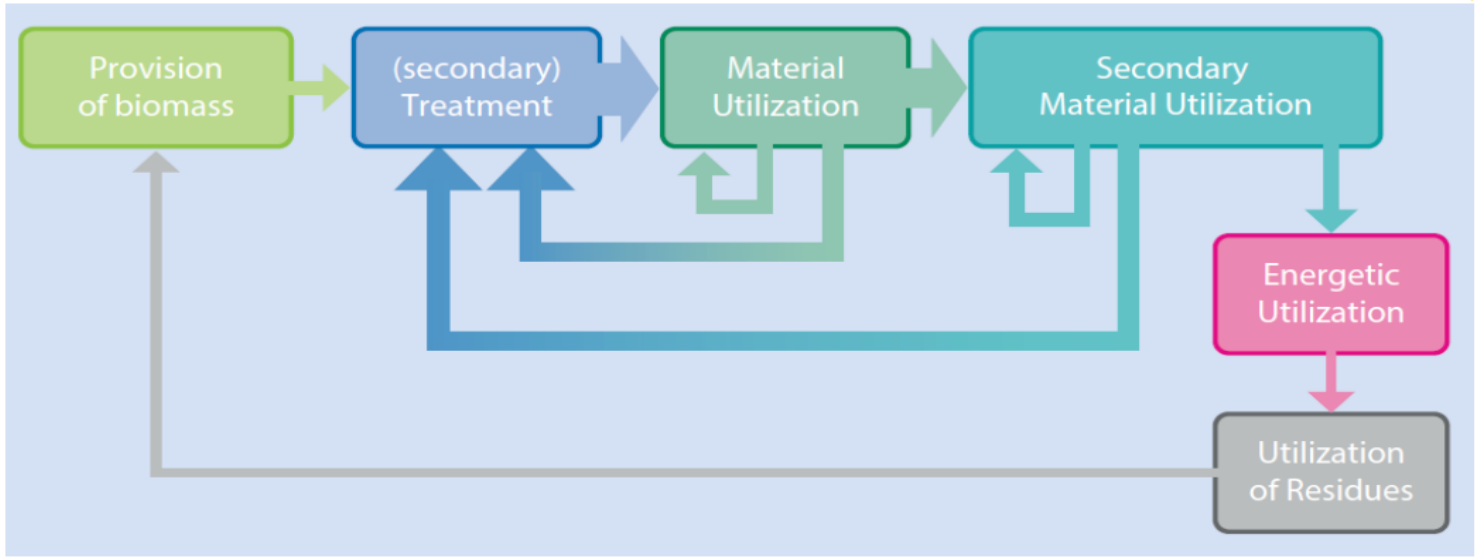
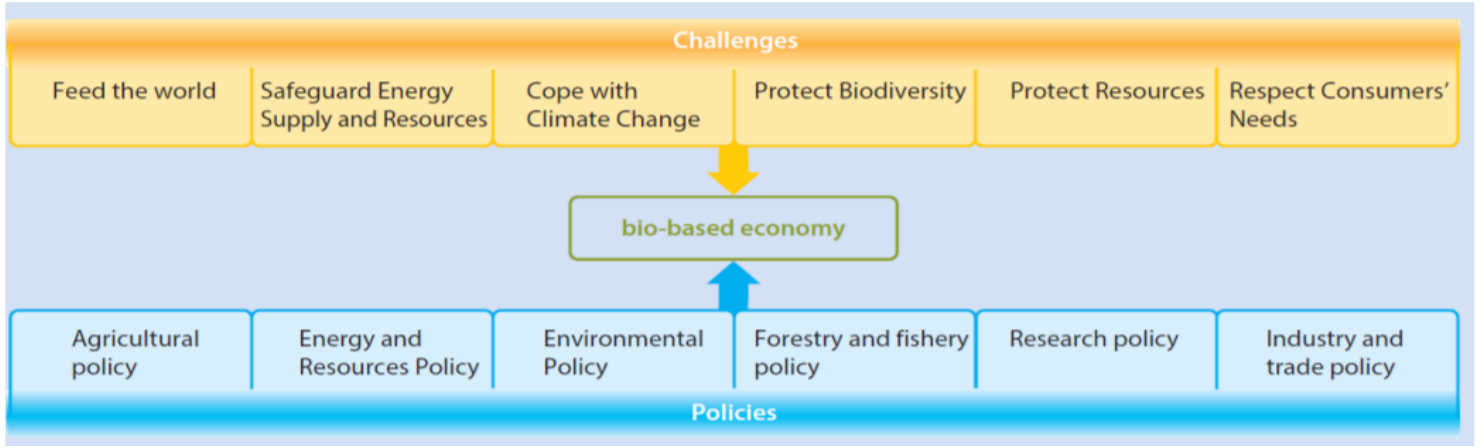


Ongoing work in BioMonitor project: www.biomonitor.eu

Double integration challenge of bioeconomy governance: Technologies and policies





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Can models evaluate integrated performance for bioeconomy?

Models cross-referenced with sustainable agriculture policies and respective bioeconomy sectors, value chain stages and indicator groups addressed – including additional sectors and value chain stages that are only covered within models (red asterisks)

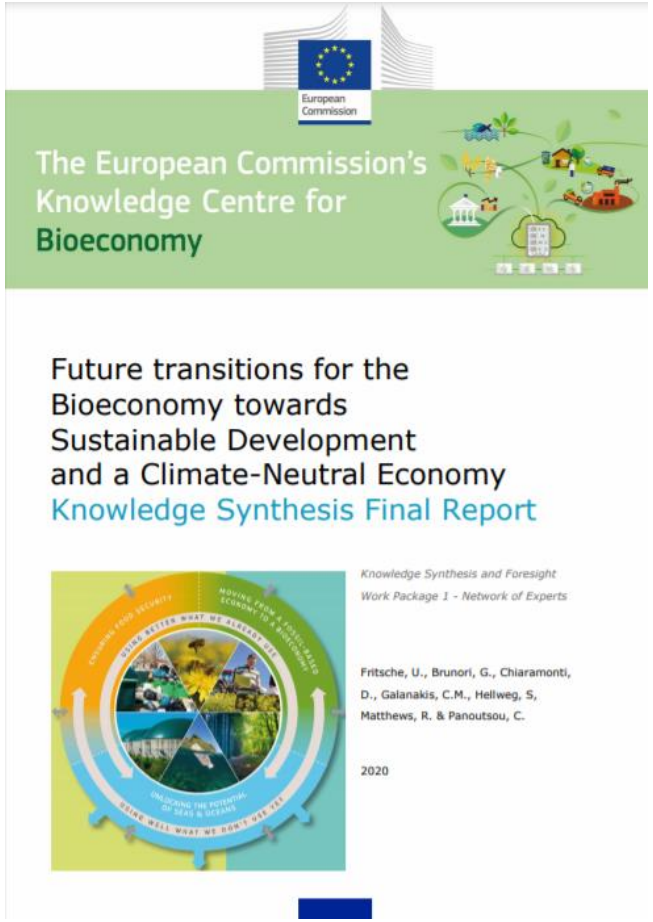
From: Christensen et al., 2021. Closing the gap between modelling and policy-making efforts addressing the five objectives of the EU bioeconomy. In Ecological Economics, Under Revision.

Governance considerations: what next?

- **Research & Innovation:** good governance can support research to learn about each method's potential, cost, and side effects
- **Life Cycle Thinking:** Establish the mechanisms and tools needed to develop agreement, coordination standards and incentives to ensure change throughout the whole sector and ensure a real and successful biobased transition.
- **Supporting appropriate adoption and upscaling**: good governance and incentives could support adoption and upscaling of carbon removal.
- **Establishing social and environmental safeguards**: good institutions will be needed to balance the potential benefits of carbon removal with its social and environmental risks.
- **Policy:** focus governance on critical challenges that lower performance and restrict future implementation.
- **Financing:** green funds to improve process efficiency, product quality and scale up innovative technologies – target co-location with existing biorefineries.

https://www.american.edu/sis/centers/carbon-removal/fact-carbon-removal.cfm
Panoutsou C., Germer S, Karka P., Papadokostantakis S., Kroyan Y., Wojcieszyk M., Maniatis K., Marchand P. 2021. Advanced biofuels to decarbonise transport by 2030: Markets, challenges, and policies that impact their successful market uptake. Energy Strategy Rev. In print

Further information:



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- Economist (2020) What is the point of green bonds? The Economist 19 Sept 2020 https://www.economist.com/finance-and-economics/2020/09/19/what-is-the-point-of-green-bonds
- EURACTIV (2021), Biomass can contribute to sector integration in Green Deal, Biomass can contribute to sector integration in Green Deal – EURACTIV.com,
- …and many more!

Please join our survey: https://biomonitor.eu/news/join-our-survey-build-policy-narratives-future-bioeconomy/

Join our Survey and Help Us Build Narratives of the Future through the Bioeconomy

The BioMonitor project is setting up its storylines and narratives that can best reflect our bioeconomy futures. To meet the need of its users, the consortium is asking for your help by participating in a survey

Press release - 03 Dec 2020

Thank you!


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