IEA Bioenergy

Mobilizing Sustainable Bioenergy Supply Chains

General conclusions of the IEA Bioenergy study

Carried out with cooperation among
IEA Bioenergy Tasks 37, 38, 39, 40, 42, and 43

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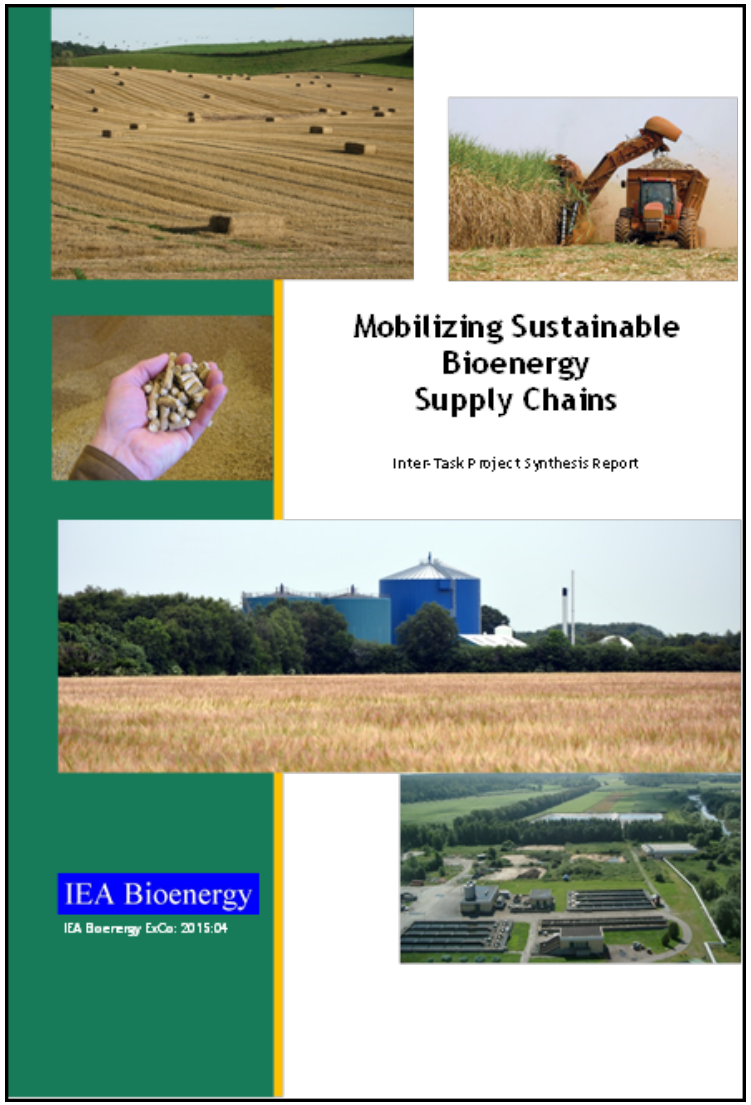
IEA Bioenergy Task 43 – Biomass Feedstocks for Energy Markets

17 May 2016, ExCo77 Workshop, Rome, Italy

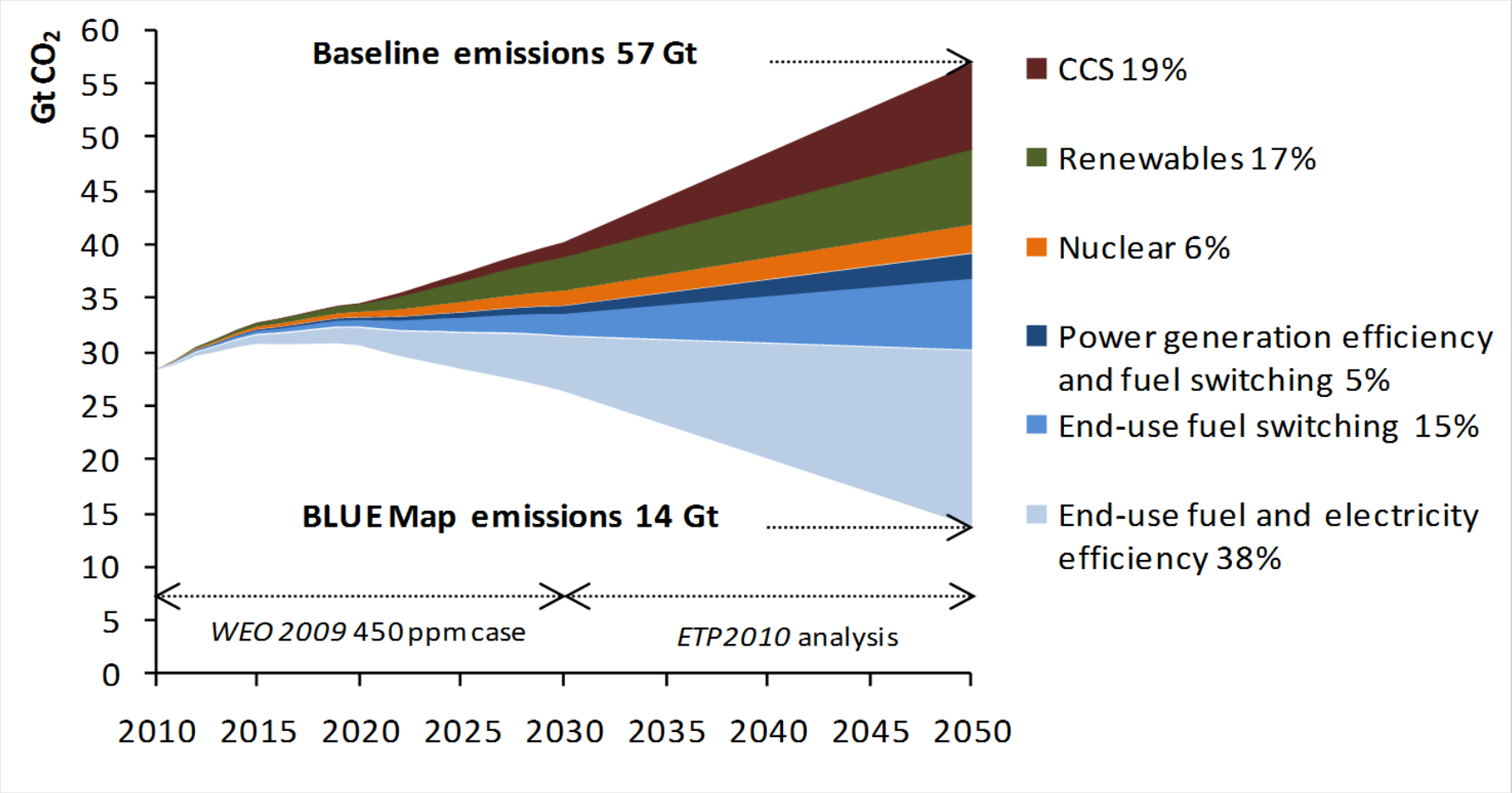


Presentation based on:

Smith, C.T., B. Lattimore, G. Berndes, N.S. Bentsen, I. Dimitriou, J.W.A. Langeveld, E. Thiffault (Eds.). 2015. Mobilizing Sustainable Bioenergy Supply Chains -- Inter-Task Project Synthesis Report. IEA Bioenergy ExCo: 2015:04. ISBN 978-1-910154-19-9 (printed paper edition). ISBN 978-1-910154-20-5 (eBook electronic edition). 170 pp.

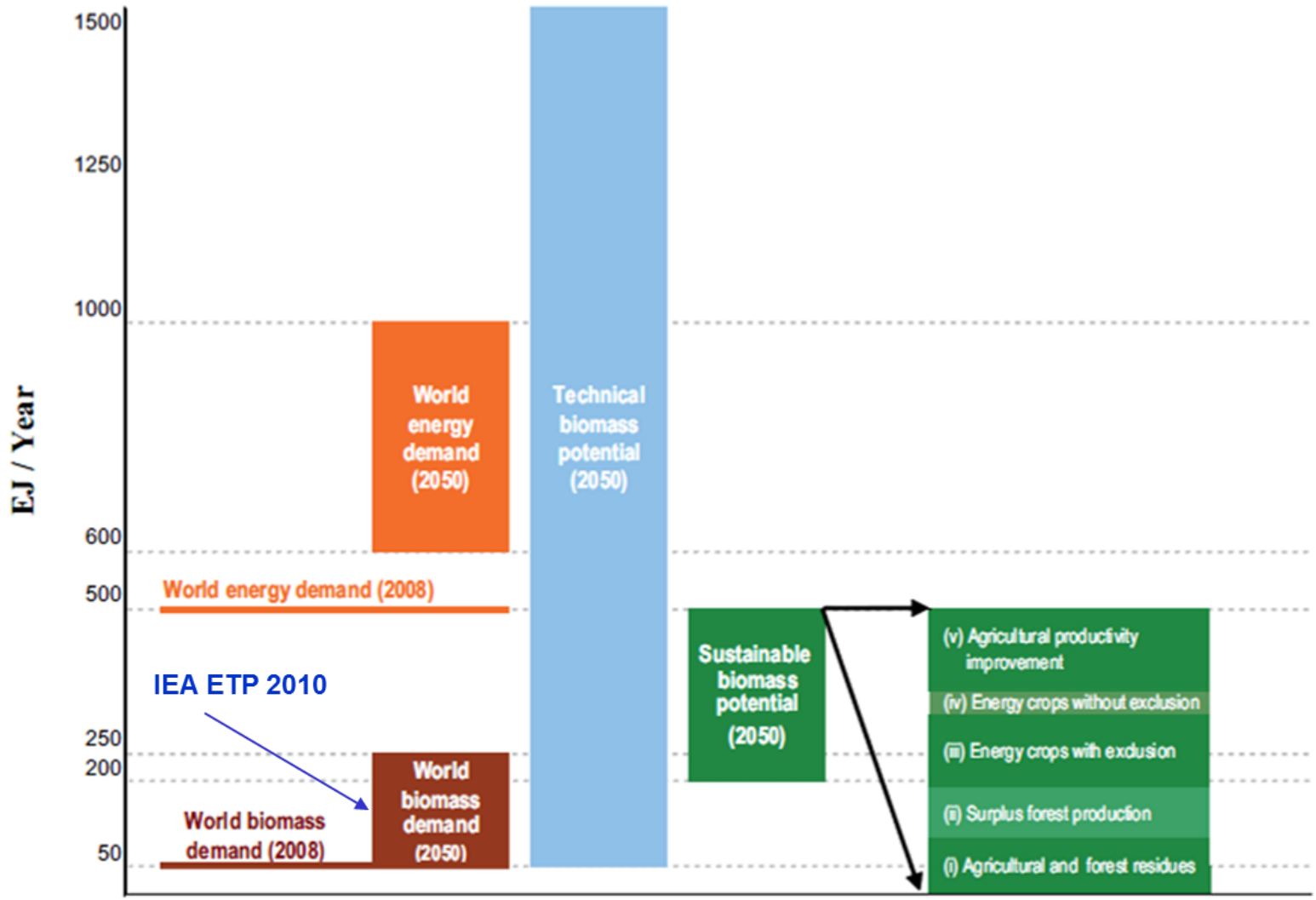
Available at:
http://www.ieabioenergy.com/publications/mobilizing-sustainable-bioenergy-supply-chains/

Significant opportunities exist to reduce greenhouse gas emissions, increase domestic energy security, boost rural economies and improve local environmental conditions through the deployment of sustainable bioenergy and bio-based product supply chains



Source: ETP 2010, OECD/IEA 2010

But there is huge uncertainty about how large a sustainable contribution bioenergy can make.



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Source: IEA Bioenergy: ExCo: 2009:05
www.ieabioenergy.com

GLOBAL BIOENERGY PERSPECTIVES

- **Current bioenergy**
  - 'Modern' bioenergy: **10-15 EJ/year**
  - Total global bioenergy (2008): **50 EJ/year**

- **Deployment level suggested by IPCC scenarios by 2050**
  - 440-600 ppm CO_2^{eq} target: **80-150 EJ/year**
  - <440 ppm CO_2^{eq} target: **118-190 EJ/year**

- **Current production of forest and agricultural biomass**
  - Industrial roundwood: around **15 EJ/year**
  - Major agricultural crops: about **60 EJ/year**.

Is a 10-fold increase likely, desirable, sustainable?

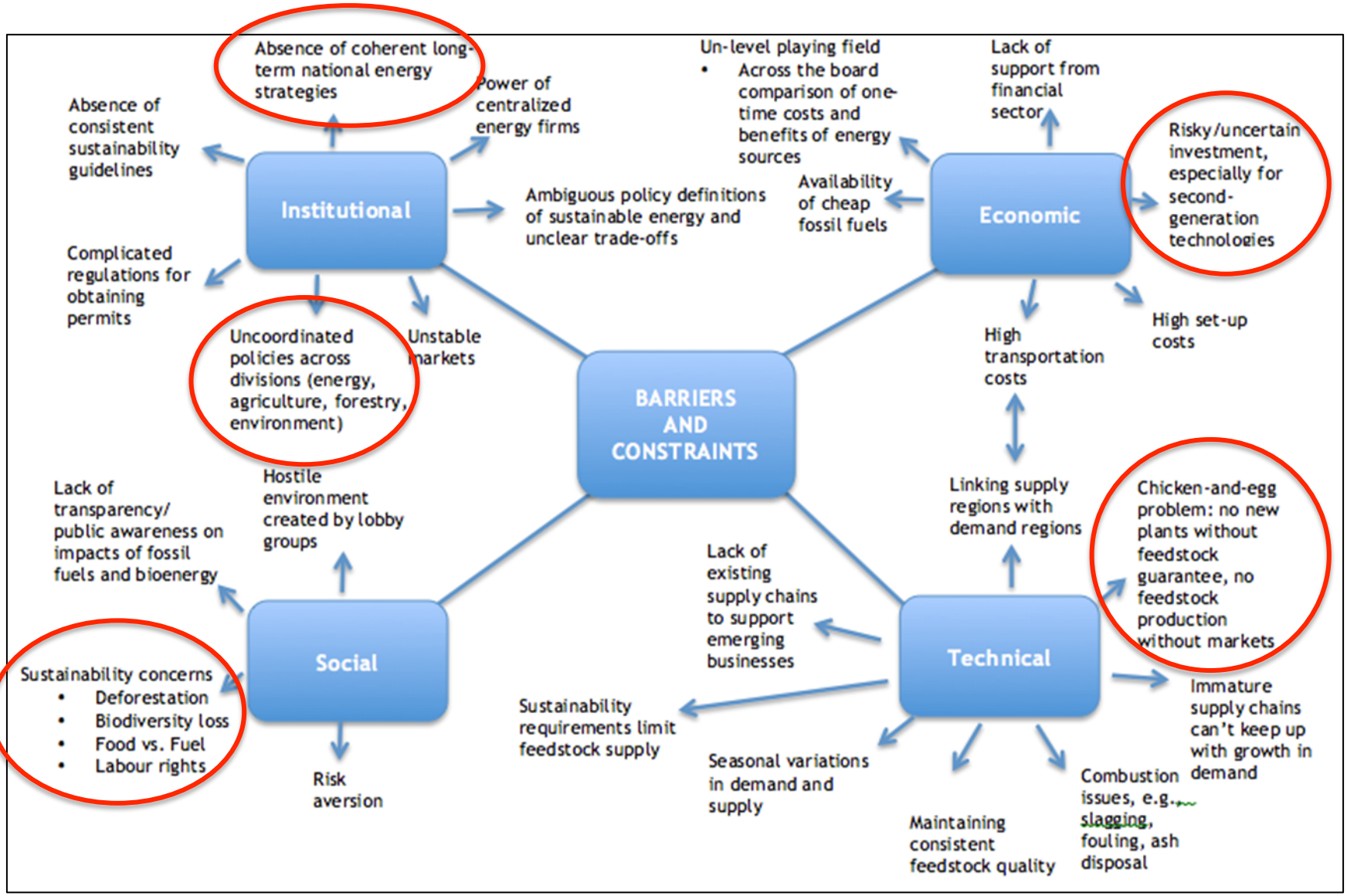
The overall objective of this 'mobilization' project was to enhance the mobilization of sustainable bioenergy supply chains.

- Identify the necessary elements of a successful and sustainable bioenergy supply chain.
- Develop new and existing frameworks that seek to understand and explain the underpinning elements that contribute to sustainable supply chains.
  - Include elements of availability of feedstock, applicable conversion processes, GHG balances, land use issues, governance mechanisms and other aspects of bioenergy production and supply.
- Stimulate integration across complex systems which leads to transfer of knowledge to new and upcoming bioenergy technologies or feedstocks in different regions of the world.
- Inform the debate, improve governance, and contribute to mobilization of sustainable supply chains globally.

Five supply chains were evaluated from both the 'bottom up' and 'top down'

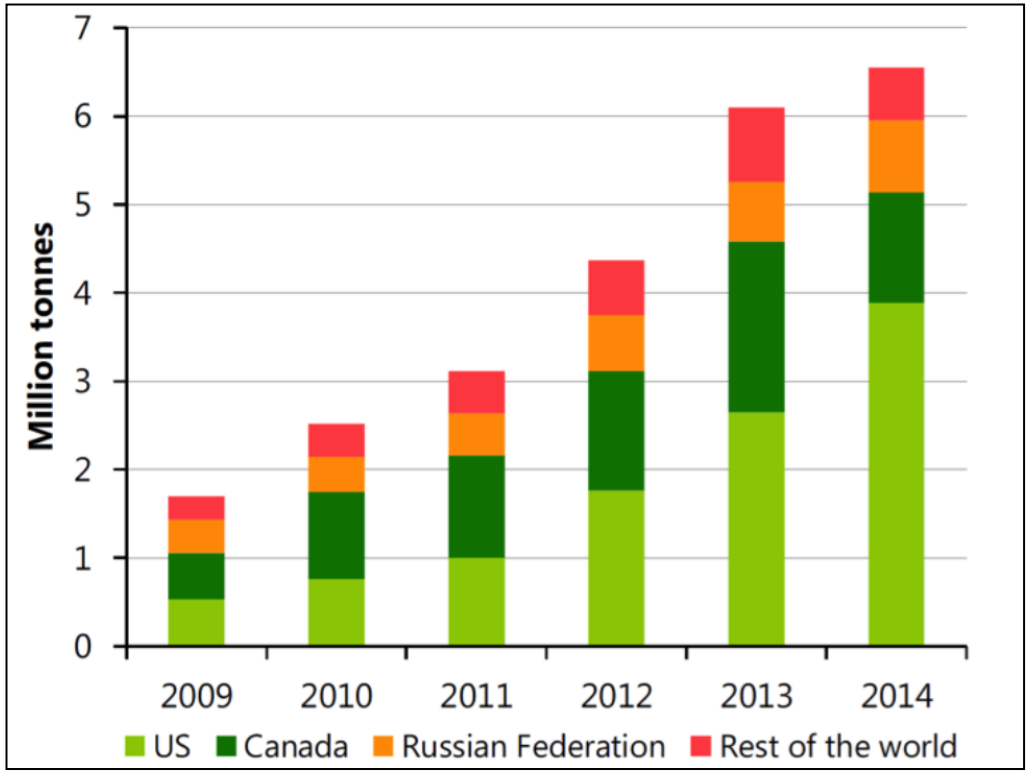
- Boreal & temperate forests
- Agricultural crop residues for bioenergy and bio-refineries
- Regional biogas from MSW, oil palm residues and co-digestion
- Integration of lignocellulosic crops into agricultural landscapes
- Cultivating pastures and grasslands: the sugar cane ethanol case

Barriers and constraints to bioenergy supply chain mobilization



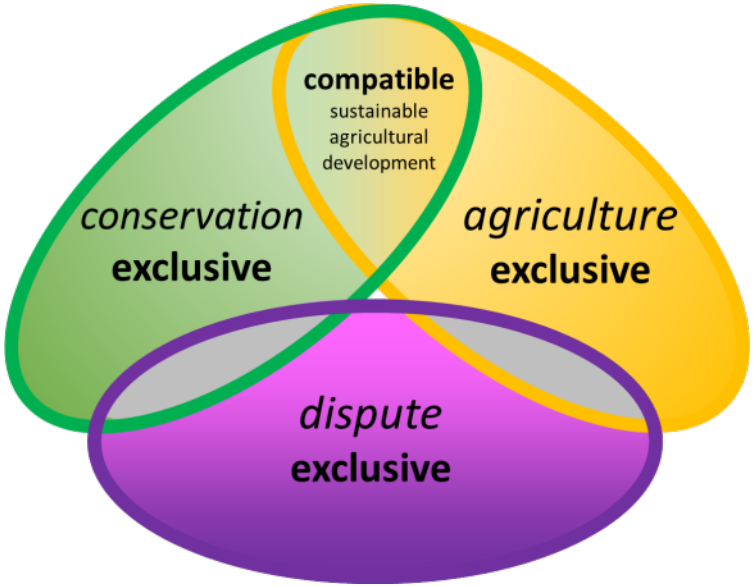
Importance of stable policy incentives that create significant markets

- Note significance of European incentives for growth of North American wood pellet exports e.g. EU 28 imports of wood pellets 2009-2014.
- Also, noting the importance of RFS2 on market development.
- **Need to mitigate investor risk through gov't action – e.g. price on carbon, incentives.**



Source: www.BioTrade2020plus.eu; UNECE-FAO 2015

Resolve potential sustainability values disputes among stakeholders



Science-based information demonstrates compatibility between agricultural and conservation interests in Brazil (Sparovek et al. 2016):

- Sufficient area to meet both conservation and production objectives
- Large scope for productivity gains supporting increased agriculture production -- increasing production does not require additional land
- Environmental protection is a complex multi-stakeholder process with multiple initiatives.

Poor governance

High forest biomass mobilization

- Biomass produced and used in large scale operations.
- Production emphasis is on higher quality land, converted pastures, etc.
- Competition for feedstocks with standard wood products is high, increasing pressure on forest resources.
- GHG benefits overall but sub-optimal due to significant LUC and iLUC effects.

Low forest biomass mobilization

- Biomass feedstocks sourced from residue streams and roundwood.
- Additional biomass demand leads to significant LUC effects and negative impacts on ecosystem services.
- Limited net GHG benefits.

Globally oriented

Forest bioenergy storylines

Regionally oriented

High forest biomass mobilization

- Biomass feedstocks from residue streams are fully utilized; other feedstocks also include tree and tree parts from sustainable forest management.
- Land use conflicts largely avoided due to strong land-use planning and integrated forest management and alignment of bioenergy production capacity with silvicultural practices to increase productivity.
- Ecosystem services are preserved at the site and landscape levels due to science-based sustainable forest management regulations.

Low forest biomass mobilization

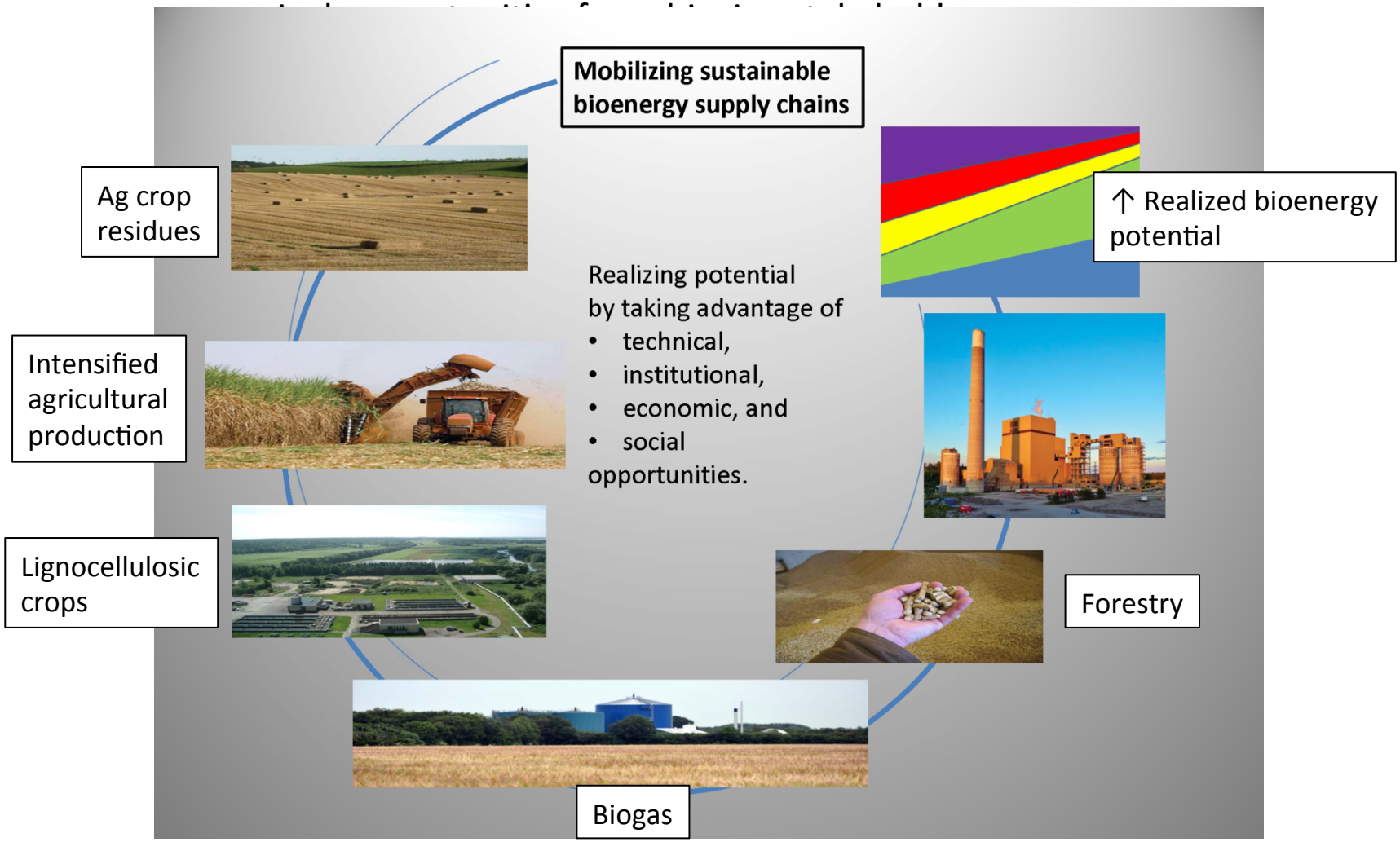
- Biomass feedstocks sourced exclusively from residue streams.
- Smaller scale bioenergy application used locally.
- Land use conflicts largely avoided, and ecosystem services are protected.
- Significant GHG mitigation benefits are constrained by limited bioenergy deployment.
- Global energy systems still dependent on fossil fuels.

Good governance

Adapted from : Chum et al. 2011

Opportunities for integrated landscape design and management

- Requires coordination across ag, forestry, environment and energy sectors



Summary of identified opportunities for mobilization and benefits derived

Opportunities to encourage sustainable bioenergy supply chain mobilization	
Technical	• Research and development of improved technologies and supply chain optimization • Technology transfer from experienced regions to regions with minimal bioenergy deployment • Learning-by-doing (e.g., starting small and scaling) • System design optimizing local conditions and using existing infrastructure • Biomass production that is aligned with existing silvicultural and agricultural practices
Institutional	• Clear and consistent policy definitions and goals for renewable energy • Coordinated policies for forestry, agriculture, renewable energy and climate change • Cooperative organizational structures along the supply chain • Internationally accepted sustainability standards • Good governance systems to guide sustainable practices • Guaranteed long-term support (e.g., feed-in tariffs, renewable energy credits, subsidies)
Social & economic	• Competitive business case incl. valuation of co- and by-products & available financial investment capital • Broad societal stakeholder consensus on pathways to achieve energy system transformation

Social, economic and environmental opportunities

- Reduced greenhouse gas emissions through replacement of fossil fuels
- Increased domestic energy security
- Rural economic development and employment opportunities
- Potential improvement in local environmental conditions
- Possible contribution to improving renewable resource management practices
- Added value to lands maintained in forestry and agriculture

Project leadership – on behalf of over 70 contributors

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Thanks!

Questions?

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