Presentation 2.1: Review of global bioenergy scenarios

Jack N. Saddler
Position: Professor & Dean
Organization/Company: University of British Columbia, Faculty of Forestry

E-mail: jack.saddler@ubc.ca

Abstract
Our team at the University of British Columbia has reviewed a number of existing studies of global forest biomass potential, particularly focused on industrial fibre supply. These studies, including a number of FAO publications, were used as the basis for an estimate of global industrial fibre supply in 2010 and 2050. Using standard heating values for wood, it can be estimated that fibre surplus to industrial needs might supply between 35 and 120 EJ of energy in 2050. In the Intergovernmental Panel on Climate Change's Special Report on Emission Scenarios, the models used anticipated bioenergy inputs of between 22 and 204 EJ in 2050. There is a potential for bioenergy demand to exceed potential surplus measurements in all but the most optimistic scenarios. The FAO and partner institutions should undertake a new 'Fibre Supply Analysis' that will take fuelwood and emerging bioenergy options into account**.**

Review of global bioenergy scenarios

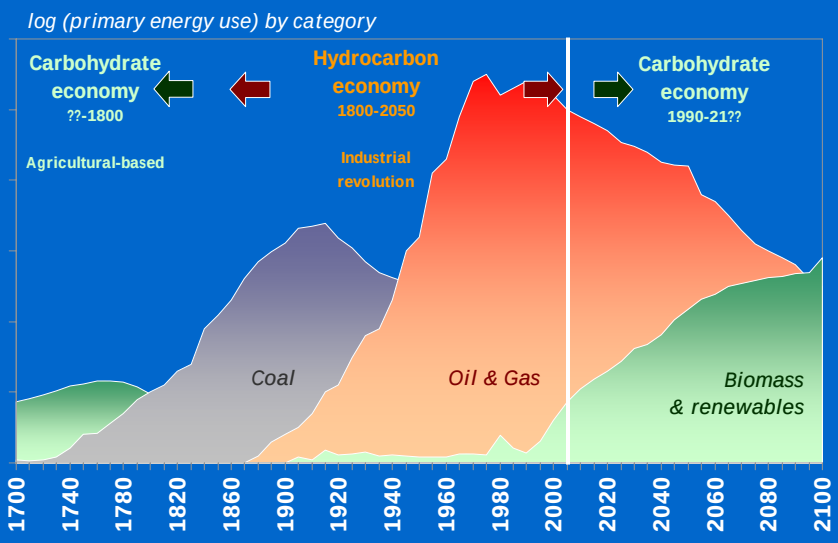
W.E. Mabee, J.N. Saddler
Forest Products Biotechnology, Department of Wood Science
Faculty of Forestry, University of British Columbia
4043-2424 Main Mall, Vancouver, BC, Canada V6T 1Z4
warren.mabee@ubc.ca

International Seminar on Energy and the Forest Products Industry
Rome, Italy: October 30 2006

Outline

1. **Drivers for bioenergy development**
2. Global fibre supply and demand
3. Estimates of fibre surplus or deficits
4. Estimates of bioenergy demand
5. Summary & Recommendations

Looking back and forward...



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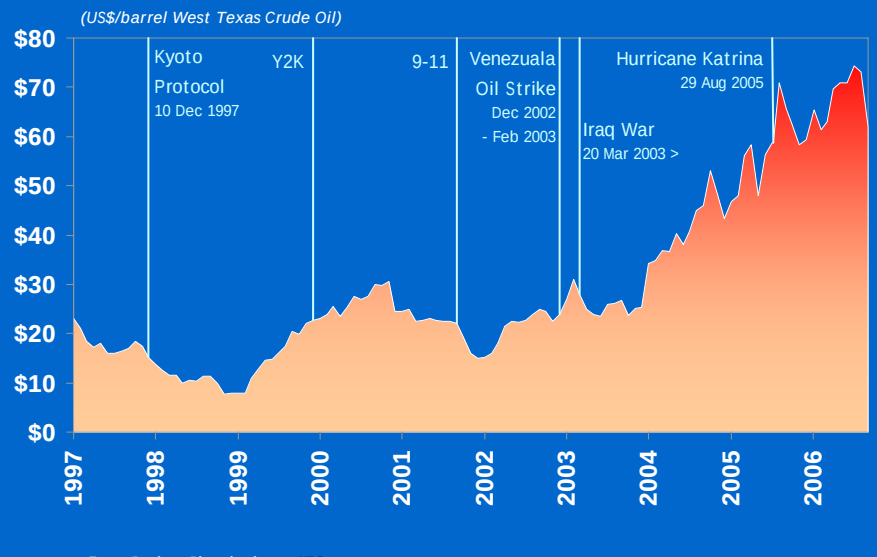
Oil Prices and World Events



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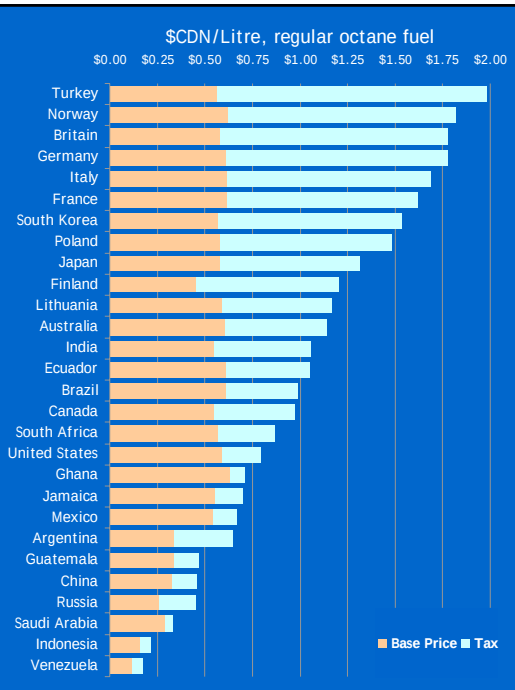
Sources: (1) WorldOil.Com. 2004,2005, 2006.

Gasoline Prices
April 2006

- Turkey: ~$2.00 CDN/litre (~$6.70 US/gal.)
- Venezuela: ~$0.17 CDN/litre (~$0.60 US/gal.)



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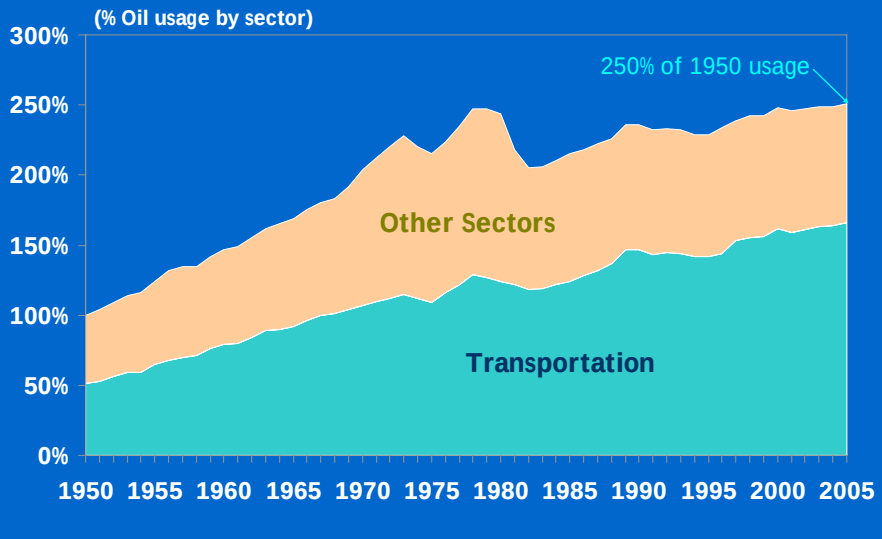
Oil for Transportation



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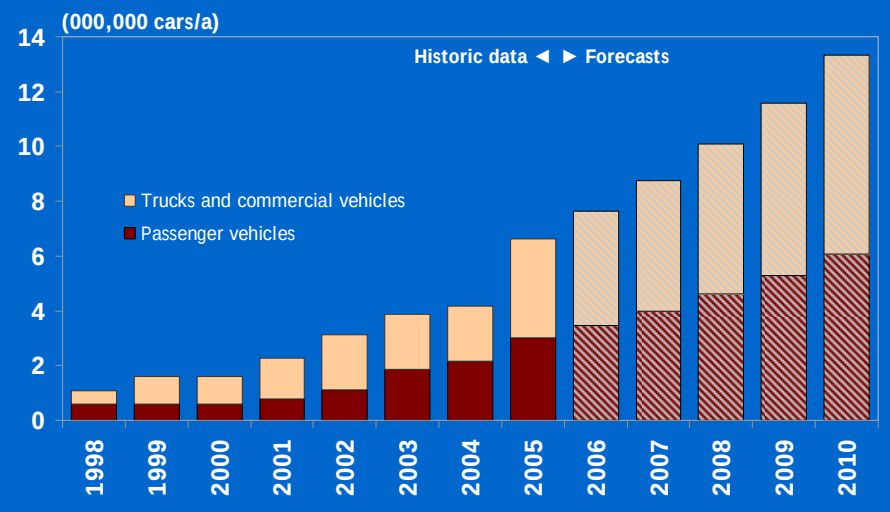
Source: (1) EIA. 2005. *Annual Energy Review.* US oil demand by end-use sector. http://www.eia.doe.gov/pub/oil_gas/petroleum/analysis_publications/oil_market_basics/Dem_image_US_cons_sector.htm

Mainland China Auto Use

Vehicle Sales, 1998-2010



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Sources: (1) Crain Communications, Automotive News, March 15, 2004; (2) South China Morning Post, Wednesday, June 23, 2004, p. B4. (3) Ward's World Motor Vehicle Data, 2005; (4) Shanghai Consular Region Report, East China Automotive Aftermarket, 2005; (5) China National Automotive Industry Consulting & Developing Corporation, 2006

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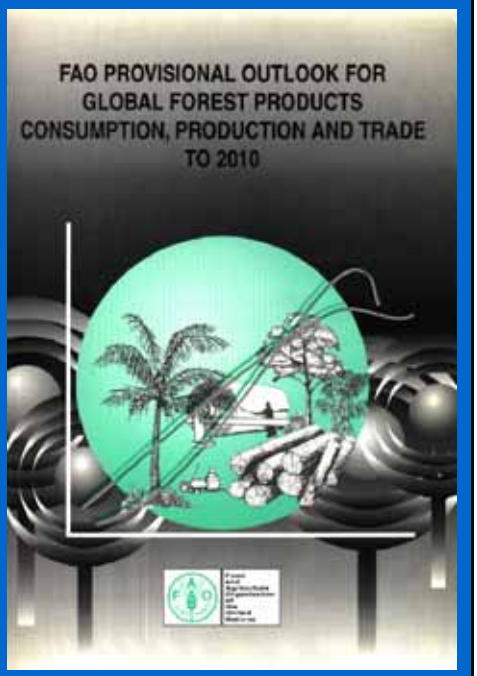
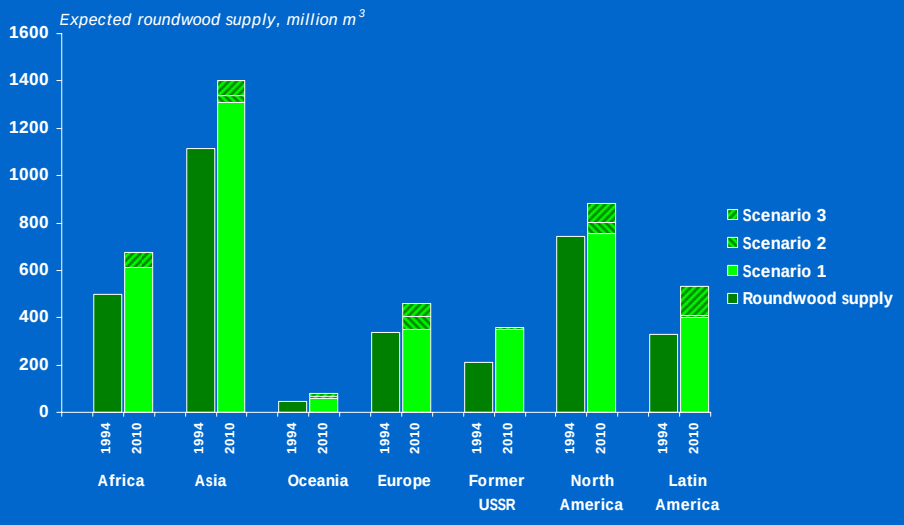
GFPM (1997)

- Consumption/production-oriented model
- National and regional analysis of trends
- Global amalgamation of figures

- 3 Scenarios:
  1. Low production
  2. 'Average' production
  3. High production



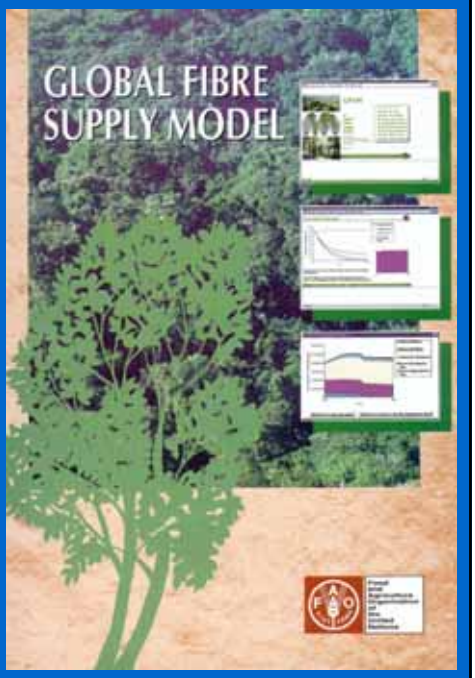
Fibre Supply: GFPM 1994, 2010



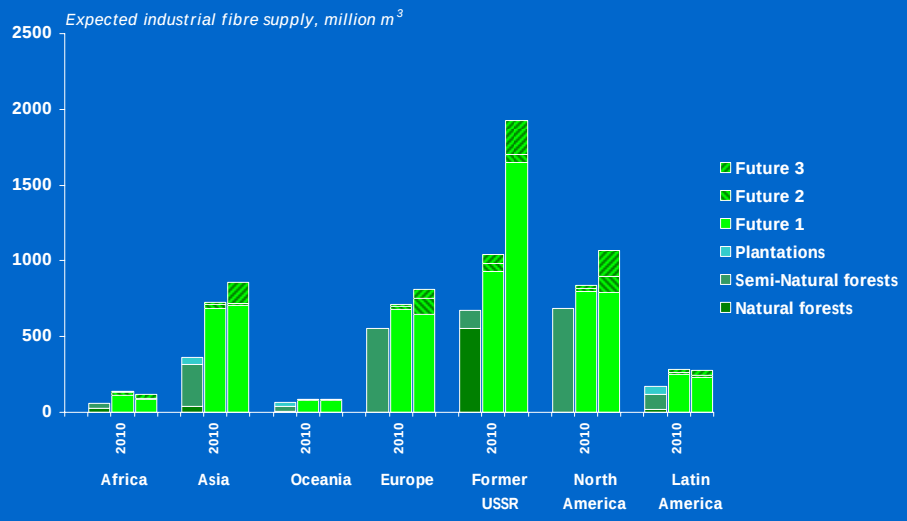
GFSM (1998)

- Supply-oriented model
- Review of all existing studies at national/ subnational levels
- Regional/global amalgamation

- 3 'Futures'
  1. 'Business-as-usual'
  2. Increased development
  3. Conservative or 'green' development



Fibre Supply: GFSM 1996, 2010, 2050



Other studies to date

- Multiple IIASA reports and models (usually regional, sometimes global)
- FAO Asia-Pacific Forestry Sector Outlook Study (1997)
- FAO Forestry Outlook Study for Africa (2003)
- FAO Trends and outlook in Latin America (2004)
- UNEP Forests in Flux report
- IEA Bioenergy – Global bio-energy potentials to 2050 (Smeets, Faaij et al. 2004)

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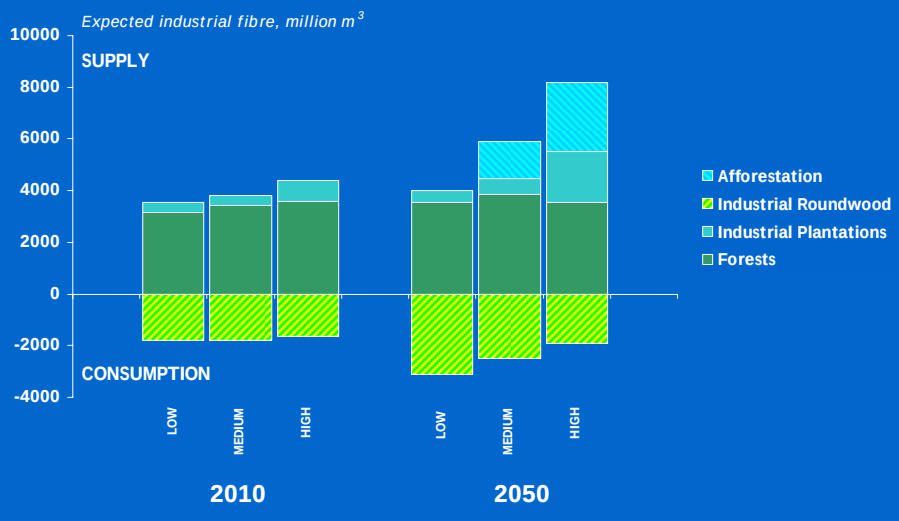
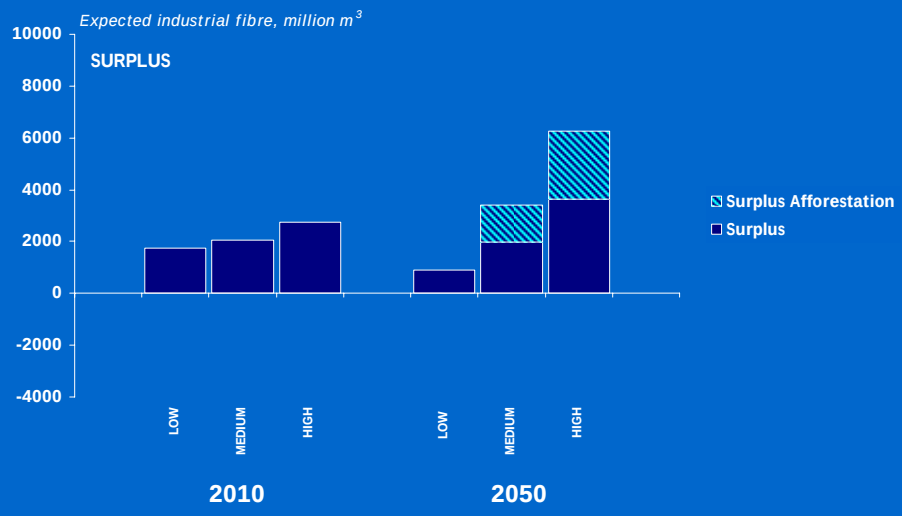
Our predictions

- Three future scenarios of global forest fibre supply and global forest products demand
- 'Low' scenario - increased economic competitiveness and decrease in forest investment
- 'Medium' scenario - 'business as usual' case
- 'High' scenario - 'green' requirements push industrial plantations

Predicted Fibre Supply/Demand



Predicted Fibre Surplus



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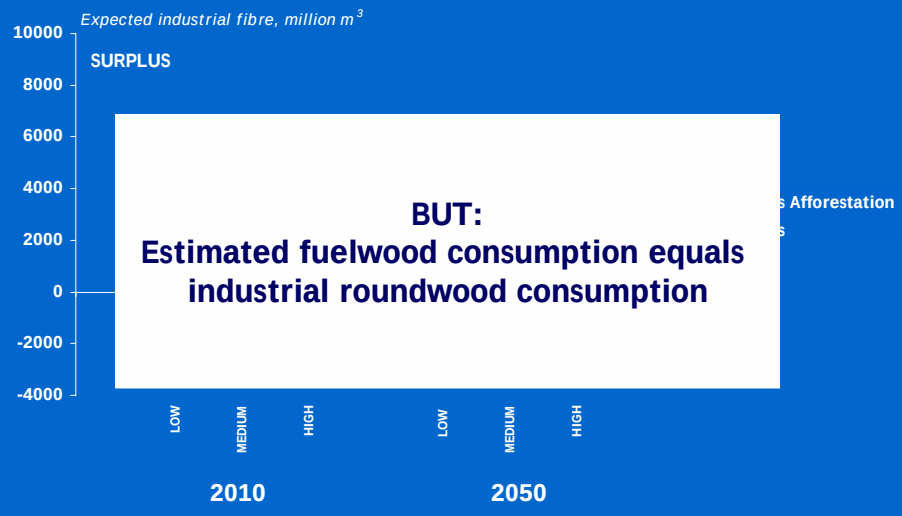

BUT:
Estimated fuelwood consumption equals industrial roundwood consumption

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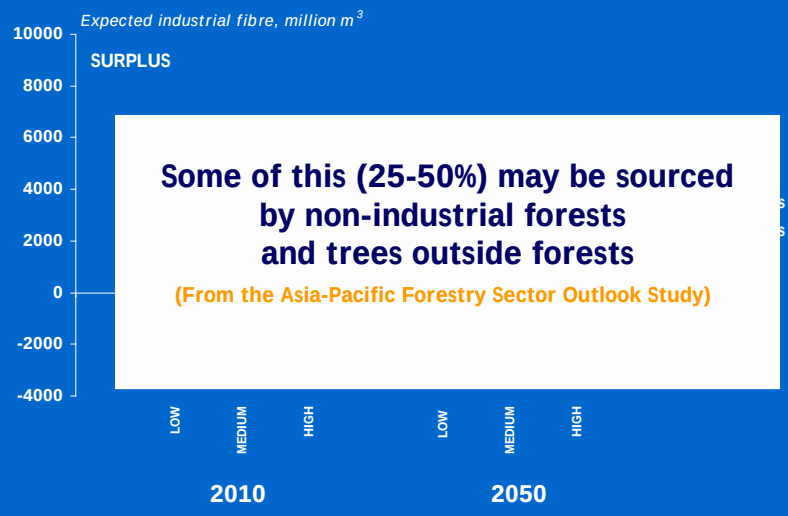
Predicted Fibre Surplus



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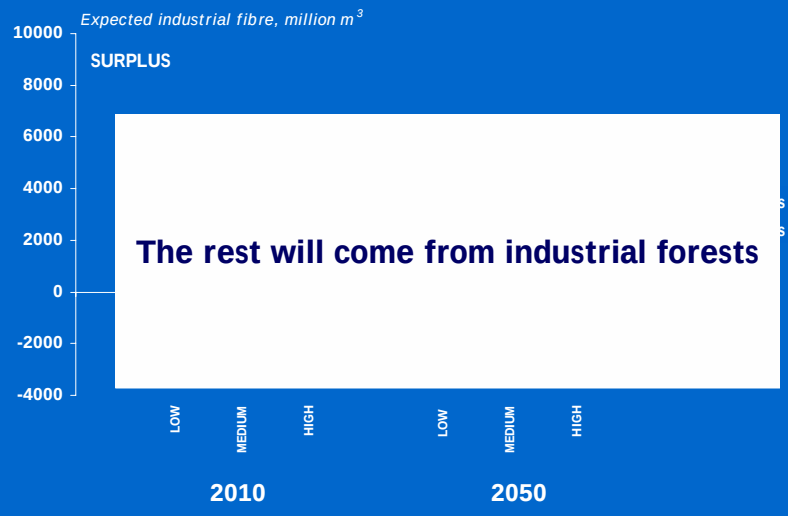
Predicted Fibre Surplus



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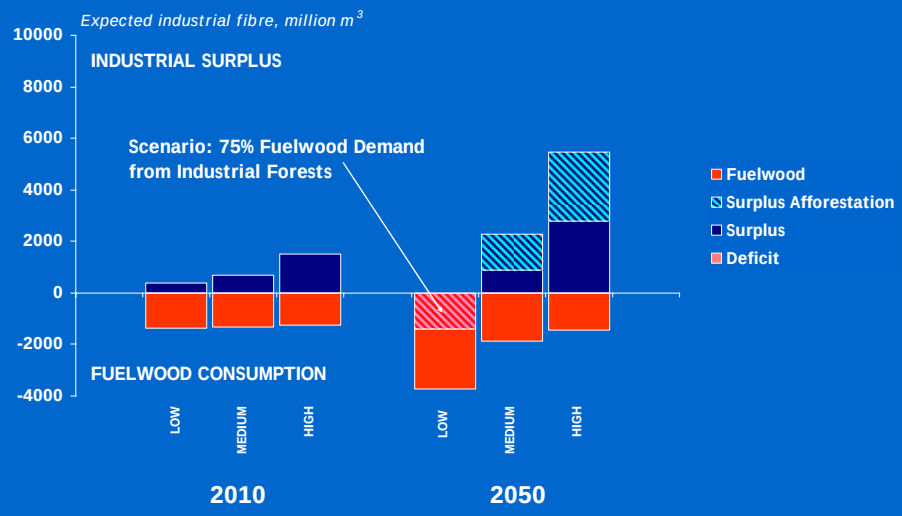
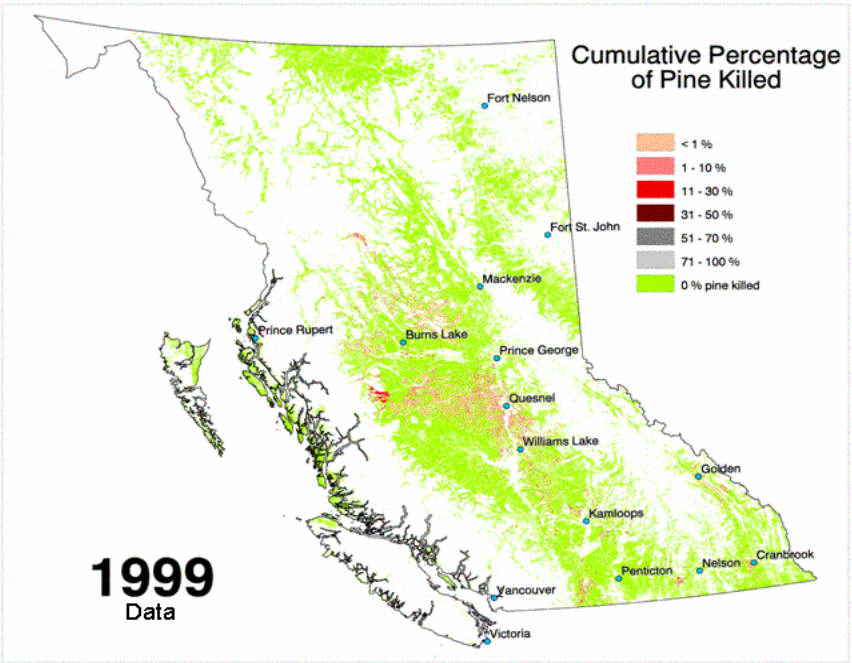
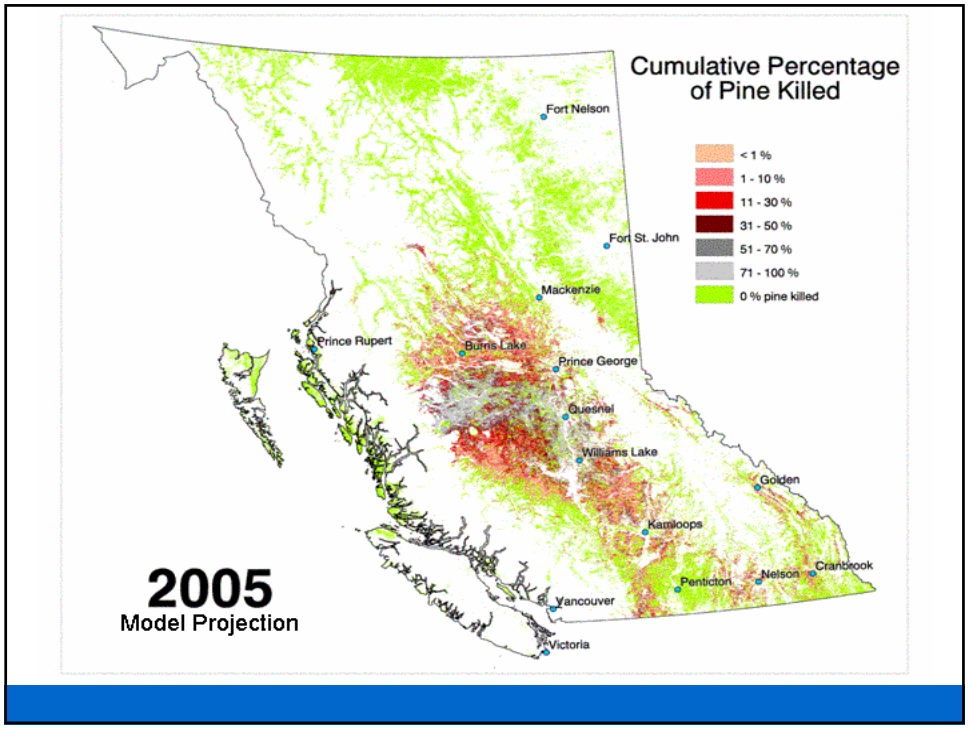
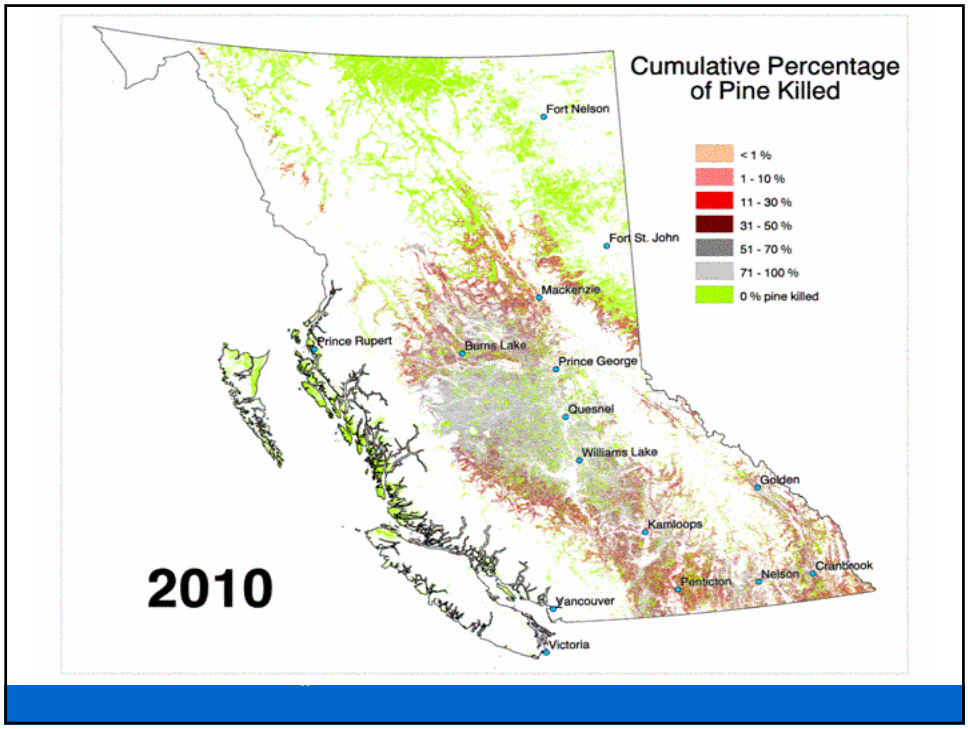
Corrected Fibre Surplus/Deficit



Forest Products Biotechnology at UBC




Cumulative Percentage of Pine Killed
< 1 %
1 - 10 %
11 - 30 %
31 - 50 %
51 - 70 %
71 - 100 %
0 % pine killed
Fort Nelson
Fort St. John
Mackenzie
Prince Rupert
Burns Lake
Prince George
Quesnel
Williams Lake
Golden
Kamloops
Penticton
Nelson
Cranbrook
Vancouver
Victoria
2005
Model Projection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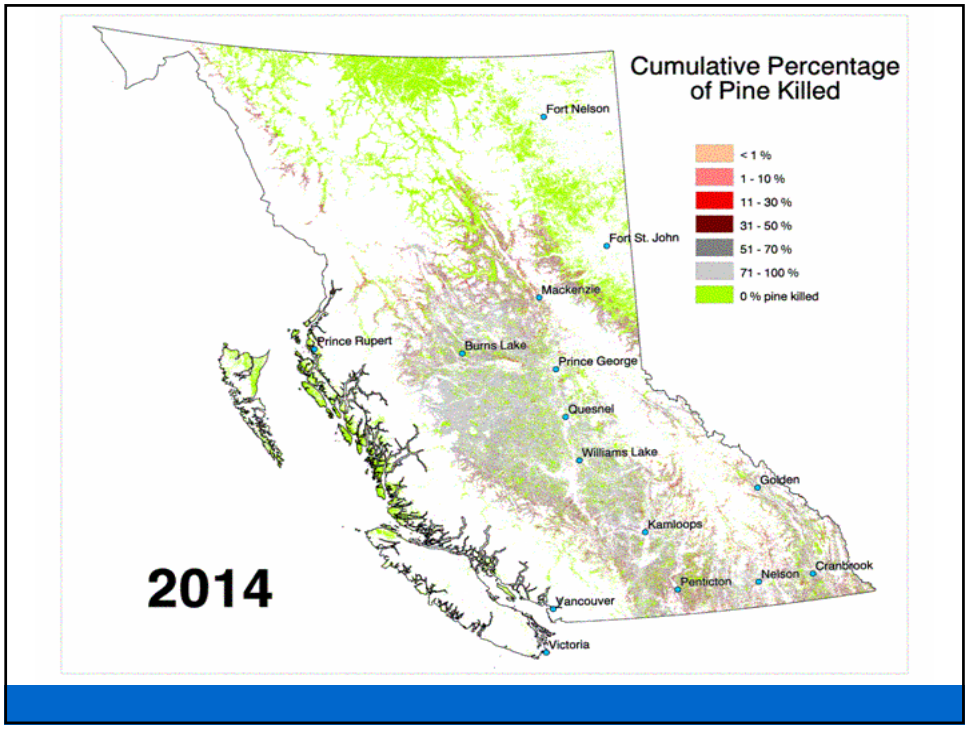
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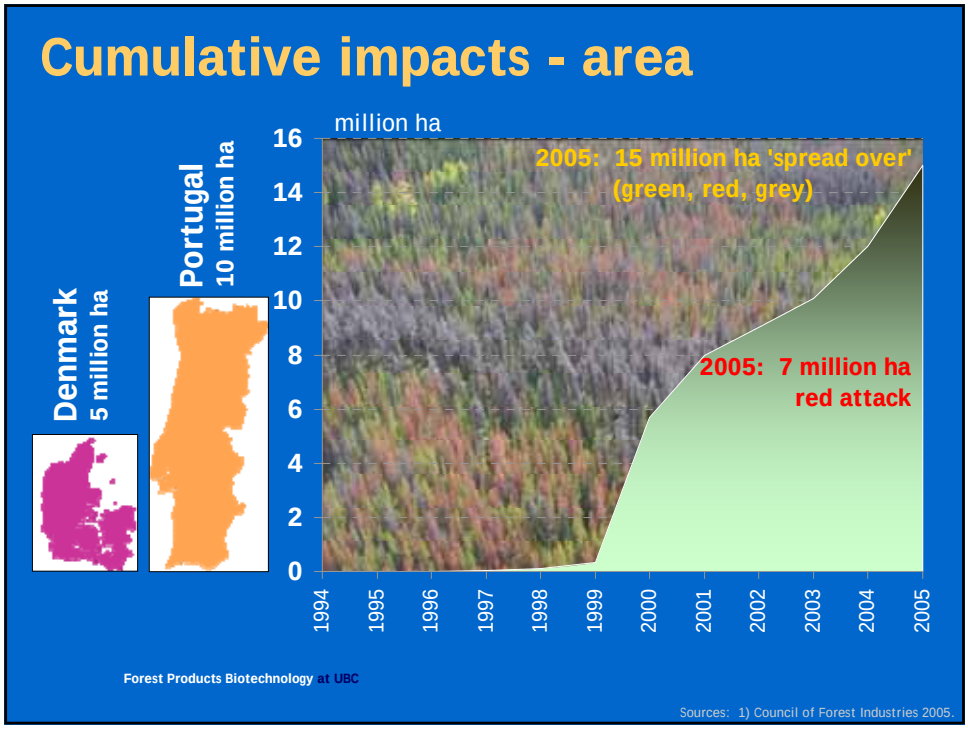
Victoria
2014


Cumulative impacts - area
million ha
16
14
12
10
8
6
4
2
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2005: 15 million ha 'spread over' (green, red, grey)
2005: 7 million ha red attack
Denmark
5 million ha
Portugal
10 million ha
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Sources: 1) Council of Forest Industries 2005.

New wood pellet capacity

- 4 new wood pellet plants, to use 10.5 million m^3 of wood over 10 years
- 4.7 million m^3 increase in annual allowable cut for bioenergy
- ~23% increase in the AAC for the Prince George & Quesnel regions alone

BRITISH COLUMBIA

NEWS RELEASE

For Immediate Release
2005FOR0101-000945
Oct. 19, 2005

Ministry of Forests and Range

BEETLE-WOOD LICENCES AWARDED TO CH ANDERSON

VICTORIA – North Central Interior British Columbia will see significant long-term investment in mountain pine beetle timber processing with the award of four forest licences to CH Anderson and Partners, Forests and Range Minister Rich Coleman announced today.

"A key part of our Mountain Pine Beetle Action Plan is to recover as much economic value as possible from beetle-attacked forests," said Coleman. "These forest licences will result in new mills being constructed, a more diverse industry and hundreds of new jobs and long-term investment for B.C.'s Interior."

The 10-year licences for the Prince George and Quesnel timber supply areas are for 10.5 million cubic metres of timber and require CH Anderson to construct or significantly expand timber processing facilities that produce something other than dimensional softwood lumber.

CH Anderson and Partners intend to invest $110 million in building four plants to manufacture industrial wood pellets for use as sustainable biofuels in European thermal power plants. The company estimates their plans could support up to 640 jobs in B.C.

"We're looking forward to working with northern communities and First Nations as we develop this new business opportunity," said CH Anderson and Partners CEO Gary Griffith. "Our investment will help offset the impact of the mountain pine beetle devastation by using as much damaged wood as possible and rehabilitating the forests."

The new licences result from a 4.7-million cubic metre increase in the allowable annual cut for the salvage of beetle-infested pine in the Prince George and Quesnel timber supply areas. Two other 15-year forest licences, totalling 21 million cubic metres, are expected to be awarded in the near future.

The development of these forest licences is one part of the government's comprehensive Mountain Pine Beetle Action Plan to help local communities diversify their forest economies. Government is also giving communities the tools to plan their own future through the $185-million Northern Development Initiative and $50-million Southern Interior Development Initiative trust funds and funding support to regional beetle action coalitions.

Potential bioenergy supply

- Heating value of wood: 15 GJ/t (20% moisture)
  18-22 GJ/t (BDT)
- Wood energy potential (surplus industrial fibre):
  - 2010: 5.7 to 33.0 EJ
  - 2050: 13.3 to 119.8 EJ

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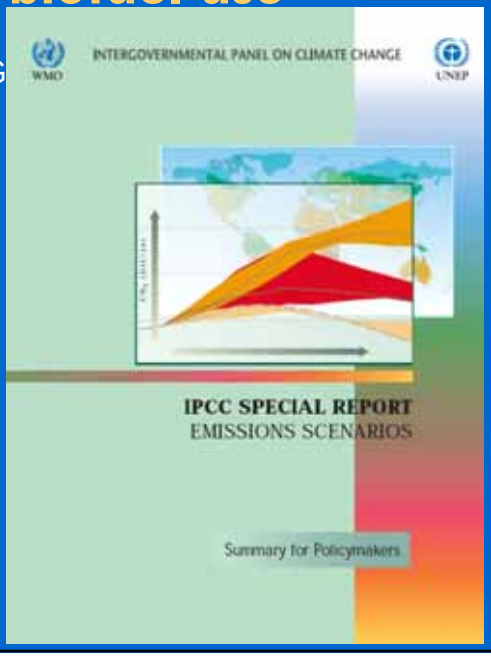
Modelling future biofuel use

- Model ran globally for GHG emissions
- Used IPCC marker and illustrative scenarios
- Used predictions of biomass energy use that reflected technological and social changes



IPCC Scenarios

1. A1 Scenarios – rapid and successful development
   A1T – new technologies enable economic dev.
   A1FI – fossil intensive future
   A1B – balanced approach with new tech, fossil fuels
2. A2 Scenario – lower trade, reduced tech change
3. B1 Scenario – sustainable development, green goals
4. B2 Scenario – neutral approach following current trends

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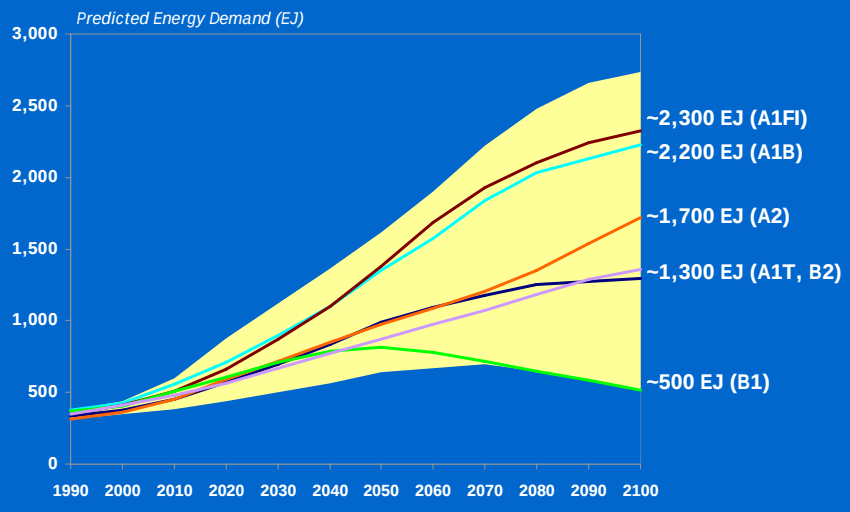
Global Energy Demand, IPCC



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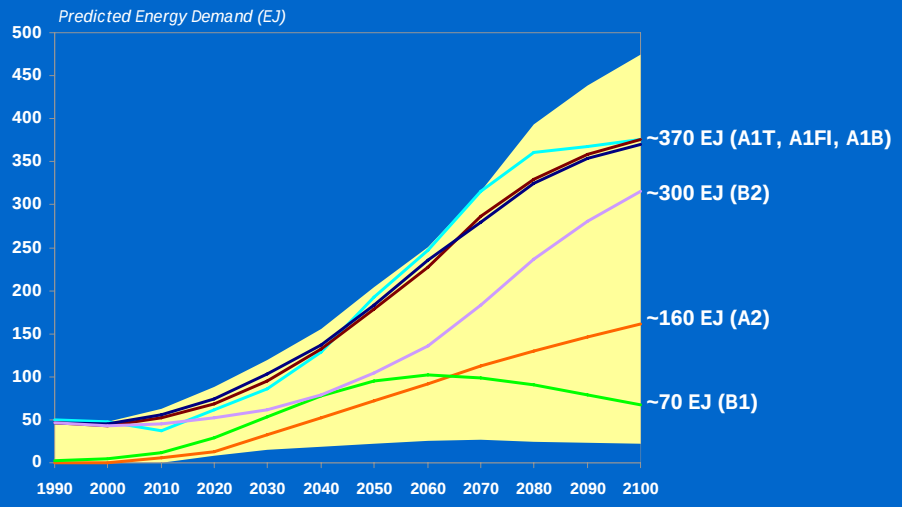
Global Bioenergy Demand, IPCC



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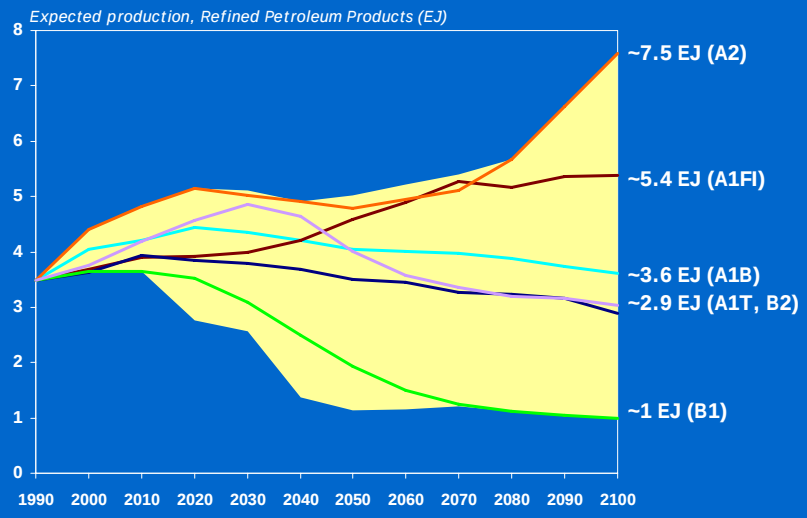
Predicted RPPs in Canada



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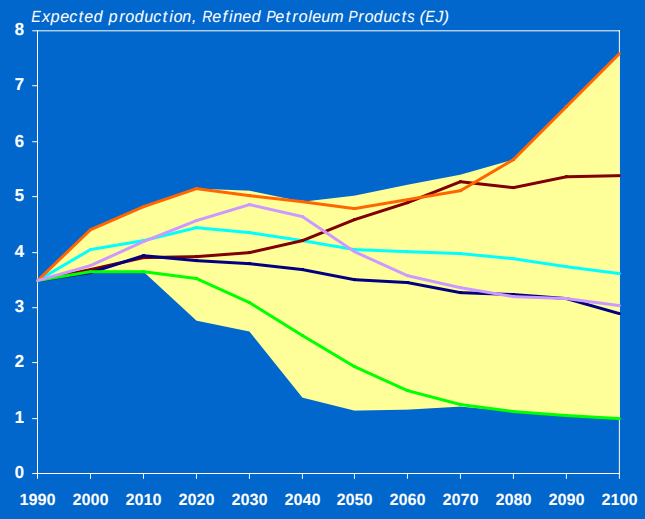
Source: (1) Statistics Canada (2006); (2) IPCC (2003)

Predicted Biofuels 2100



3.6 EJ (High)

0.1 EJ (Low)

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Summary of estimates

- Estimated supply (industrial roundwood surplus), 2050:
  13.3 to 119.8 EJ

- Estimated demand (all sources of bioenergy), 2050:
  22 to 204 EJ

Questions:

- How much bioenergy can the forest provide in reality?
- How will bioenergy impact existing forest products?
- Can fuelwood be used to supply industrial bioenergy?

Recommendations

- FAO and partners should undertake a new 'Fibre Supply Analysis' that takes fuelwood and emerging bioenergy options into account

- The use of new technologies to more efficiently extract bioenergy at all stages of forest operations must be considered

- Champions need to be identified in our organizations to move this project forward