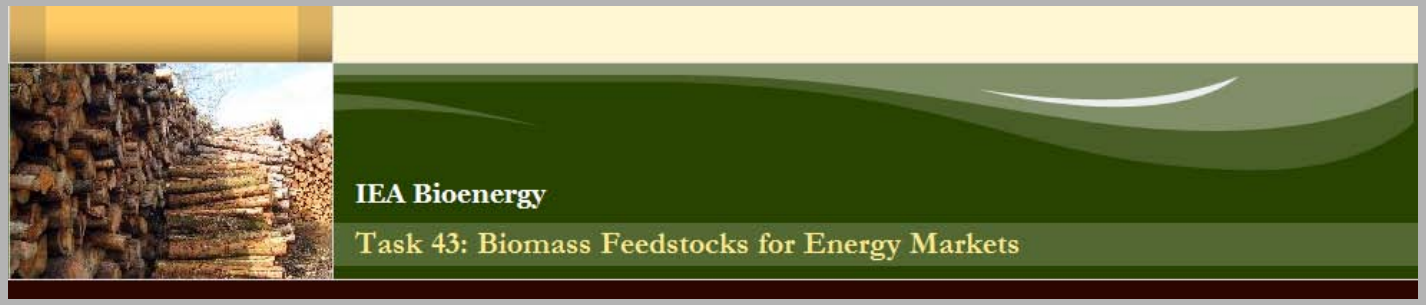
IEA Bioenergy Task 43 workshop

'Mobilizing Sustainable Supply Chains for Forest Biomass for Energy'



Charleston, South Carolina

21 February 2012

http://www.ieabioenergytask43.org/

IEA Bioenergy

Task 43: Biomass Feedstocks for Energy Markets

Objective

To promote sound bioenergy development that is driven by well-informed decisions in business, governments and elsewhere. This will be achieved by providing to relevant actors:

- timely and topical analyses,
- syntheses, and
- conclusions on all fields related to biomass feedstock, including:
  - biomass markets and
  - the socioeconomic and environmental consequences of feedstock production.

IEA Bioenergy

Task 43: Biomass Feedstocks for Energy Markets

Work scope for the Task period 2010-2012

The Task covers all aspects of feedstock, its markets and environmental as well as socio-economic impacts. It has a global scope and includes commercial, near-commercial and promising production systems in agriculture and forestry. The Task will be concerned with issues related to the linking of sustainable biomass feedstocks to energy markets, explicitly considering environmental and socioeconomic aspects. Systems analysis integrating several disciplines will be used to conduct analyses that allow evaluation of alternatives across sectors and explicit examination of issues related to tradeoffs, compatibility and synergies between food, fibre and energy production systems and related markets.

One central aim is to achieve strong outreach and impacts as a result of Task activities.

IEA Bioenergy

Task 43: Biomass Feedstocks for Energy Markets

Work programme -- organized to effectively address the questions:

- How can we further develop and implement feedstock production systems to provide attractive solutions for energy security, climate change, and sustainable development?

- How can policy and market based instruments effectively promote sustainable development, and how can science-based sustainability criteria and standards be formulated to take into account the vast regional variation in conditions for production of different feedstocks?

- What are costs and gains associated with productivity, competitiveness and environmental performance of feedstock supply systems and how do they impact deployment and market penetration of the systems?

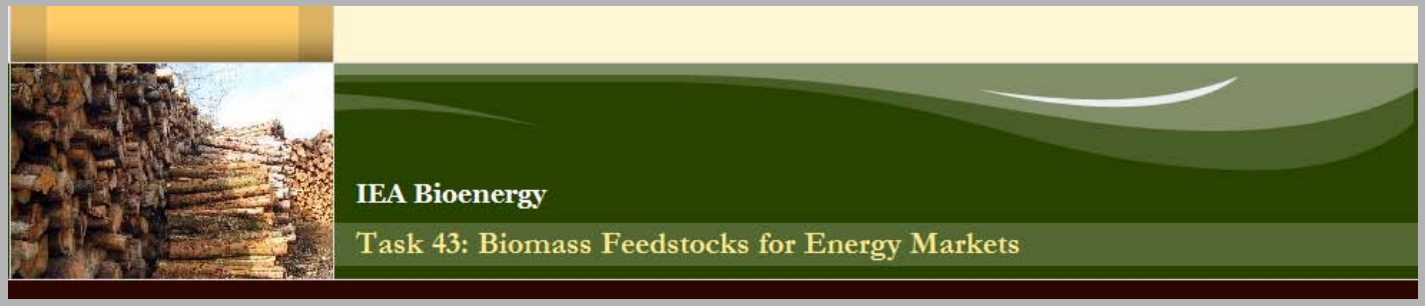
- What are the motivations, opportunities and capabilities for producers in agriculture and forestry to change from conventional production systems and deploy or integrate sustainable bioenergy production systems in response to new demands?

- What are necessary and sufficient conditions for financial investment in developing feedstock production systems?

Mobilizing Sustainable Supply Chains
--
Opportunities and Challenges

Tat Smith
Professor
Faculty of Forestry
University of Toronto

IEA Bioenergy Task 43 workshop
'Mobilizing Sustainable Supply Chains for Forest Biomass for Energy'



Charleston, South Carolina
21 February 2012

Overall message—

Mobilising Sustainable Bioenergy Supply Chains

The foundation for mobilising sustainable bioenergy supply chains should be a competitive business case that is efficient along the whole supply and value chain from the growing side to energy markets and consumers.

Sustainability criteria can often be viewed as constraints on the system, but also provide an adaptable framework that provides an opportunity for all actors to engage and contribute to sustainable deployment of bioenergy systems.

Challenges to resolve:

- **Develop competitive supply and value chains**
- **Quantify (+ / -) sustainability impacts of bioenergy supply chains**
- **Simplify governance of supply chains**

Forests will continue to be a globally important bioenergy feedstock... can we get greater penetration?

Market penetration depends on:

- Energy market development and penetration
- Forest supply chain complexity and cost
- Confidence in feedstock inventory estimates
- Development status of major conversion technologies
- Sustainability considerations

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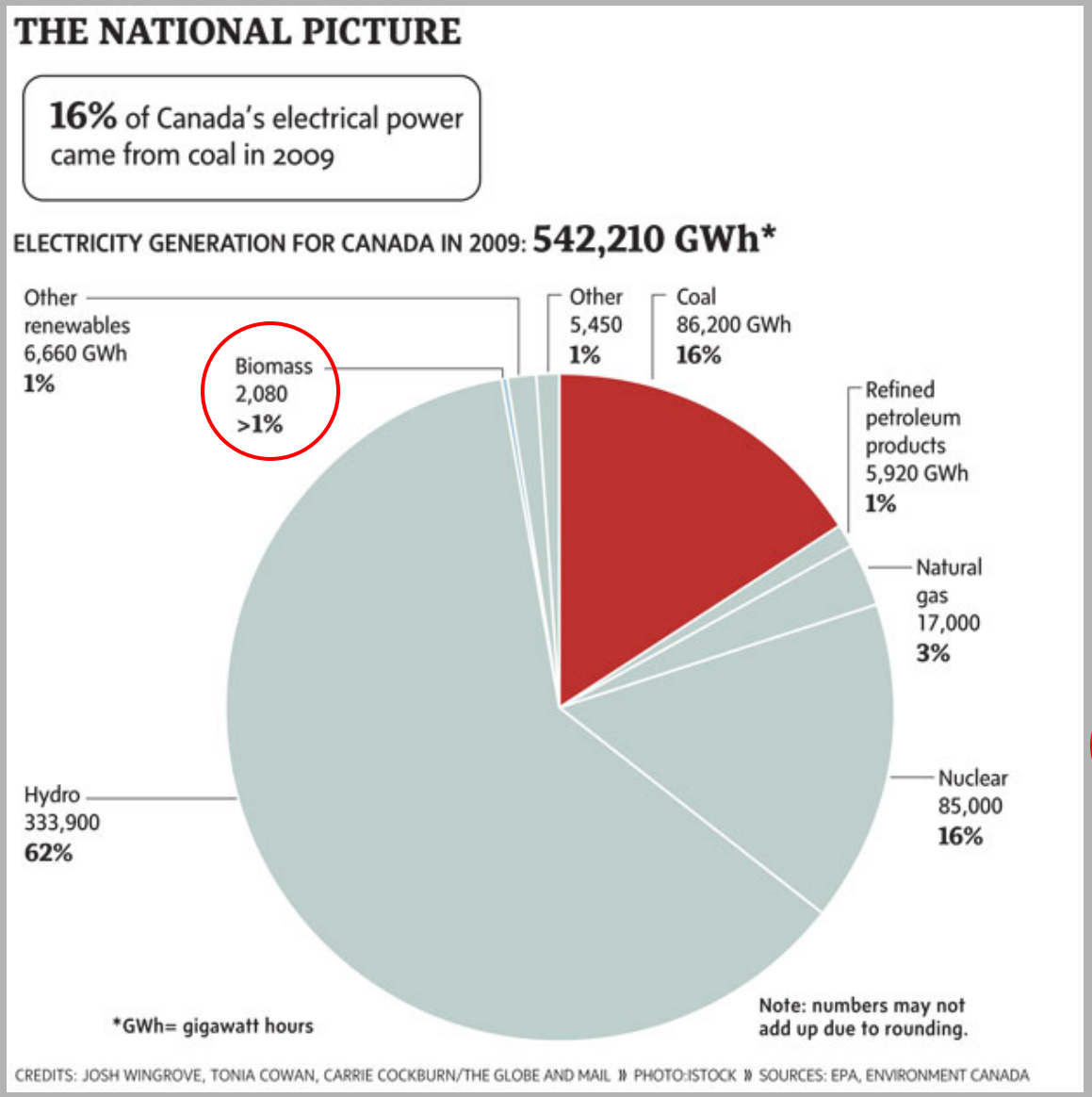
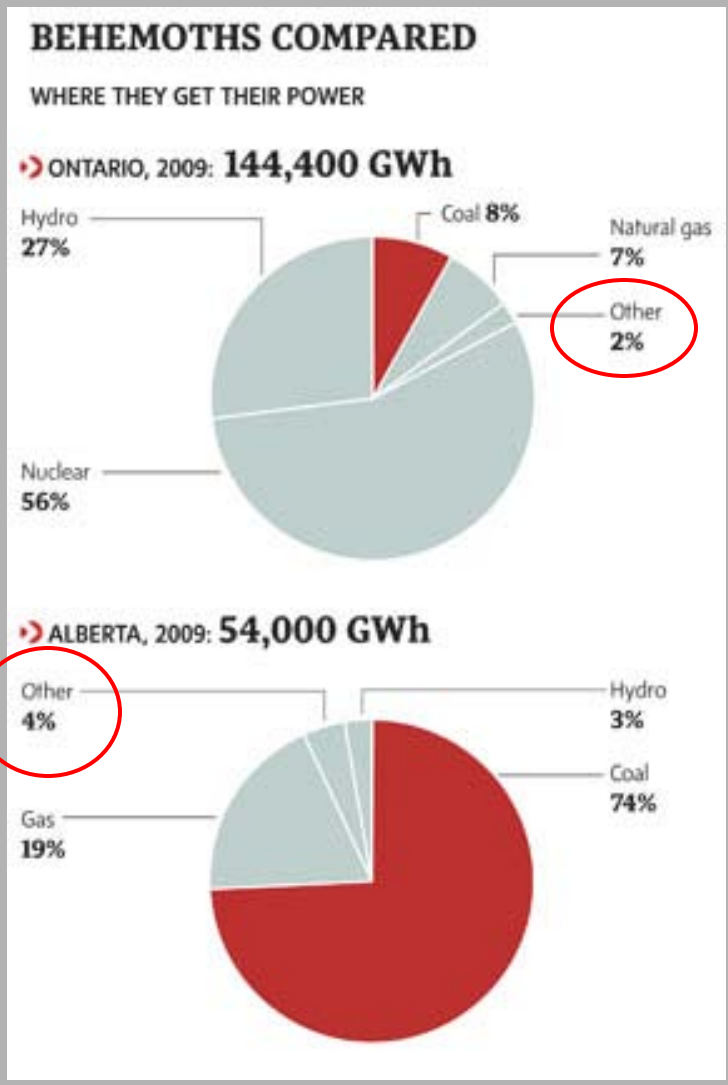
Canada's electricity feedstocks, 2009

… a challenge to penetrate this sector by replacing existing capacity

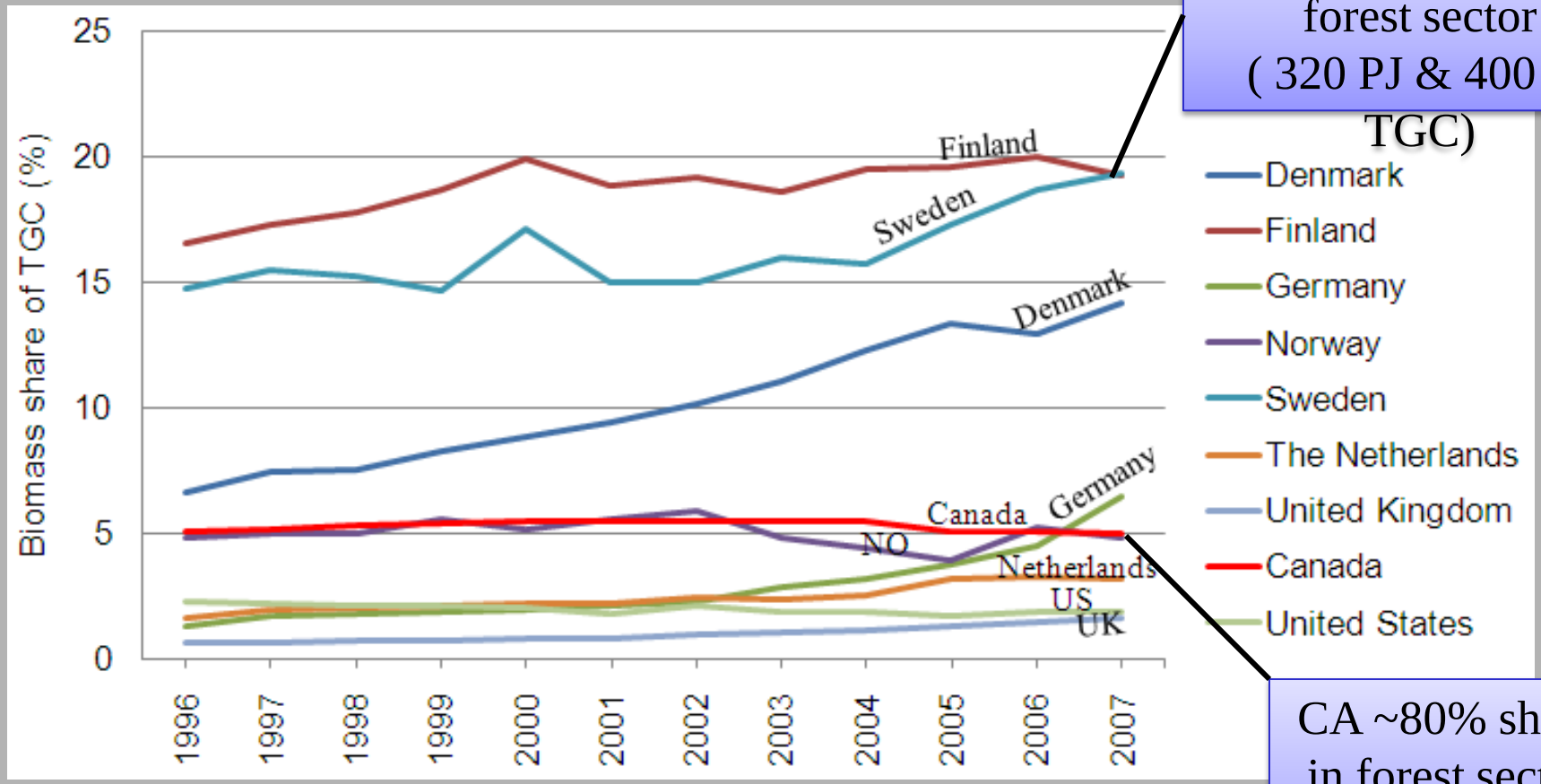




Source: The Globe & Mail, 12 Sept 2011

Biomass share of total energy production

What challenges to moving % biomass up significantly?



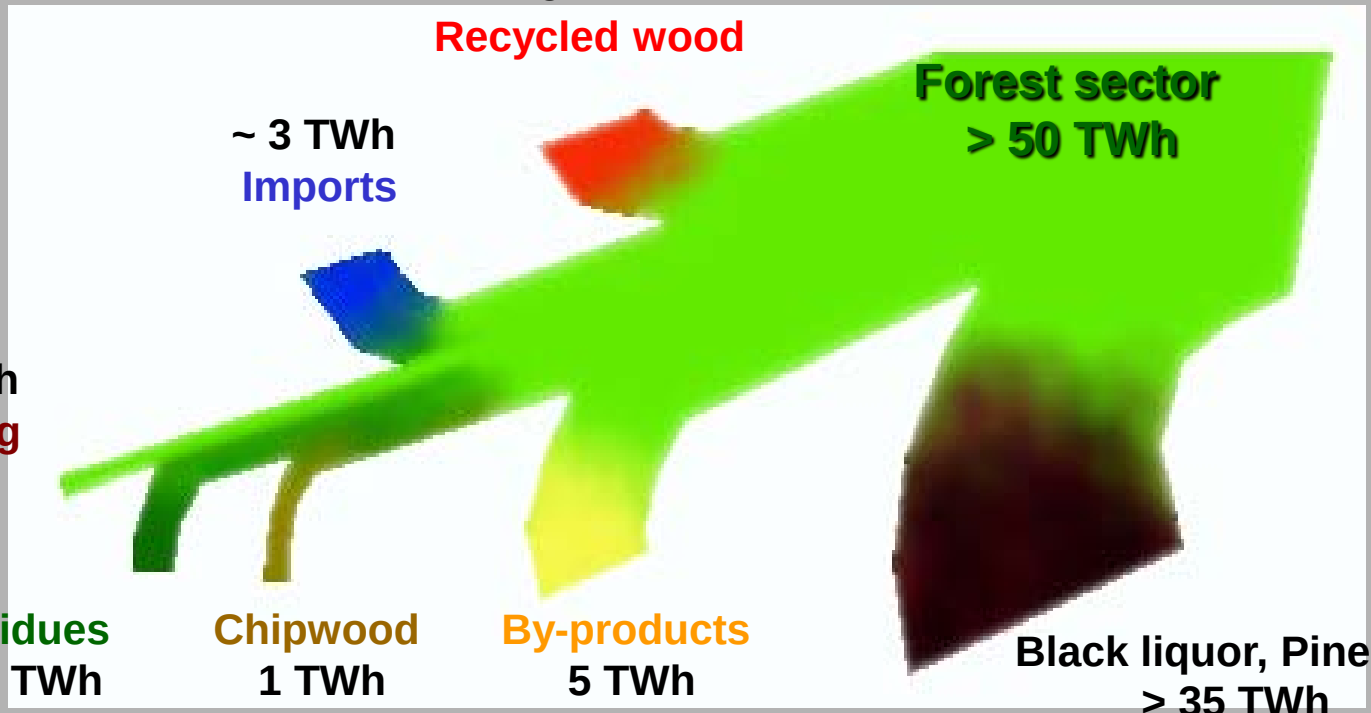
FI & SE 80% share in forest sector (320 PJ & 400 PJ TGC)

CA ~80% share in forest sector (~600 PJ TGC)

(EIA, 2008; EUROSTAT, 2009)

Total volume and sources of forest energy must change significantly

Note the current importance of manufacturing by-products



Source: Björheden, 2004

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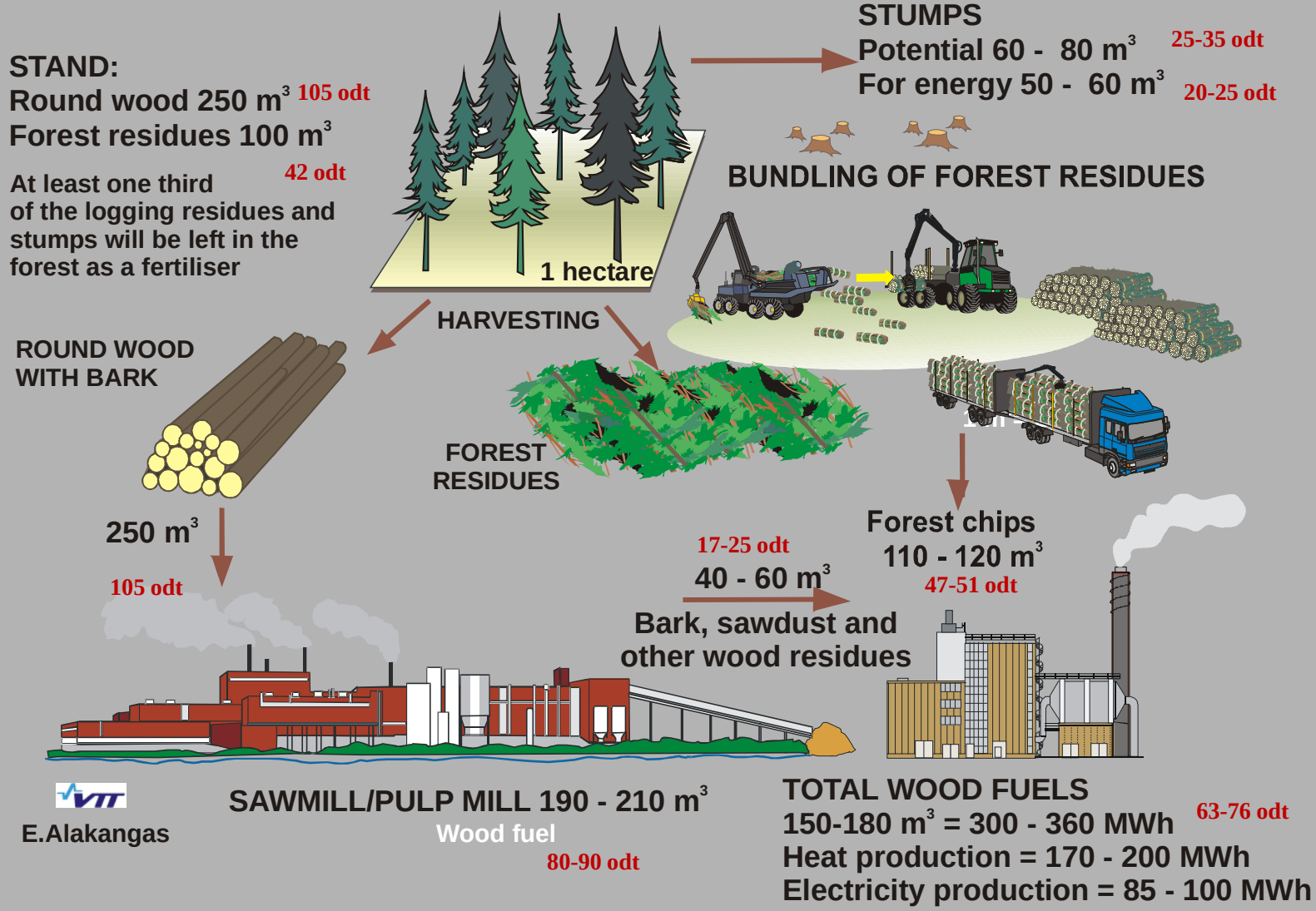
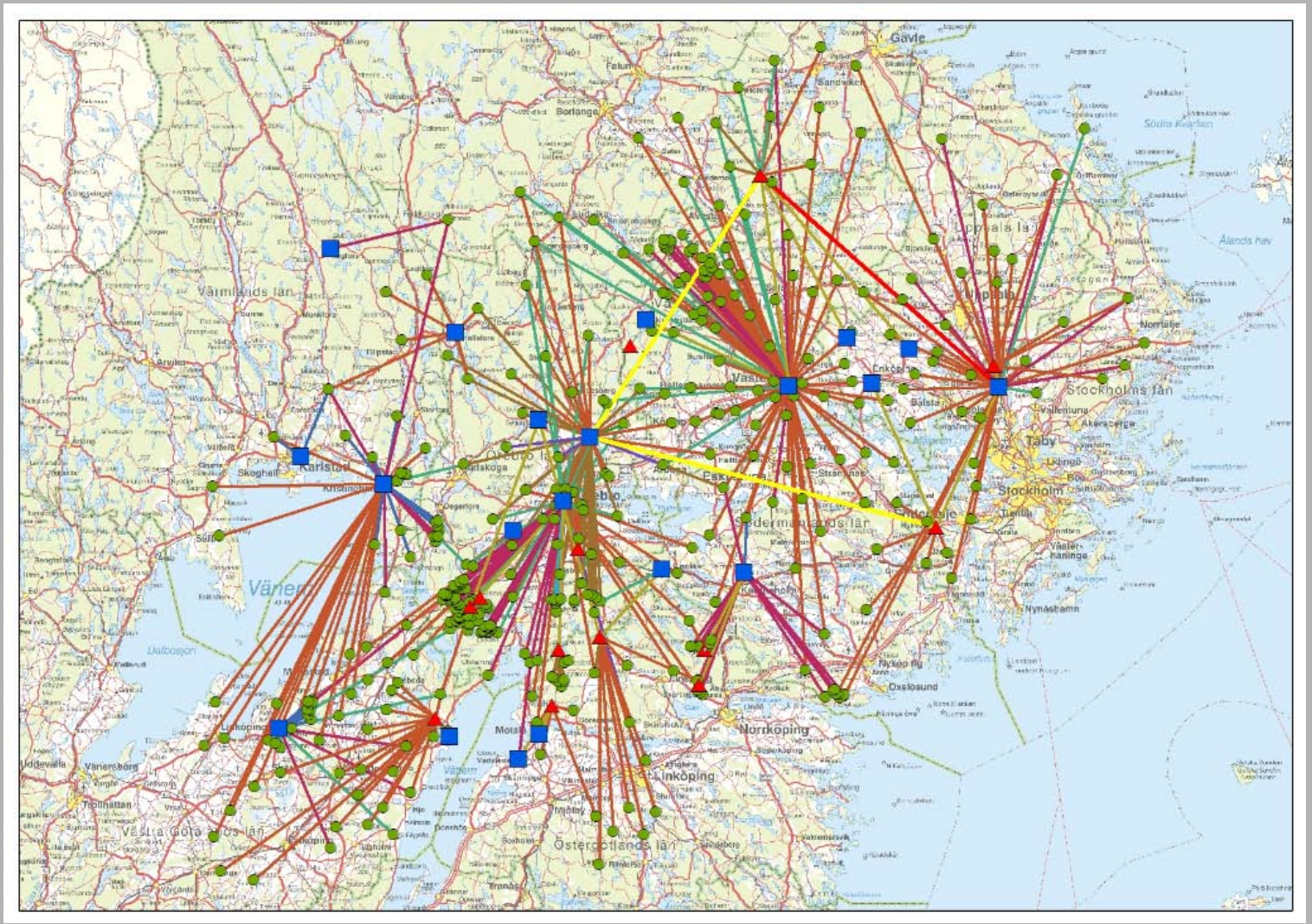
Requires efficient integration



Consider complexity of feedstock supply chains

All flows of assortments – Swedish case



Source: Filsberg et al. 2010

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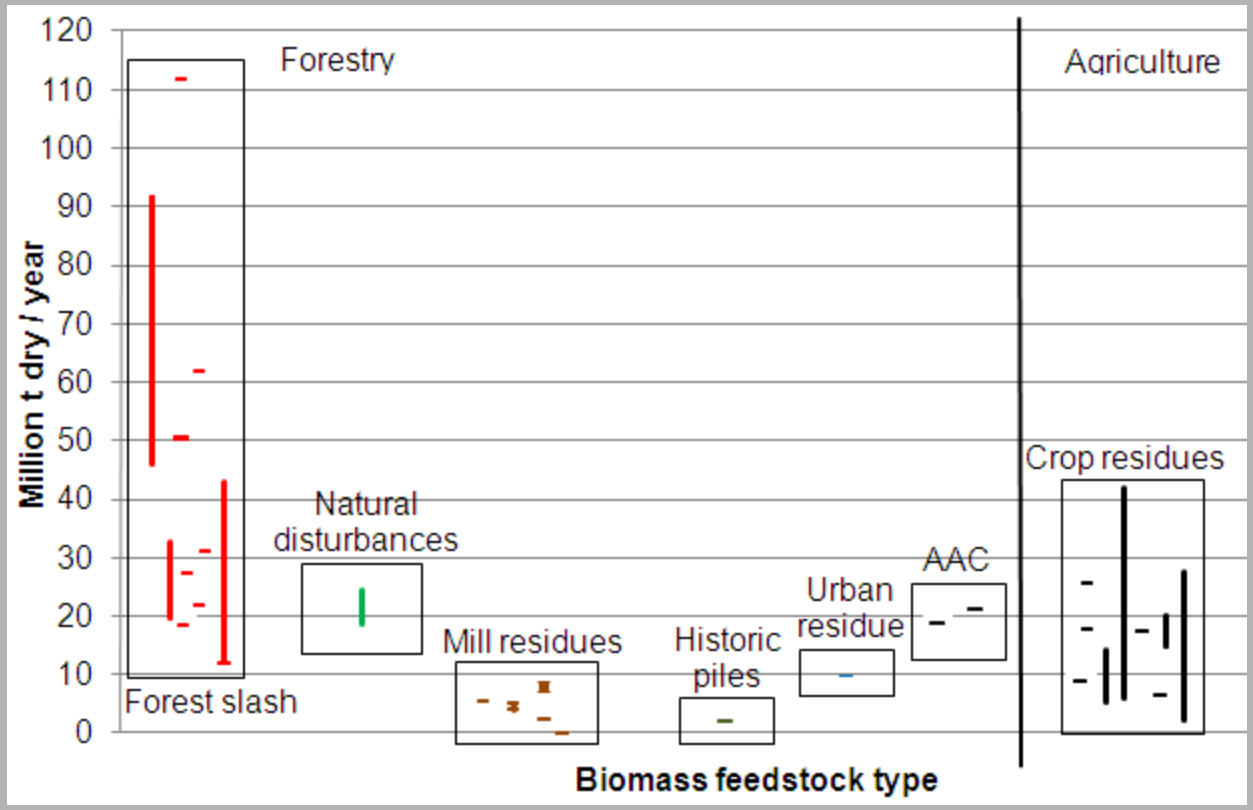
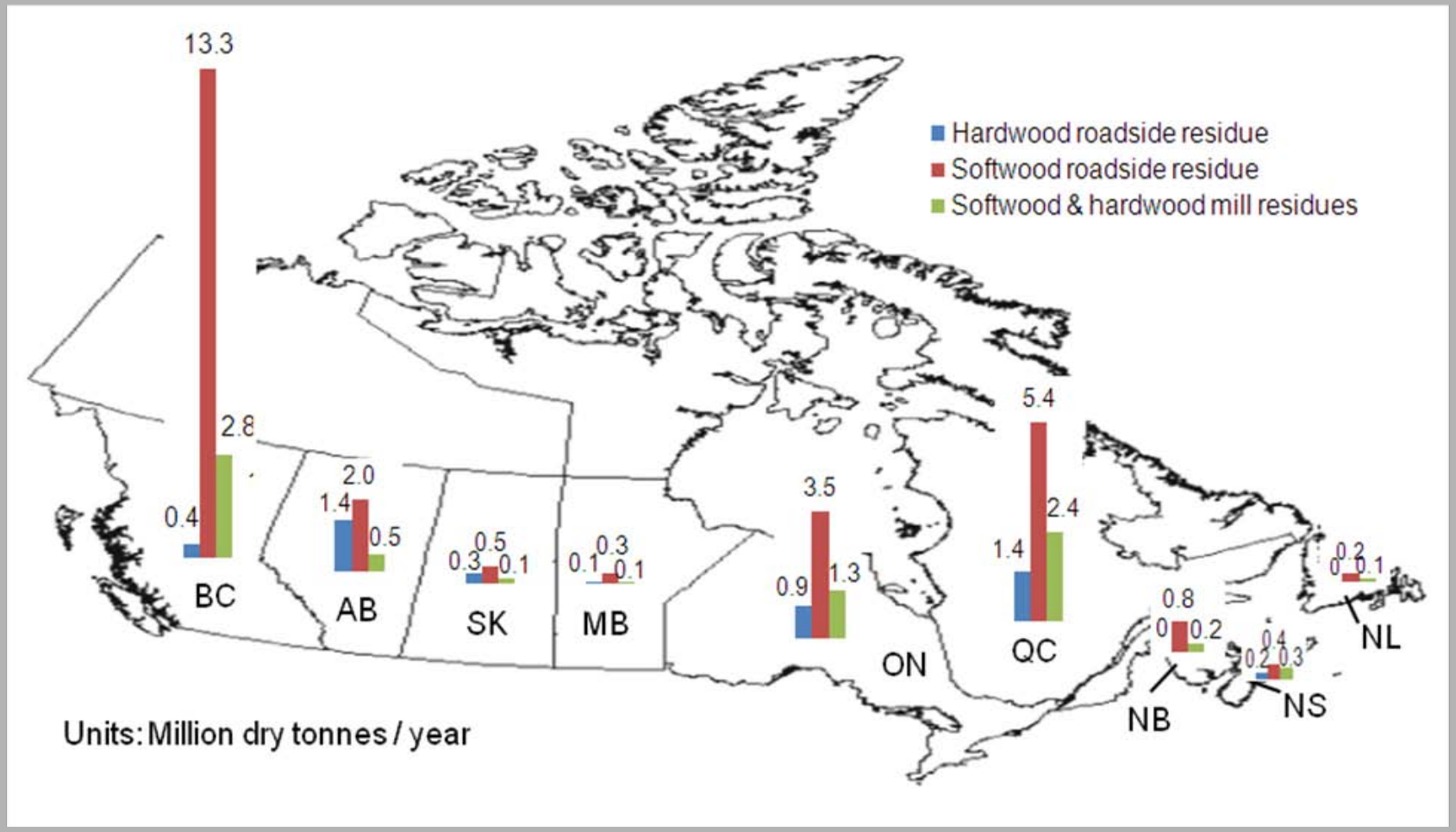
Biomass inventory studies conducted in Canada for forest and agriculture sources of biomass



Huge variation in some estimates
… and what amount is sustainably and commercially available?

Source: Smith et al. 2009.

Provincial forest residue availability



(Sidders et al., 2008)

Canadian forest sector – AAC vs actual harvest

Prior to global financial meltdown. What proportion available?

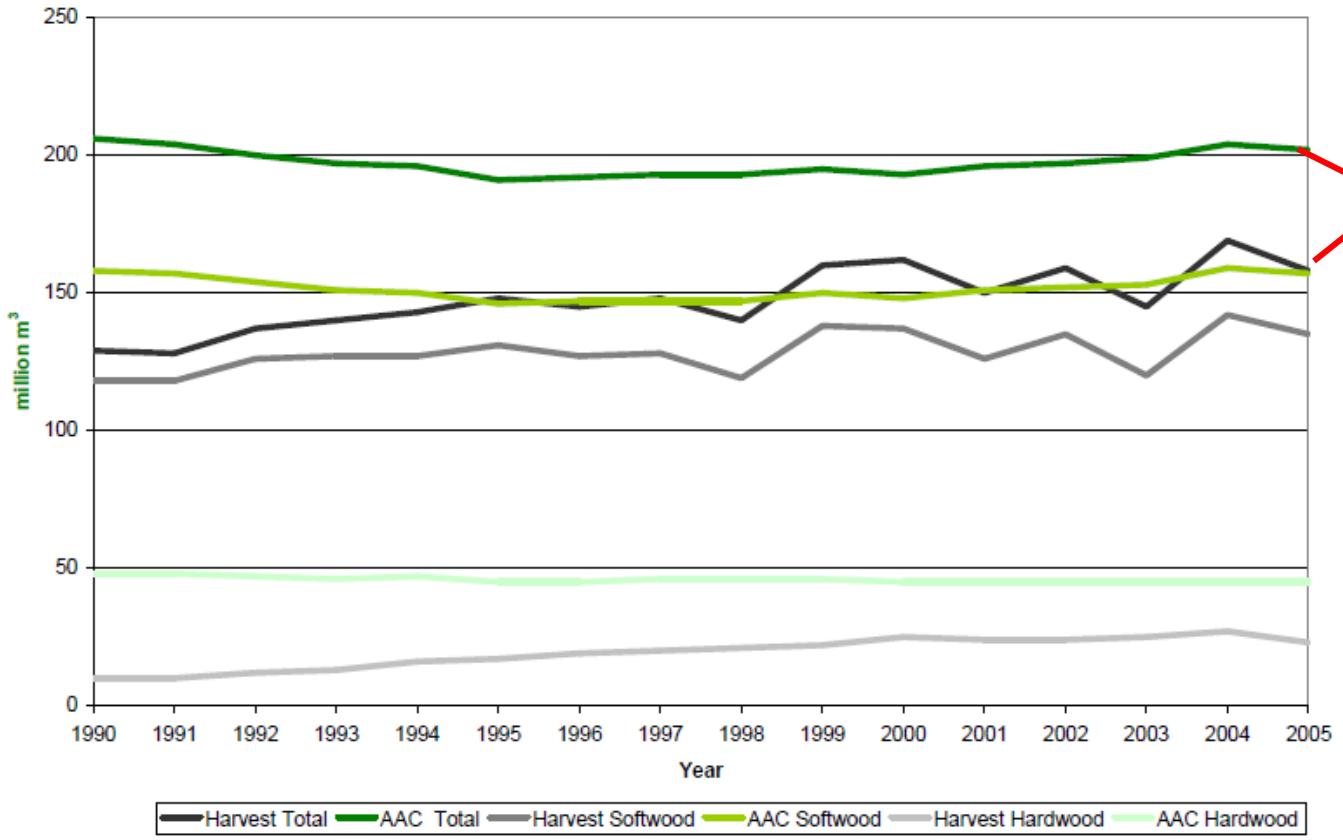


Figure 5.3a Allowable annual cut versus actual harvest (provincial crown land), 1990–2005 (million m3) (CCFM, 2008).

Criteria and Indicators of Sustainable Forest Management in Canada: National Status 2005
Data updated: January 2008

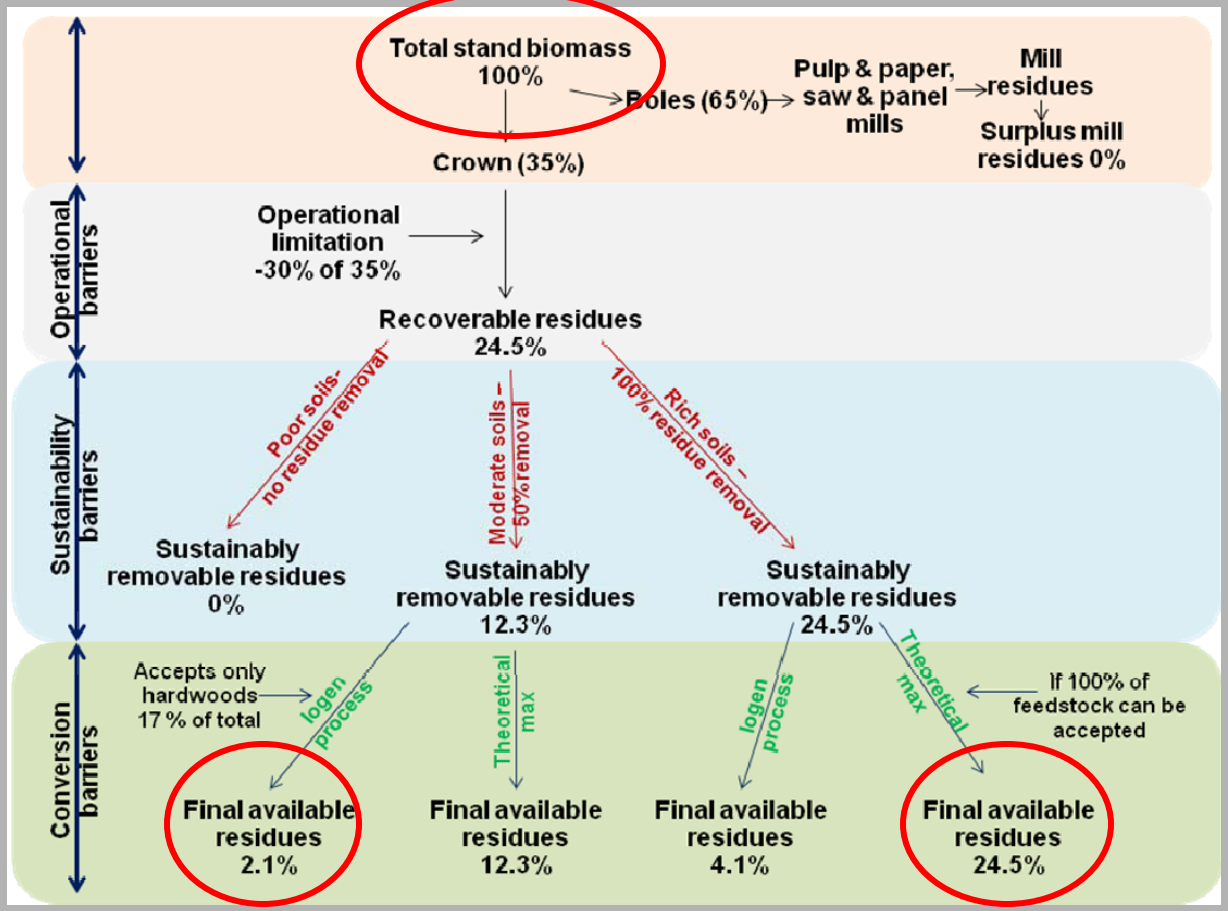
Unused AAC

50 million m^3/yr

Source: http://www.ccfm.org/ci/rprt2005/

Forest residue availability on a percent basis under a cut-to-length harvest system

Considering operational, sustainability and conversion technology barriers



How applicable in major forest regions of Canada?

Source: Smith et al. 2009.

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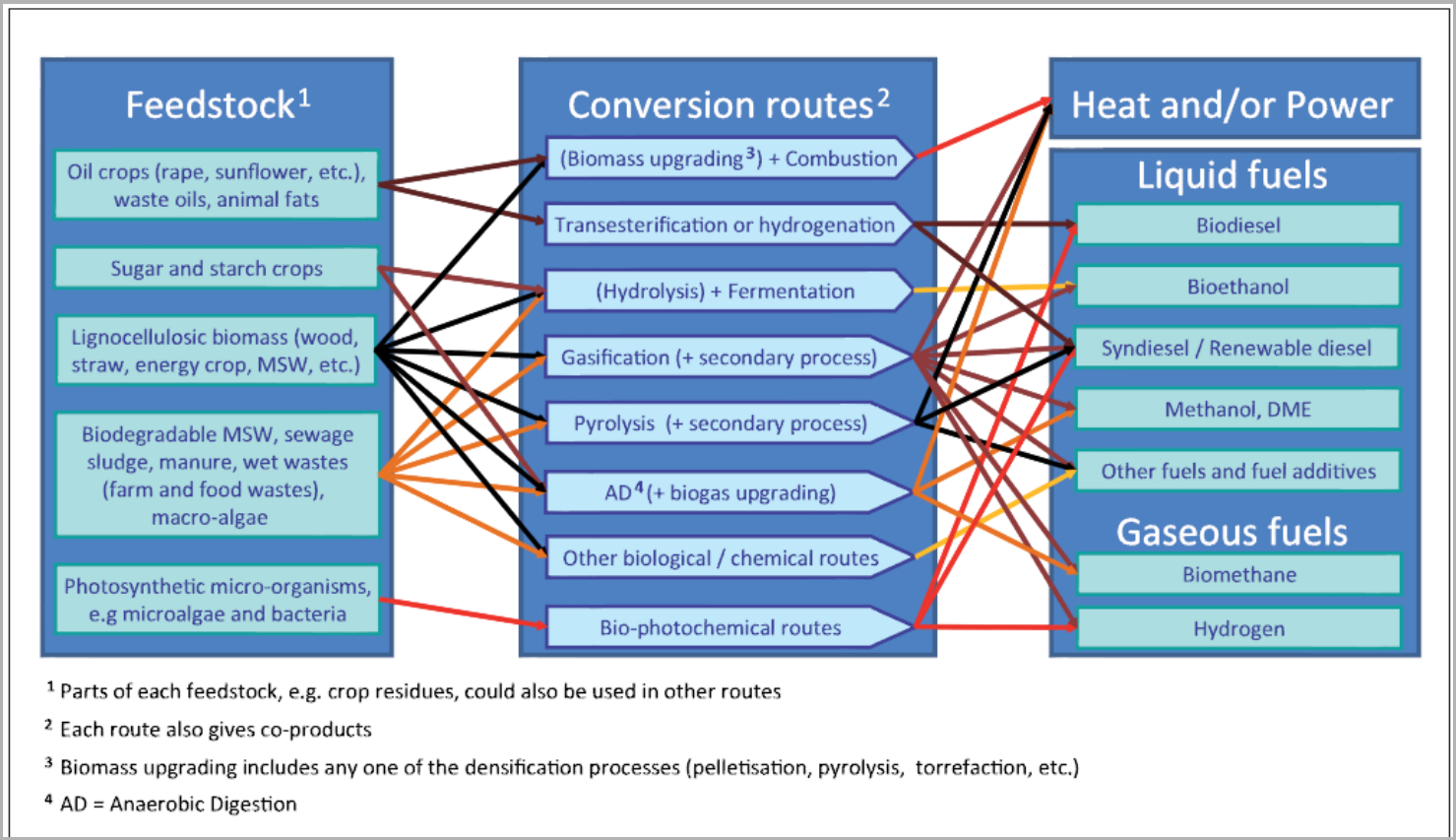
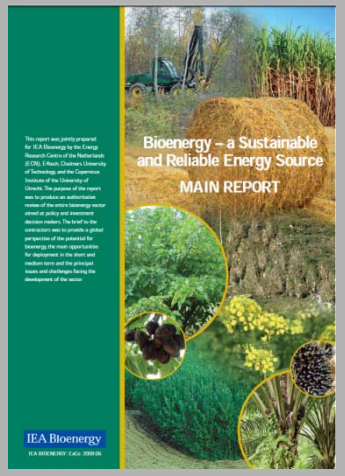
Conversion pathways –
feedstocks to bioenergy and bio-based products

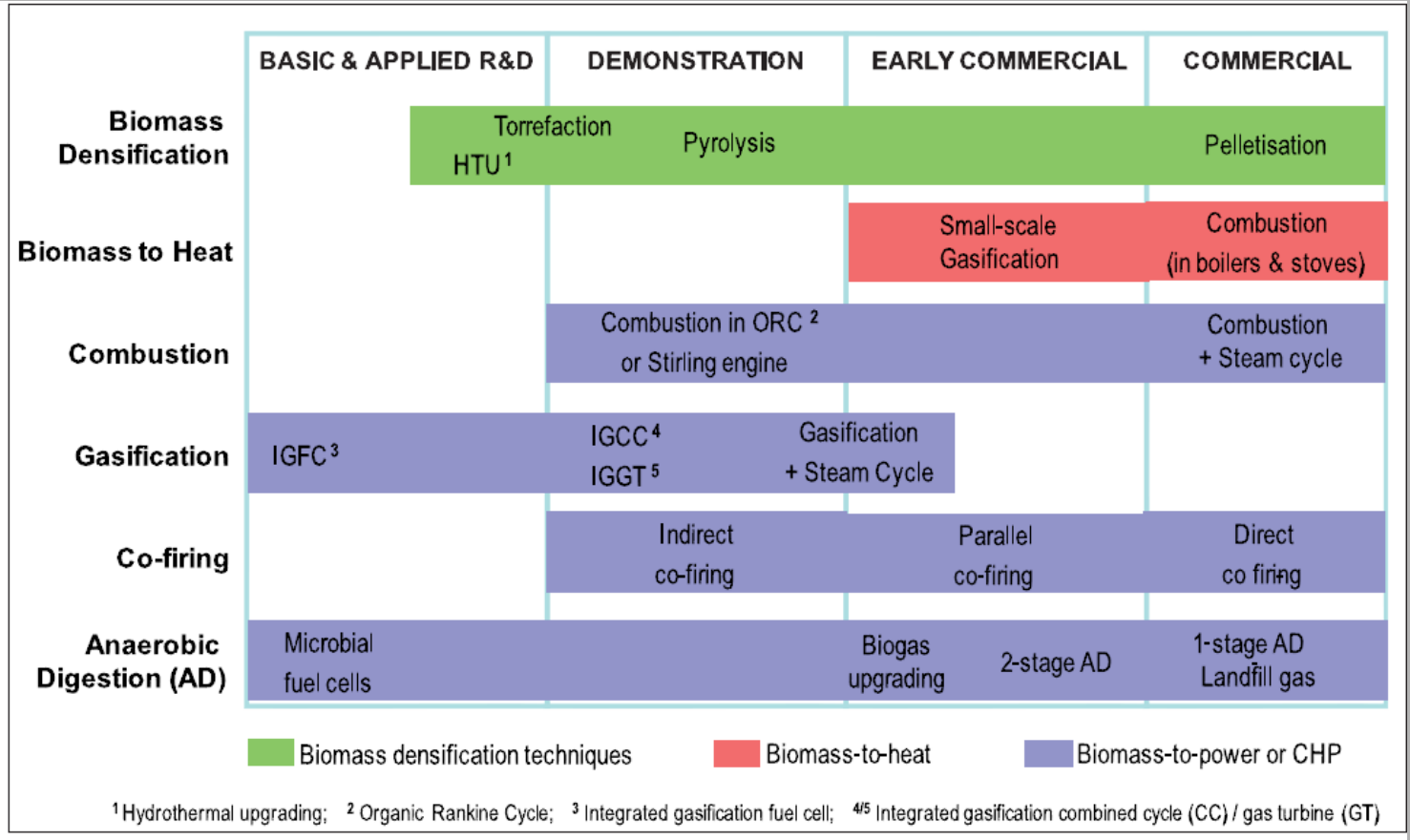


Source: E4tech 2009

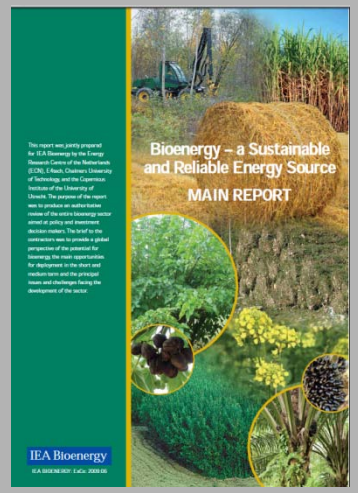


IEA Bioenergy: ExCo: 2009:05

Development status of main technologies – upgrade, heat & power

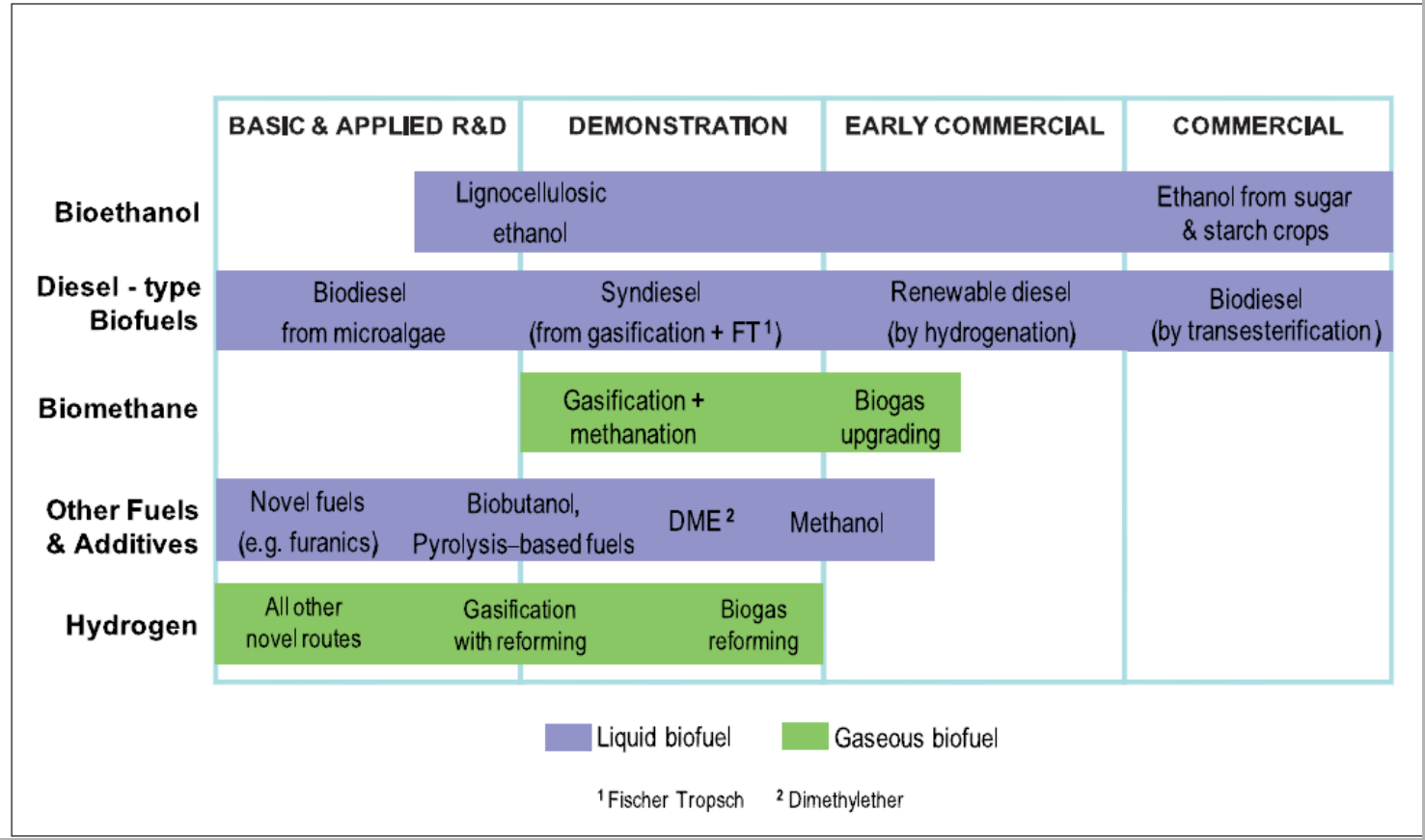


Source: E4tech 2009

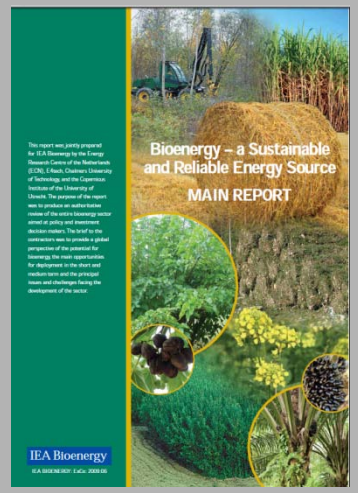


IEA Bioenergy: ExCo: 2009:05

Development status of main technologies – biofuels for transportation

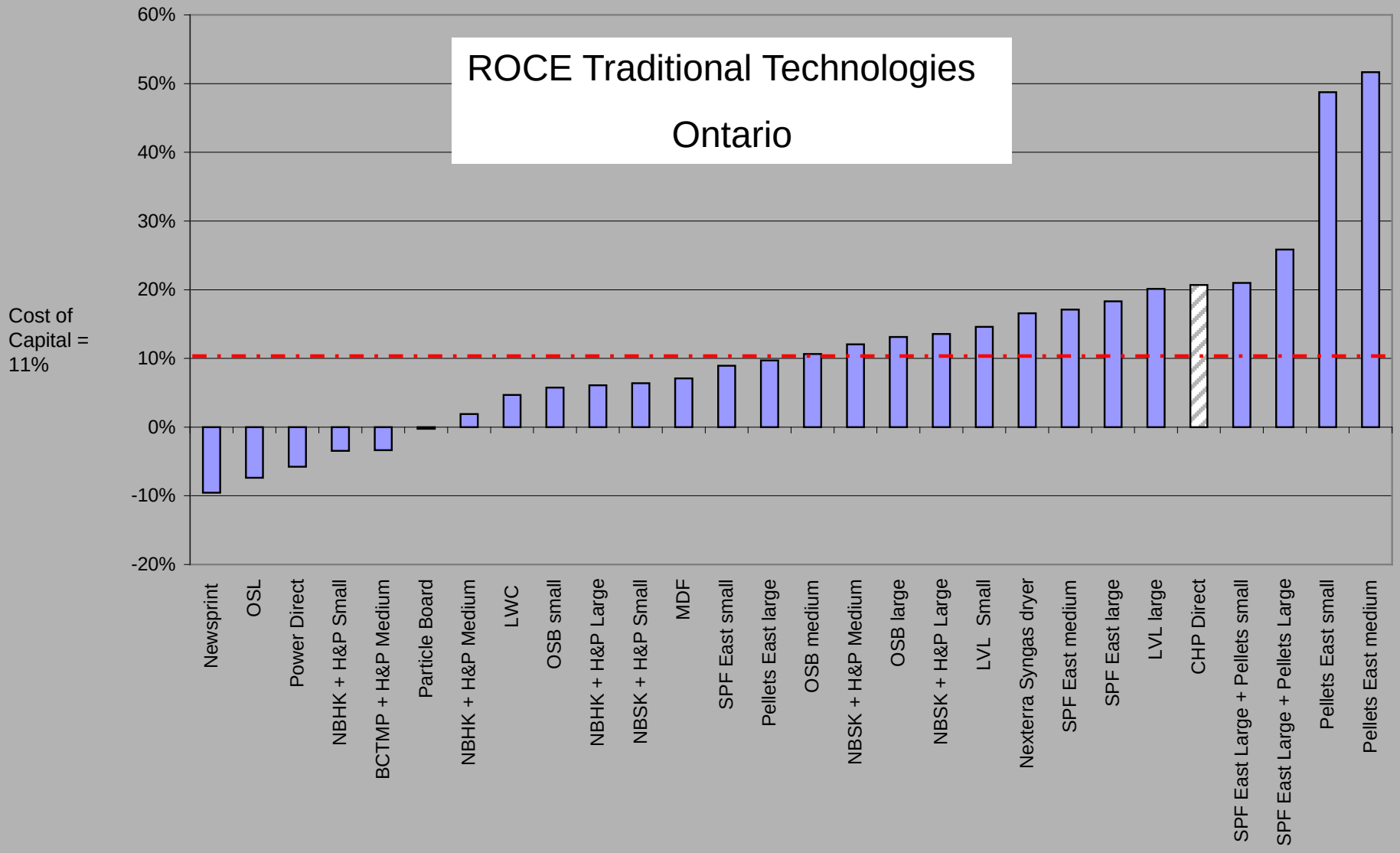


Source: E4tech 2009



IEA Bioenergy: ExCo: 2009:05

What technologies will attract capital?



Source: FPAC 2010.

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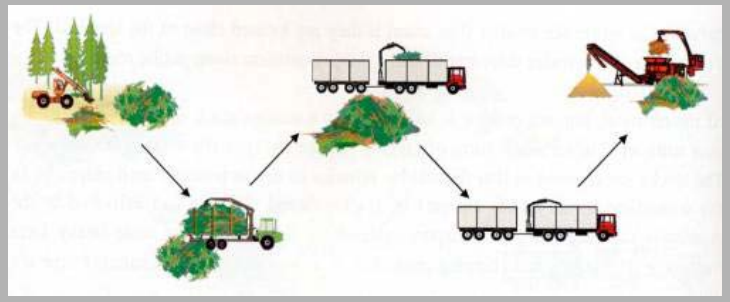
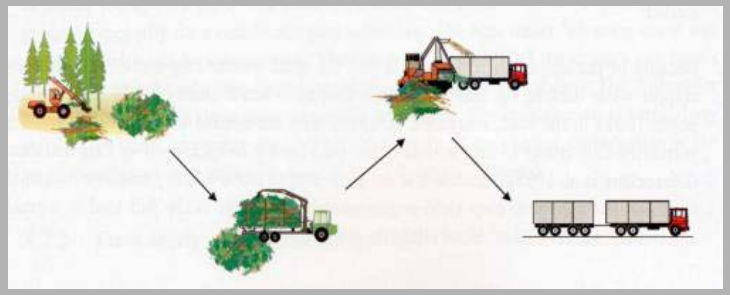
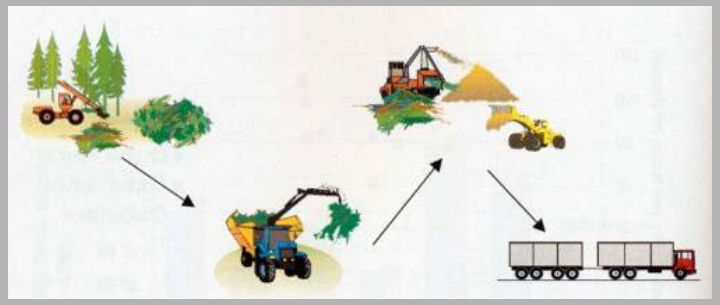






Graphics source:

Courtesy Tapio Ranta, VTT Processes 2002

Our responsibility & challenge:

Design low-impact systems

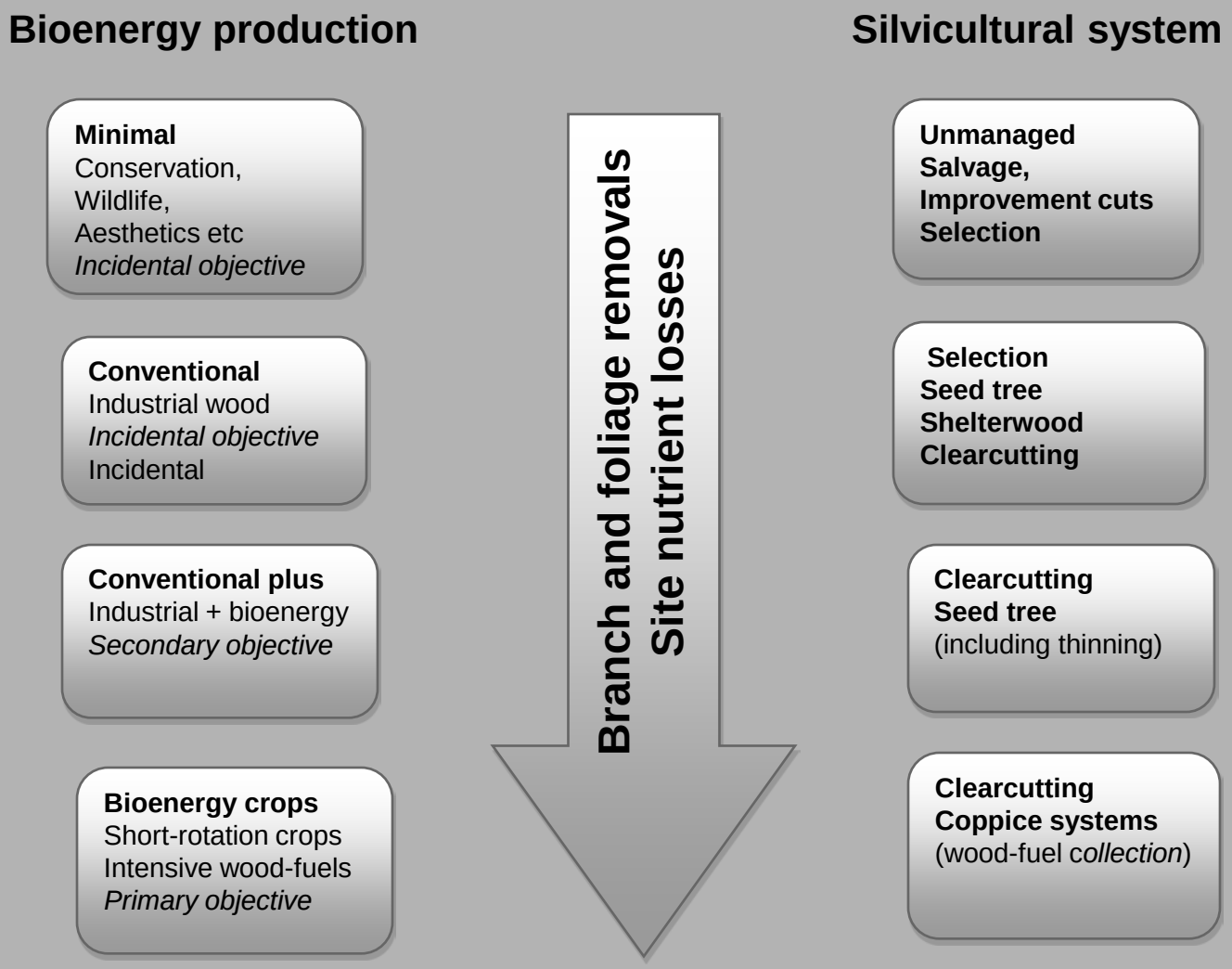
- Identify risks to soils, water, biodiversity, GHG balances
- Identify practices to mitigate risks

Develop standards and C&I for SFM

- Environmental
  - incl. LCA
- Economic
- Social

Commit to certification of whole value chain

Classify sites by management intensity



Mead & Smith, in press

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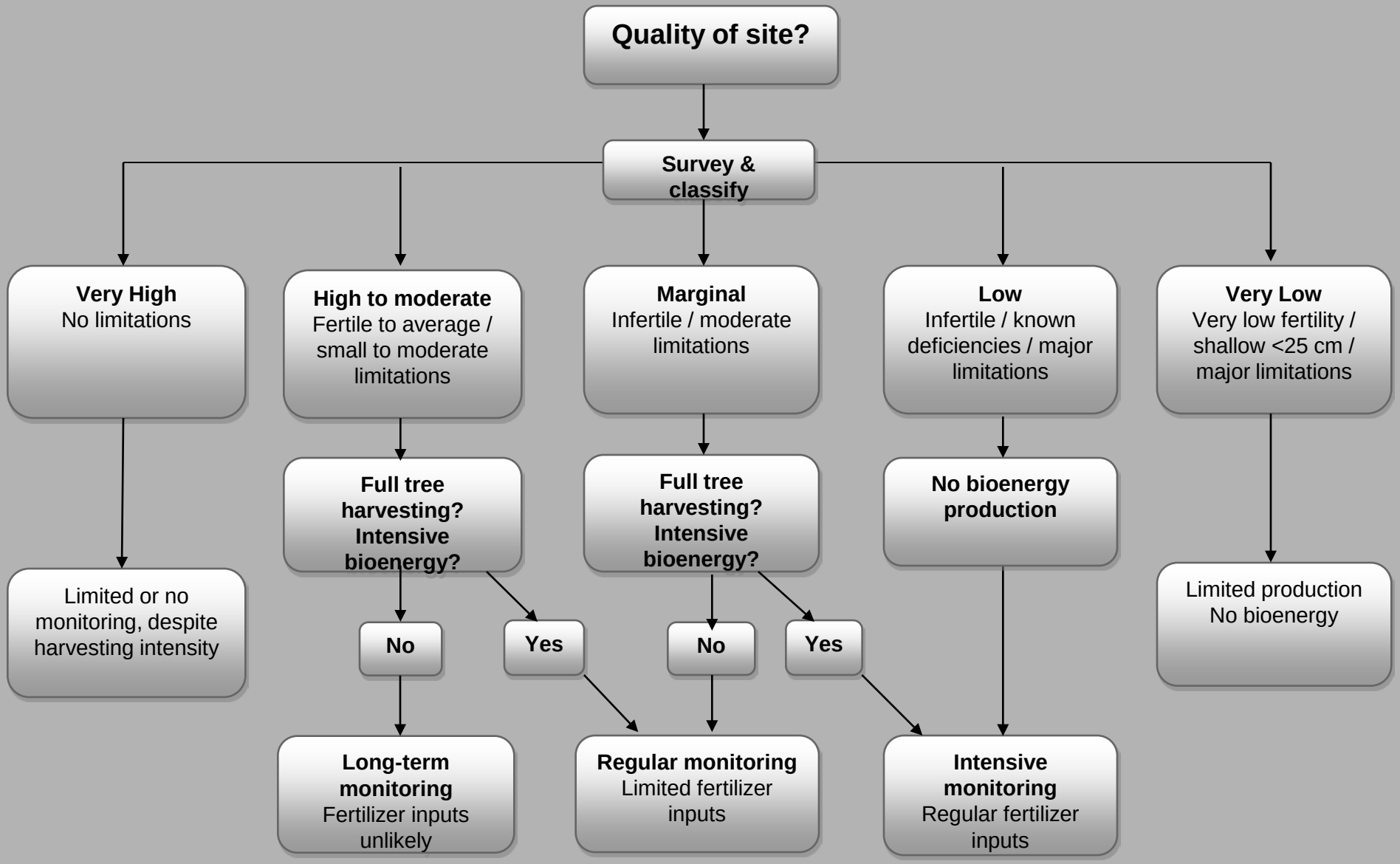
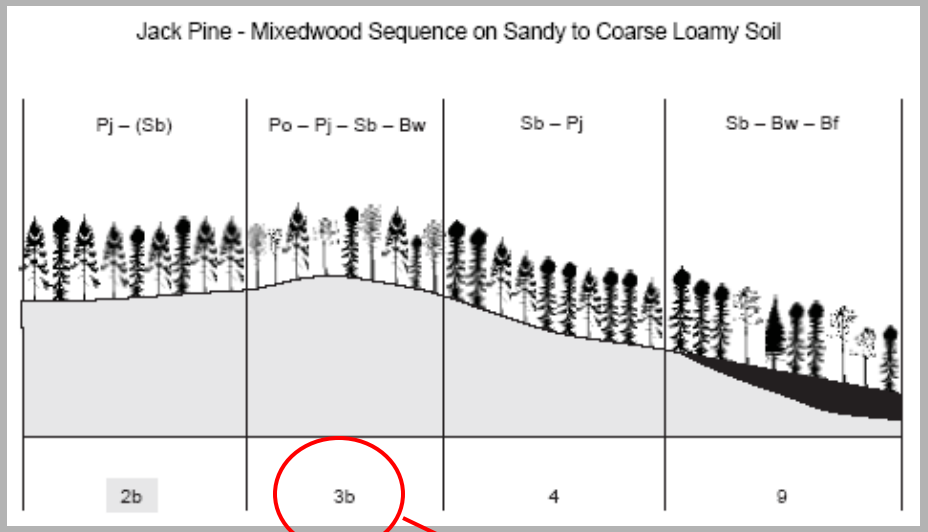
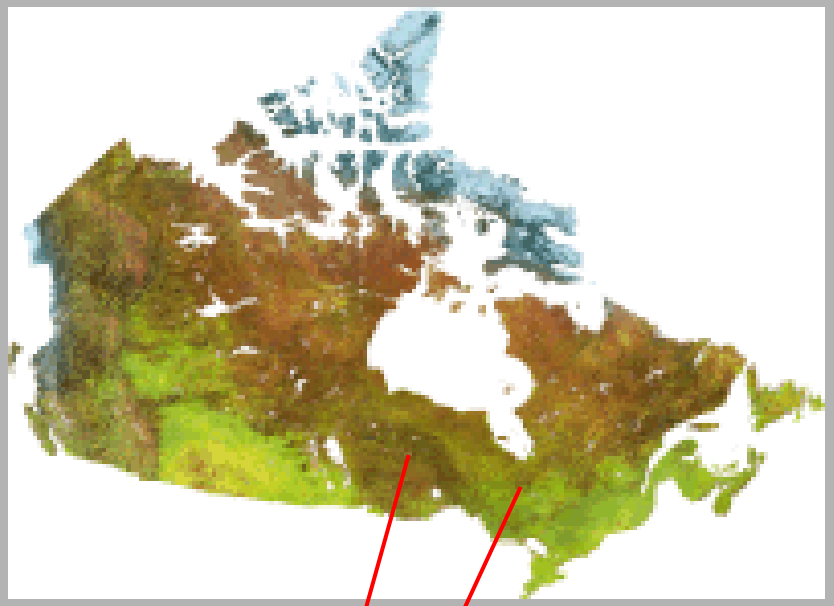
Classify sites by site quality

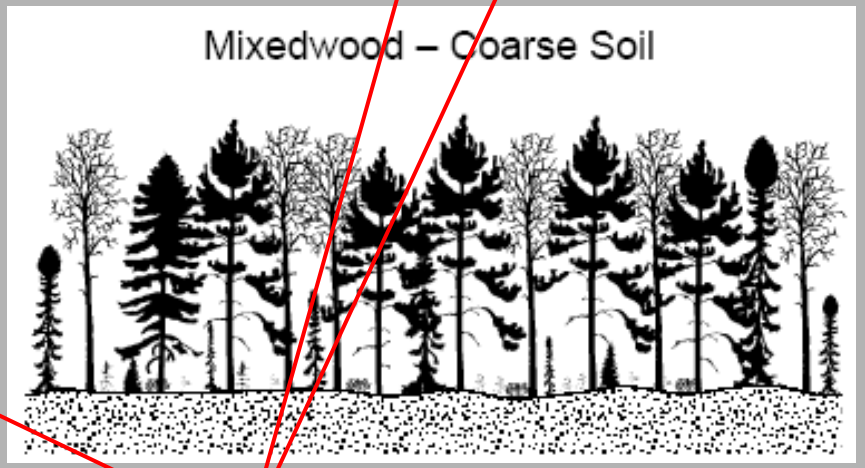


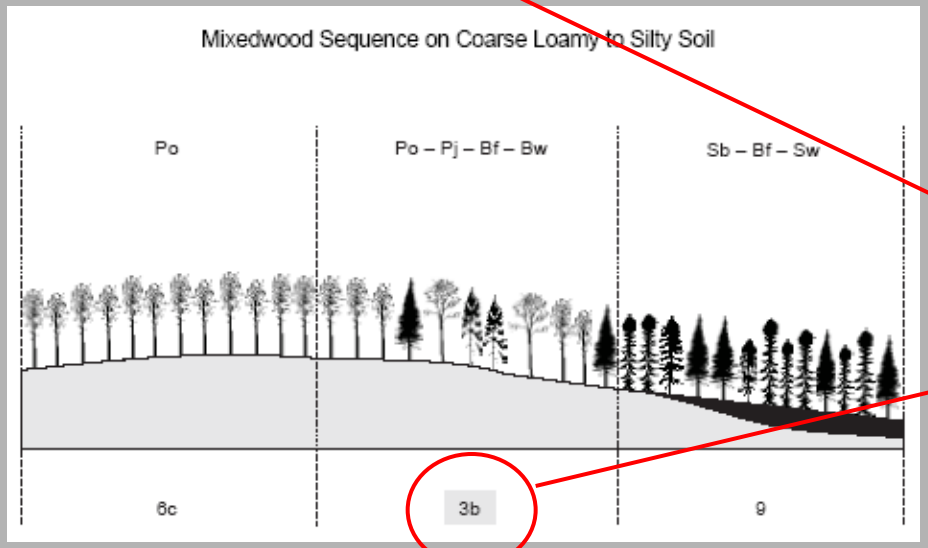
Mead & Smith, in press

Various intensities of approaches to classifying remote forest cover and soils









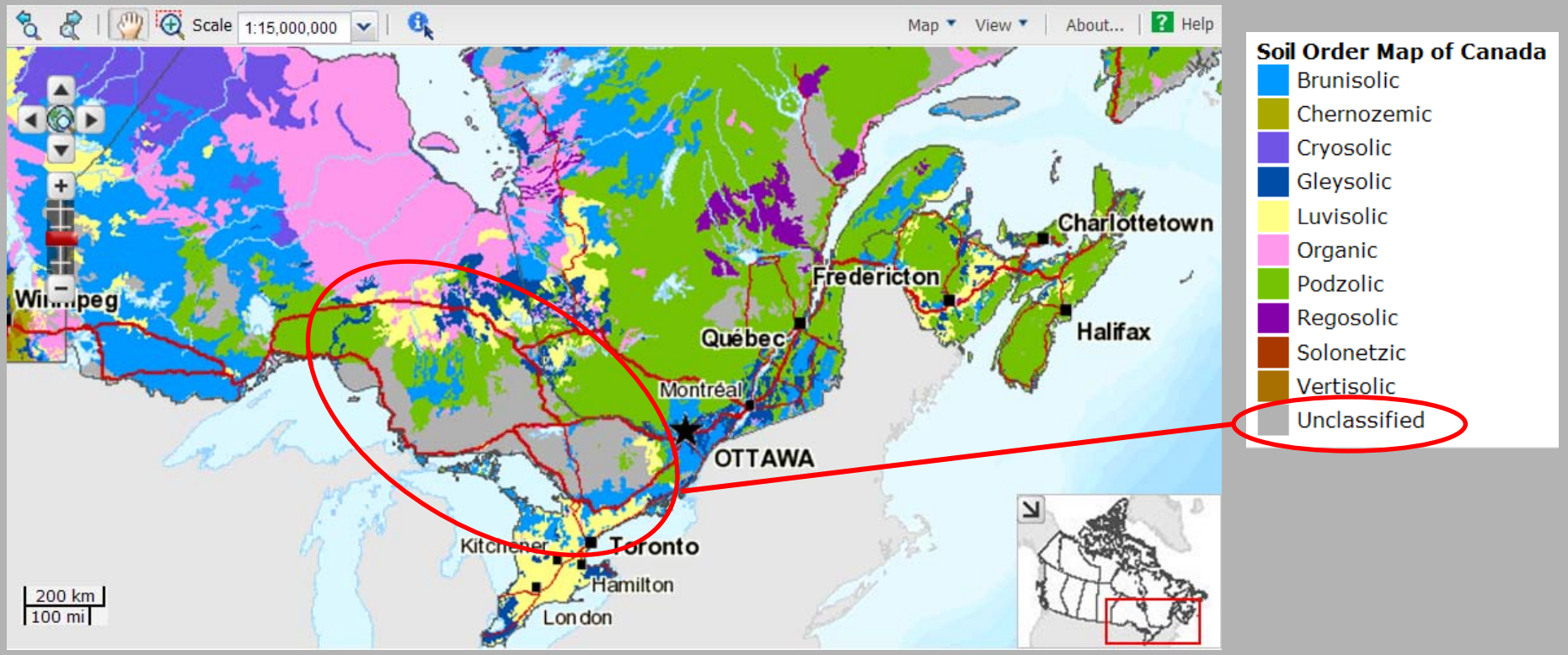
Site type 3b

Sources: OMNR 1997, CFS 2006

What soil classification approaches will be adequate?

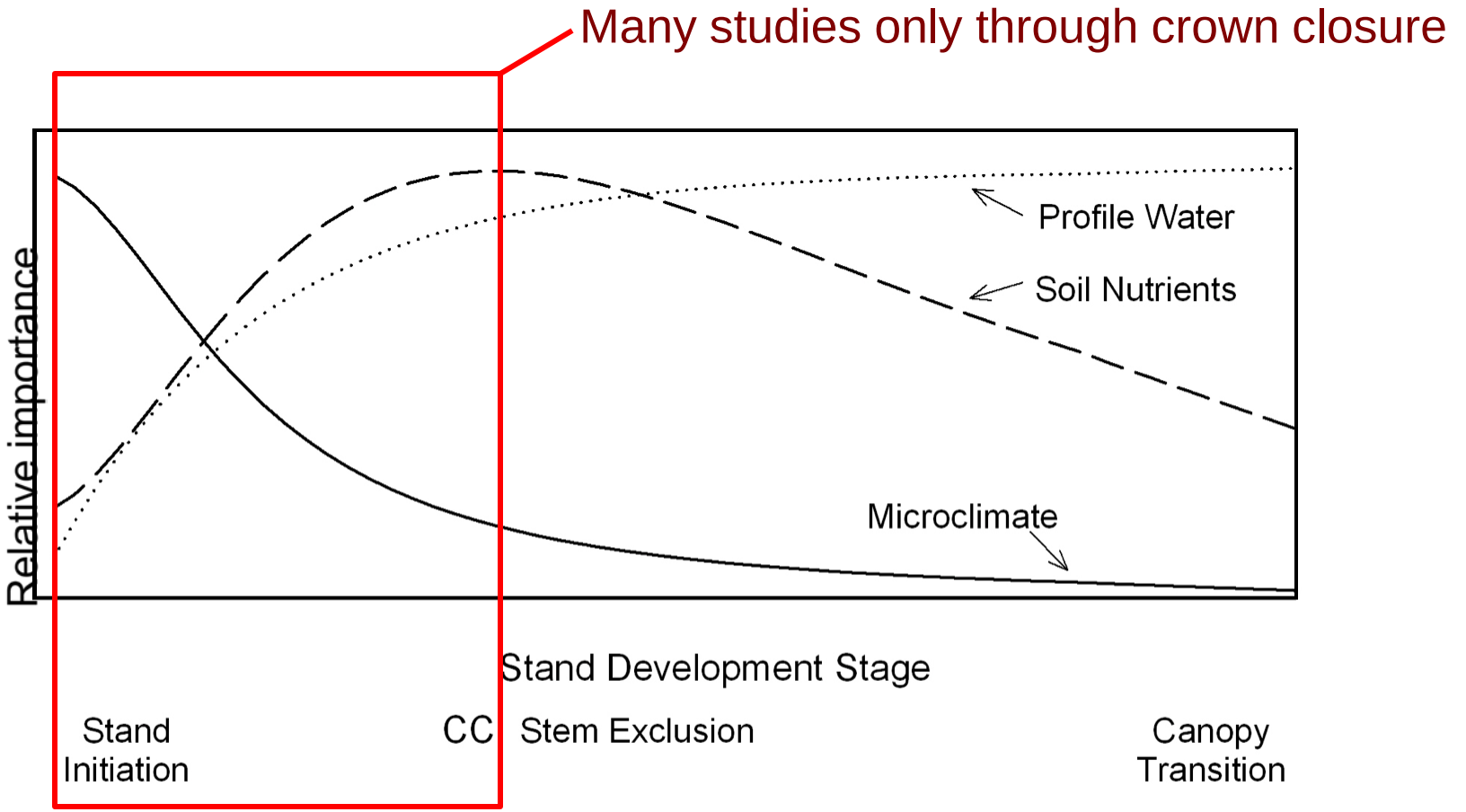
How much of the landscape is classified and mapped?

Soils of Canada



http://atlas.agr.gc.ca/agmaf; updated: 30 May 2011

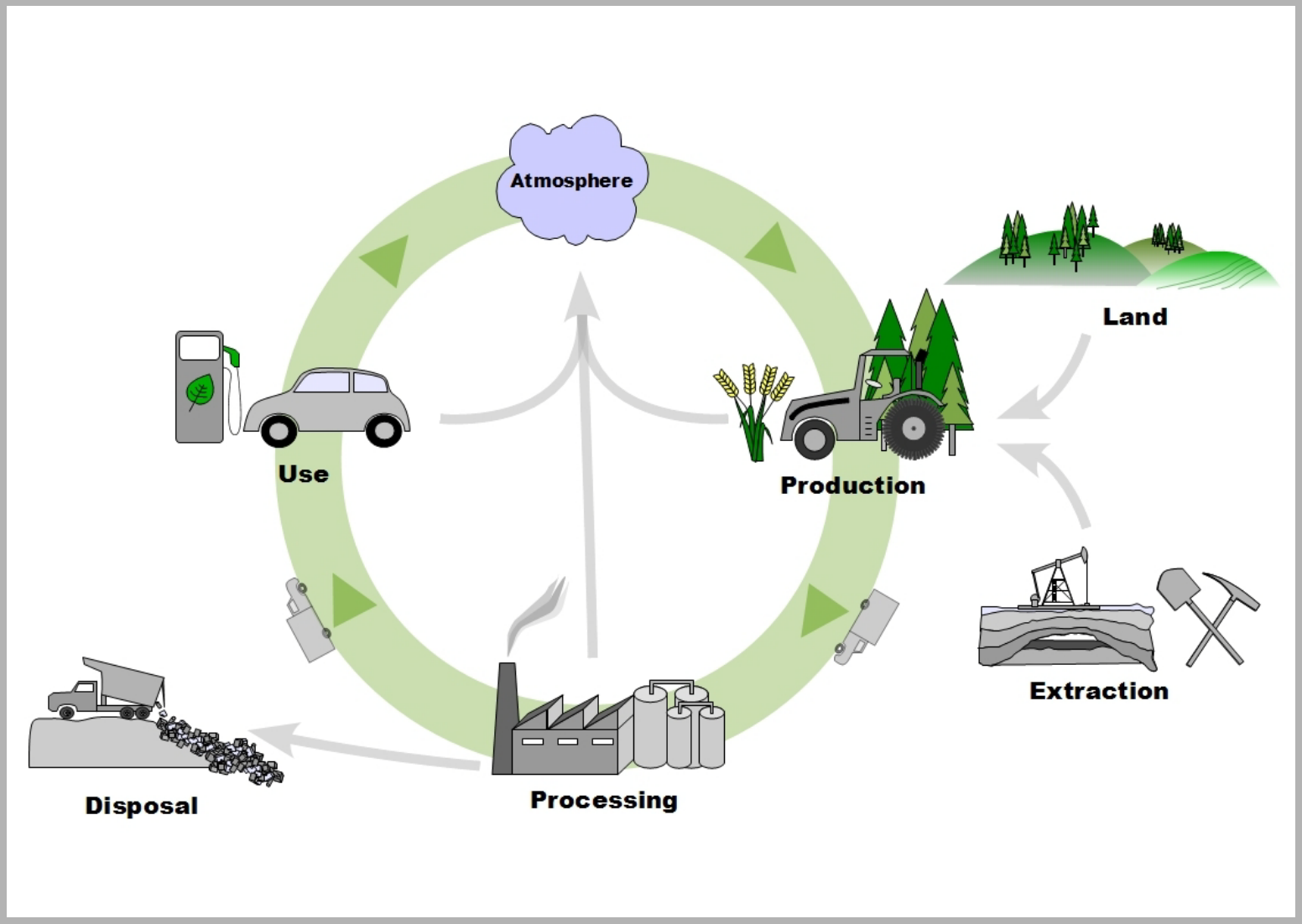
Our assessments must consider temporal dynamics in resource availability…



Fleming et al. in prep

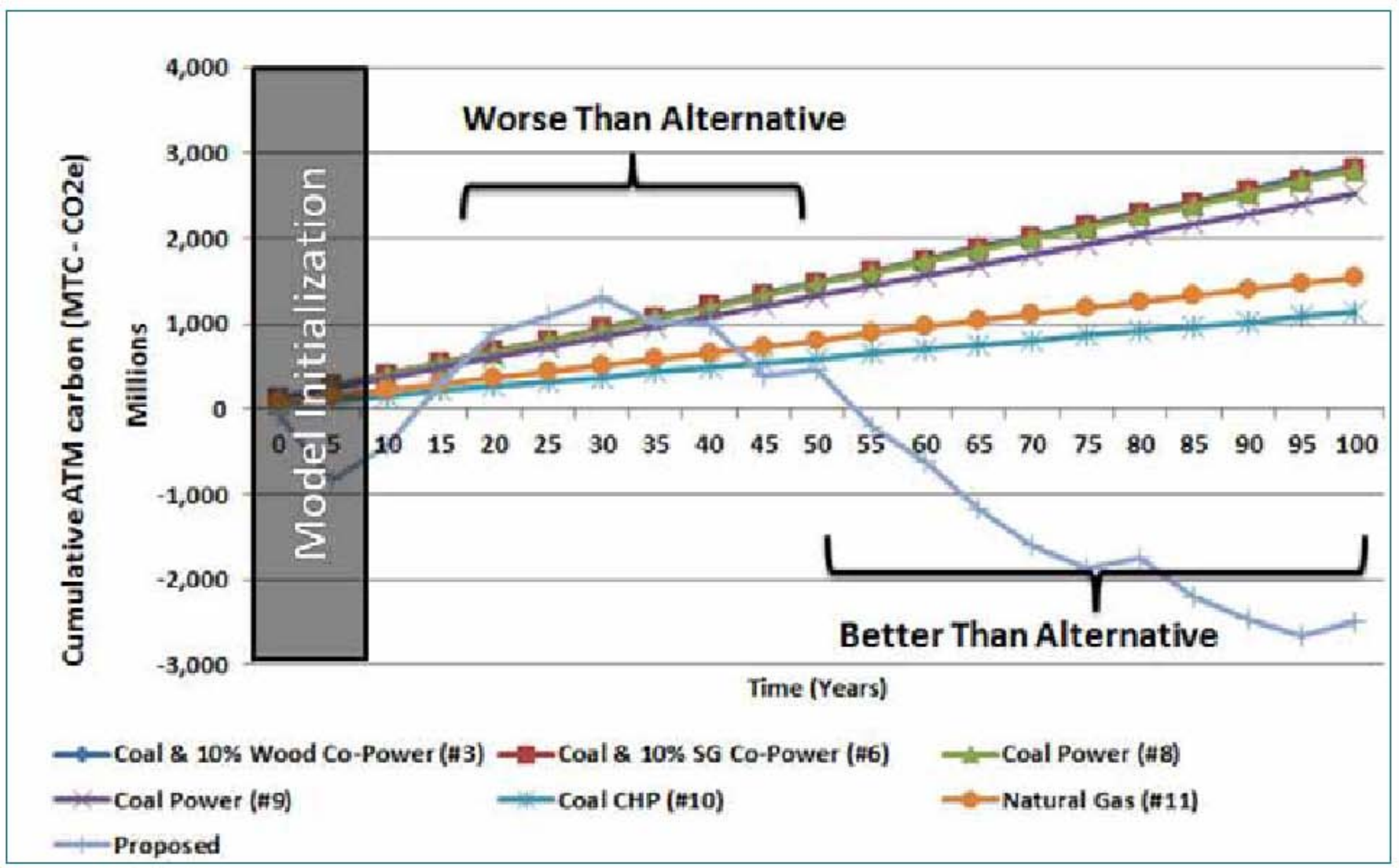
Increasing demand for Life Cycle Assessment of bioenergy systems

But for how many environmental values beyond CO_2?



Bird et al. -- IEA Bioenergy:ExCo:2011:03

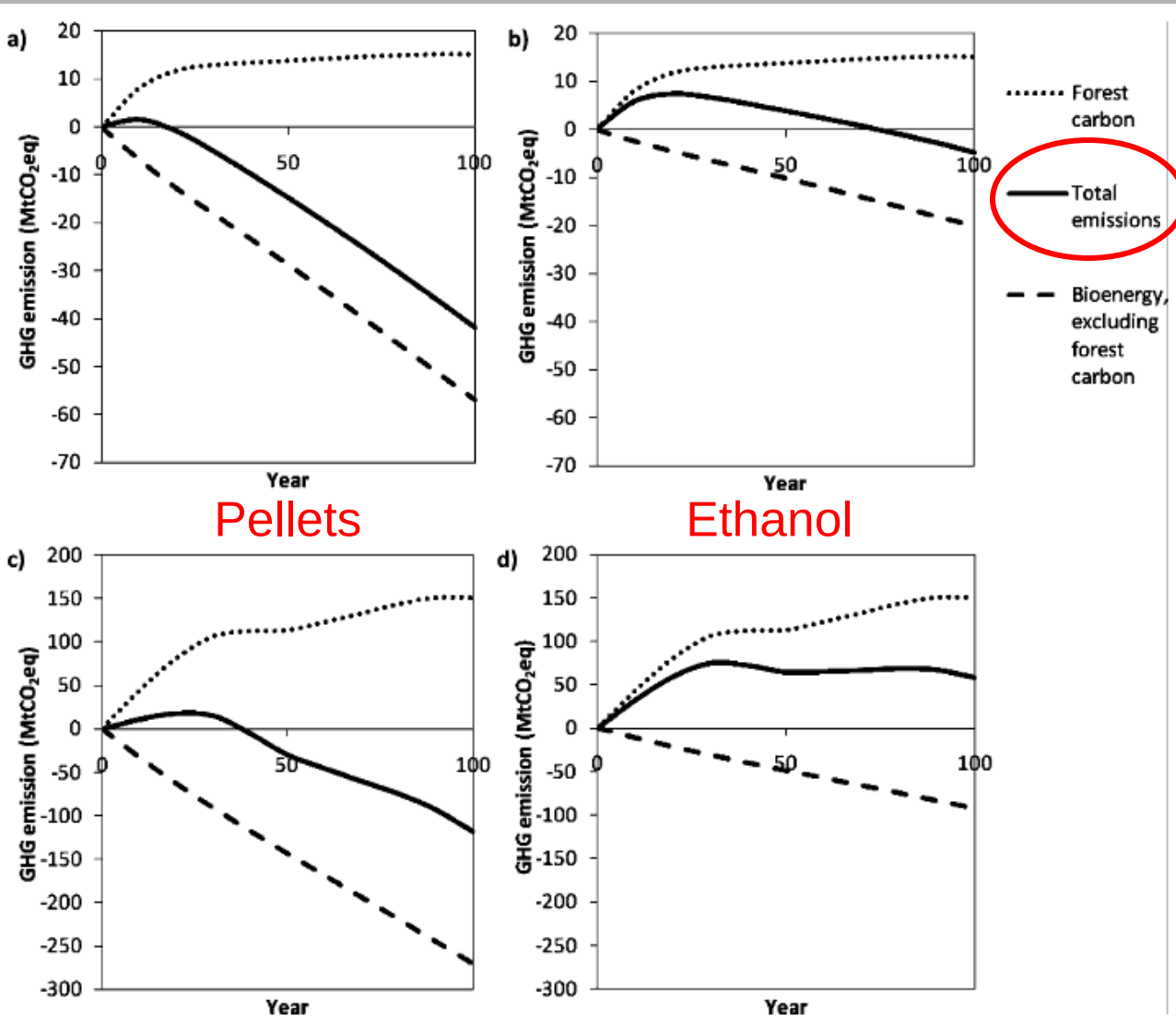
Cumulative atmospheric carbon balance over 100 years using coal and natural gas technologies to meet energy demand of proposed biomass facilities in SE-US.



Source: NWF 2012

Ontario GL-St.L forest LCA for bioenergy production showing:

Significance of feedstock source, fossil reference system energy density and time



Cumulative GHG emissions from continuous biomass harvest for bioenergy production:

(a) pellets produced from residues, displacing coal (20% co-firing),

(b) ethanol produced from residues, displacing gasoline (E85 fuel),

(c) pellets produced from standing trees, displacing coal (20% co-firing), and

(d) ethanol produced from standing trees, displacing gasoline (E85 fuel).

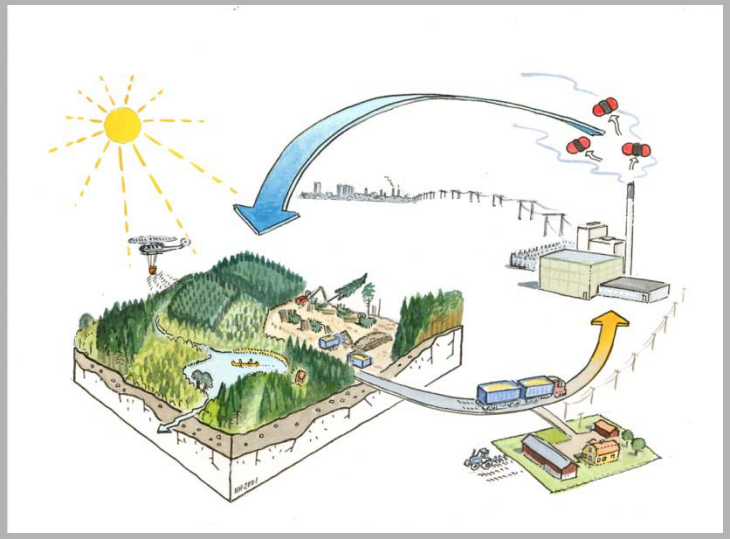
Positive values indicate an increase in GHG emissions to the atmosphere.

Source: McKechnie et al. 2011

A few points about certification systems…

With more than 50 certification systems…

- Governance is increasingly complex
- Potential negative impacts along the whole supply chain



- Overlapping jurisdictions over Chain of Custody
- Trade may be restricted
- Can multiple governance systems be harmonized?

Overall message—

Mobilising Sustainable Bioenergy Supply Chains

Mobilize sustainable bioenergy systems by developing a competitive value chain from the forest to energy markets and consumers.

Sustainability criteria provide an adaptable framework to deploy sustainable bioenergy systems.

Challenges to resolve:

- **Develop competitive supply and value chains**
- **Quantify (+ / -) sustainability impacts of bioenergy supply chains**
- **Simplify governance of supply chains**


Thanks!
Questions?
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