Summary Series

Mobilizing Sustainable Bioenergy Supply Chains

IEA Bioenergy Strategic Inter-Task Project

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Mobilizing Sustainable Bioenergy Supply Chains

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With contributions of over 70 members of IEA Bioenergy Tasks 37, 38, 39, 40, 42, and 43

SUMMARY

This report is based on the results of a project that analyzed sustainable bioenergy production systems to determine the factors critical to their mobilization through a series of case studies. This work focused on five globally strategically significant bioenergy supply chains representing major global biomes and potential primary and residue supplies:

- forest biomass from temperate and boreal ecosystems;
- agricultural crop residues in Denmark, Canada and the USA;
- regional biogas production from municipal solid waste (MSW), oil palm residues and co-digestion of municipal and agricultural wastes;
- integrating lignocellulosic crops into agricultural landscapes and
- pasture and grassland cultivation in Brazil.

The most prominent driving forces for modern bioenergy expansion on a global scale are political instruments to reduce reliance on non-renewable, imported fuels and to meet GHG reduction targets. The desire for growth of the bioenergy sector is also driven by a number of other factors, including: rural economic development and employment; a need for product diversification in the forest and agricultural sectors; the desire to find innovative uses for residue streams and waste products; and efforts to improve the productivity of forests, fields and degraded lands. Generally speaking, policy drivers underpinned by financial incentives have been more critical in influencing bioenergy expansion at local to global scales than market factors, and as a result, outside of local, small-scale applications many supply chains are not yet economically viable without external support. Government support and financial incentives therefore continue to be important to encouraging the mobilization of bioenergy supply chains.

Biomass supply chains and conversion technologies are in various stages of commercial readiness and exhibit different levels of complexity; therefore, the applicability and extent of the challenges identified will vary from supply chain to supply chain. Understanding different feedstocks production and conversion pathways producing biofuels, bioenergy and co-produced bio-based products is crucial to face these challenges and developing an effective business case for emerging industries.

One of the major challenges to realizing mobilization potential is that biomass supply infrastructure has not yet been fully established in many parts of the world. Efficient and commercially viable conversion technologies are also lacking for a number of supply chains and regions. Furthermore, the willingness of stakeholders to invest in infrastructure and technology is challenged by uncertainties surrounding long-term feedstock supply of both crops and value chain residues. This variability is due to different operational, sustainability and conversion constraints acting along specific supply chains, which need to be better understood to develop realistic resource assessments.

Challenges to mobilizing bioenergy supply chains are not only present in the technologies and the economics of logistical systems, but also in institutional development. Policies need to be

coordinated across departments (e.g., forests, agriculture, energy, environment and climate change) to support and govern emerging bioenergy systems. Regulations must ensure that increased biomass outputs respect sustainability considerations, which also need to be better understood.

Critical to supporting the mobilization of sustainable bioenergy supply chains is continued research and development into supply chain optimization, particularly developing more efficient and cost-effective technologies. Significant opportunities also exist to increase supply chain efficiencies through technology transfer from regions with well-developed supply chains to regions with minimal bioenergy deployment and learning-through-doing. Streamlining biomass supply chains with existing silvicultural and agricultural practices (e.g., timing of operations, use of machinery) is another opportunity to increase efficiencies and cost effectiveness, while at the same time increasing the overall productivity of existing practices.

If bioenergy supply chains are to be sustainable over the long term and appeal to a wide range of stakeholders, they must be economically attractive, socially acceptable and/or offer social and economic benefits to communities, and, maintain or improve ecosystem services.

The synthesis report as well as the supply chain reports are available at:
http://www.ieabioenergy.com/publications/mobilizing-sustainable-bioenergy-supply-chain

CONCLUSIONS

Significant opportunities exist to reduce greenhouse gas emissions, increase domestic energy security, boost rural economies and even improve local environmental conditions through the deployment of sustainable bioenergy and bio-based product supply chains. There is currently a wide variety of promising feedstocks, conversion pathways and different end products that can be produced at a range of scales. However, there are a number of technical, institutional, and socio-economic challenges to market penetration of bioenergy that need to be faced in order to realize opportunities on a wider scale (Figure 1). Some of the most significant challenges include issues related to: supply chain complexity and cost, including logistics and intermediate storage; market development and penetration; confidence in feedstock inventory estimates; development status of major conversion technologies; and satisfying a growing number of sustainability requirements.

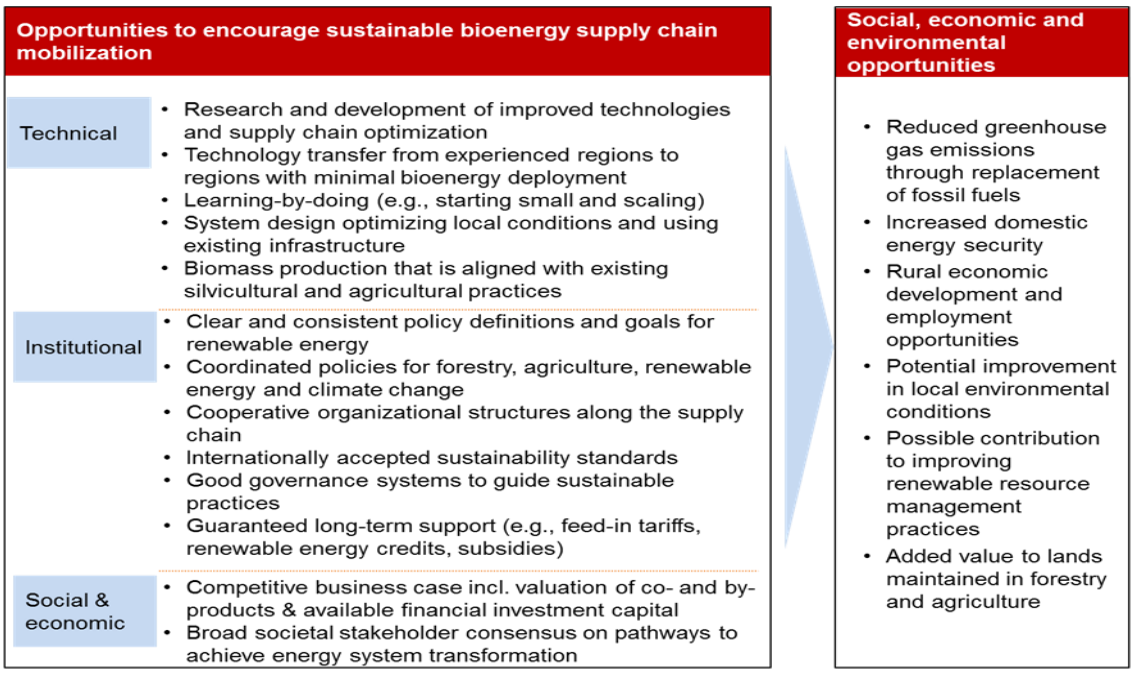

Figure 1. Summary of opportunities to mobilize bioenergy and realize positive benefits

IEA BIOENERGY

The IEA Bioenergy Technology Collaboration Programme (www.ieabioenergy.com) is a global government-to-government collaboration on research in bioenergy, which functions within a framework created by the International Energy Agency (IEA - www.iea.org). As of the 1st January 2016, 23 parties participated in IEA Bioenergy: Australia, Austria, Belgium, Brazil, Canada, Croatia, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Republic of Korea, the Netherlands, New Zealand, Norway, South Africa, Sweden, Switzerland, the United Kingdom, the USA, and the European Commission.

The mission of IEA Bioenergy is to increase knowledge and understanding of bioenergy systems in order to facilitate the commercialisation and market deployment of environmentally sound, socially acceptable, and cost-competitive bioenergy systems and technologies, and to advise policy and industrial decision makers accordingly. The Agreement provides platforms for international collaboration and information exchange in bioenergy research, technology development, demonstration, and policy analysis with a focus on overcoming the environmental, institutional, technological, social, and market barriers to the near- and long-term deployment of bioenergy technologies.

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Further Information

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