

**Environmental and governance  
challenges  
for mobilization of  
sustainable forest bioenergy supply  
chains**

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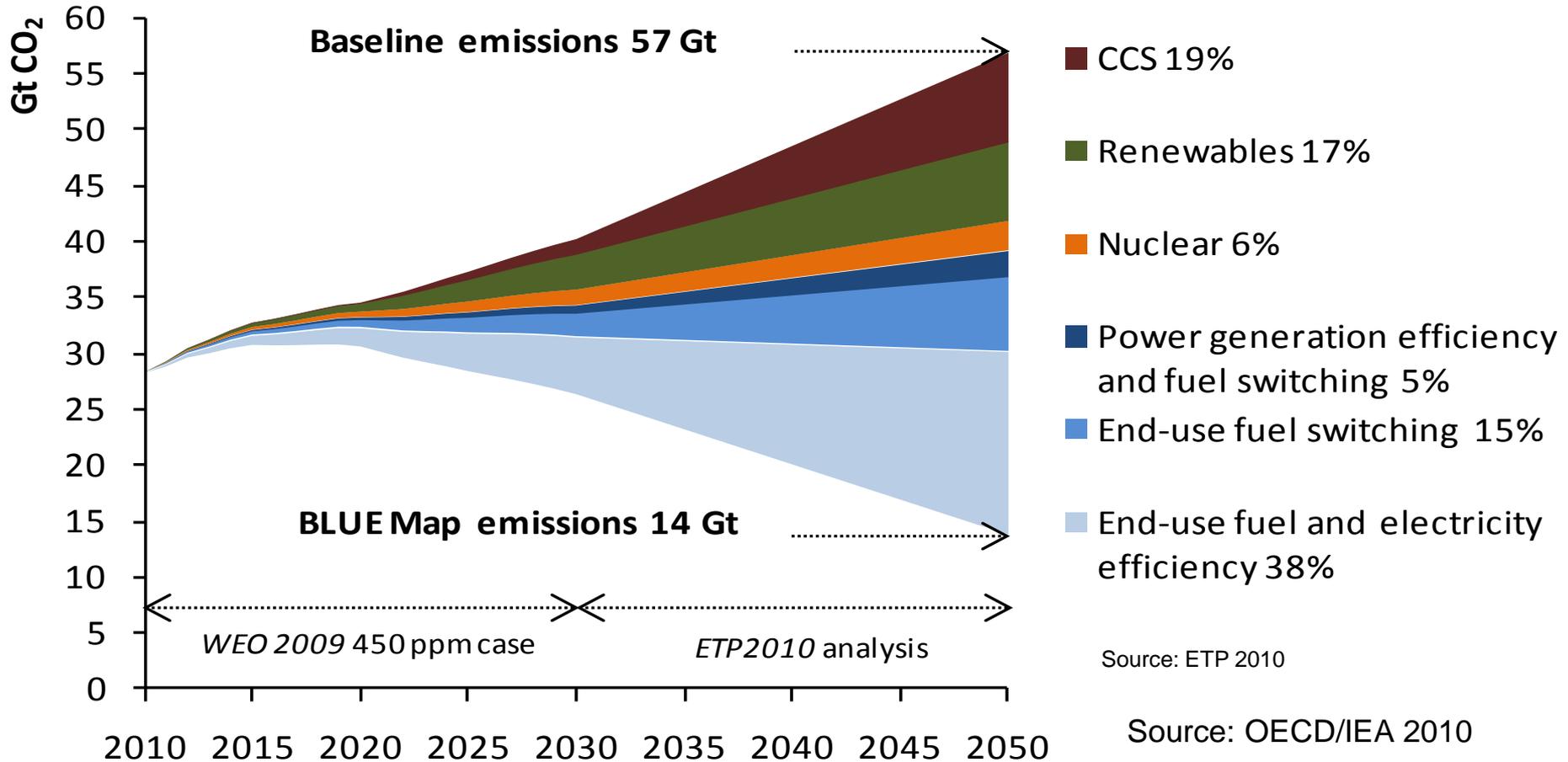
IEA Bioenergy Task 43

*Incorporating Bioenergy into Sustainable  
Landscape Designs*

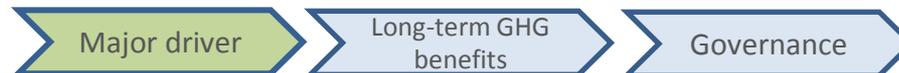
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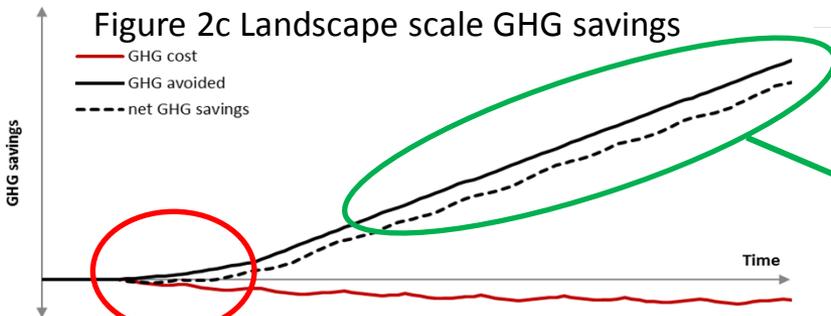
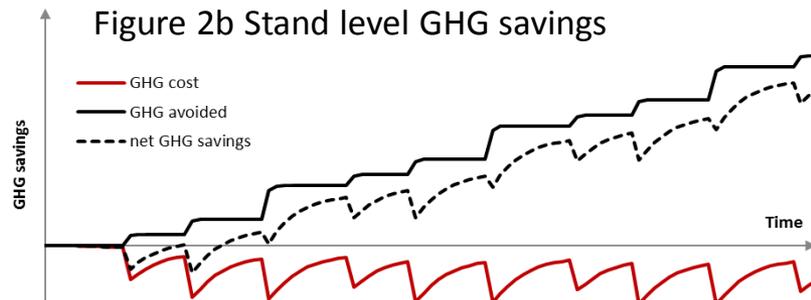
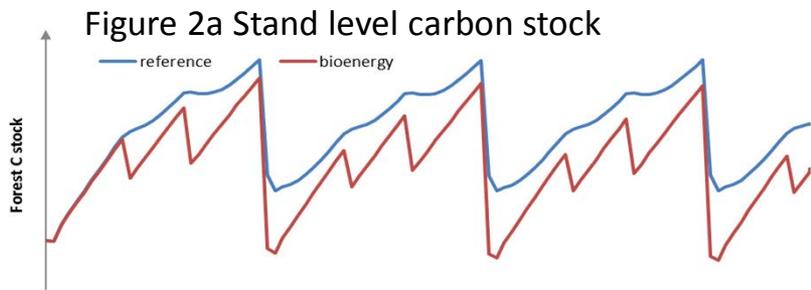
5 March 2014

# We need a global 50% CO<sub>2</sub> cut by 2050



- A wide range of technologies will be necessary to reduce energy-related CO<sub>2</sub> emissions substantially





## Note significance of:

- Long-term net benefits of bioenergy
- Forest ecosystem dynamics
- Forest management
- Feedstock source (residues, unused AAC)
- Fossil fuel reference system energy density
- Time

Cowie et al. -- IEA Bioenergy: ExCo:2013:04

Long-term GHG benefits

Short-term delay in timing of mitigation

Figure 2 illustrates the timing of GHG savings in a case where there is a GHG cost, using the example of a stand that is thinned twice before final harvest, and where thinning and harvest residues decay slowly on-site in the reference case. Figure 2a shows the carbon stocks ((sum of carbon in trees, soil and litter) at stand level in the reference and bioenergy cases. Figure 2b shows the GHG savings from an individual stand as the biomass removed from the forest is used for energy products, and Figure 2c shows the GHG savings summed across a landscape comprising multiple stands at different stages in the rotation cycle, assuming that all stands follow the red curve from Figure 2a.

Major driver

Long-term GHG benefits

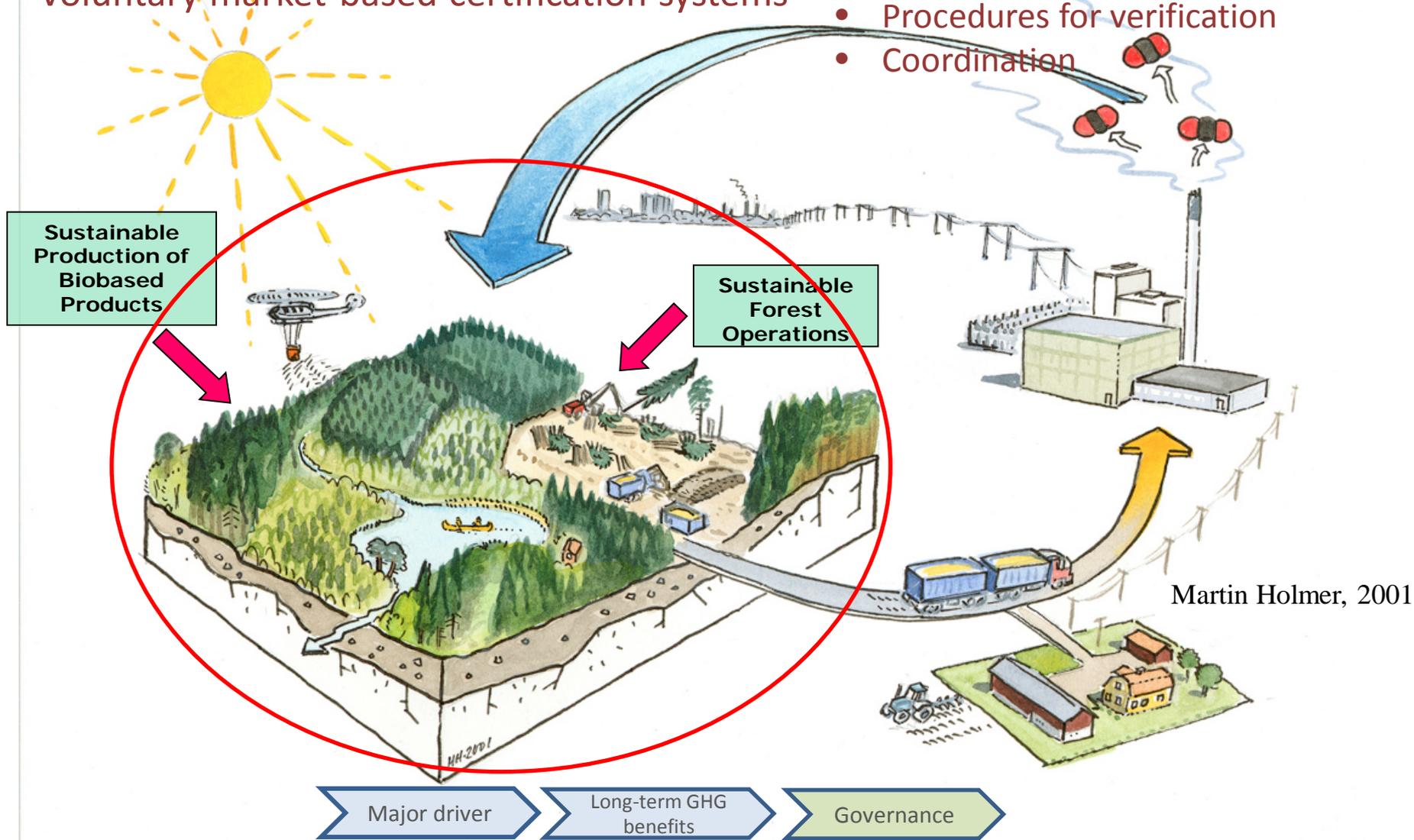
Governance

## Governance takes several forms:

- Strictly enforced regulations
- International sustainability standards
- State and provincial guidelines and BMPs
- Voluntary market-based certification systems

## Problems to solve:

- Sustainability criteria, incl. terms & intent
  - Primary forests
  - Biodiversity
- Procedures for verification
- Coordination



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