

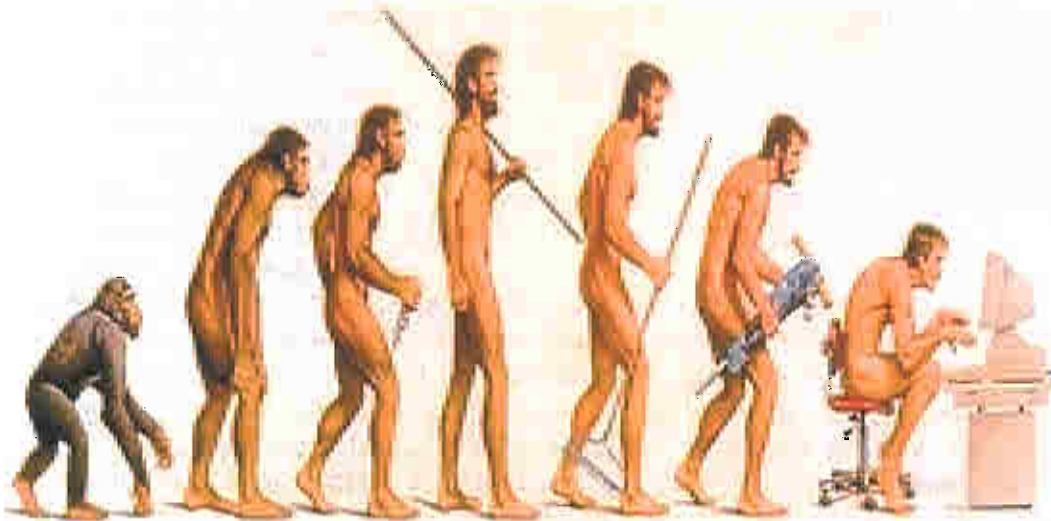
# Biomass – Feedstocks for BioEnergy & BioProducts

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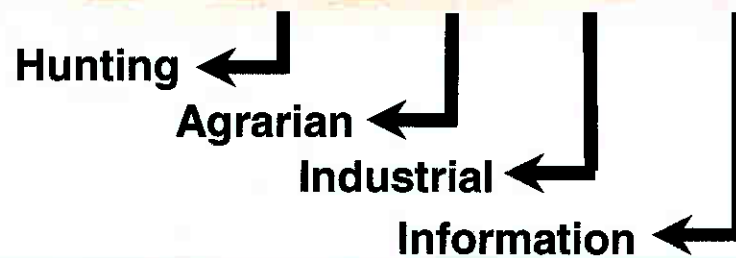
*New Opportunities for the Bioeconomy*



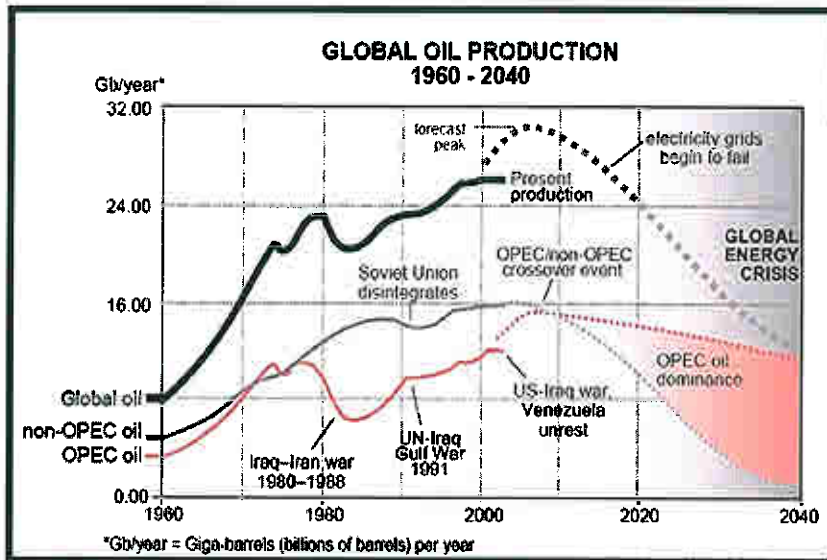
# Humankind's Economic Cycles



What's  
Next?



# Hubbard's Peak



## Peak Oil Will:

- 1) Make your life miserable
- 2) Make biomass cost-effective feedstocks for bioenergy and bioproducts
- 3) Bring on the bioeconomy

# The Bioeconomy

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The Bioeconomy Will:

- 1) Generate as much innovation and prosperity as the information technology and energy sectors combined - >\$100 billion in Canada
- 2) Wean the Canadian economy from its dependence on fossil fuels as a source of energy and platform chemicals
- 3) Help meet Kyoto Protocol commitments on greenhouse gas reductions

# A Roadmap Toward the Bioeconomy

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- Fight culture
- Scan for opportunities
- Develop a strategy based on resources, knowledge, capital and labor
- Secure resources and/or knowledge
- Secure partnerships
- Acquire technology and secure markets
- Revise strategy

# Bioproducts & Biomass

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*Bioproducts* = products that are made, derived or manufactured from all parts of living organisms – *biomass* in a large sense

*Biomass* = any type of living or dead plant or organic material that is available on a renewable or recurring basis

# Sources of Biomass

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- 1) **Forestry** - as waste from timber harvesting operations; as salvageable dead wood; as sawdust and other waste wood residues generated by the wood products industry
- 2) **Agriculture** - as surface harvest residues; as milling residues and as dedicated energy crops of perennial grasses and short rotation species
- 3) **Urban** - as waste vegetable oil, residential yard waste, wooden pallets, construction waste and municipal solid waste

# Unused Forest Biomass

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- Is this a commodity?
- What about ownership?
- What about competing uses?

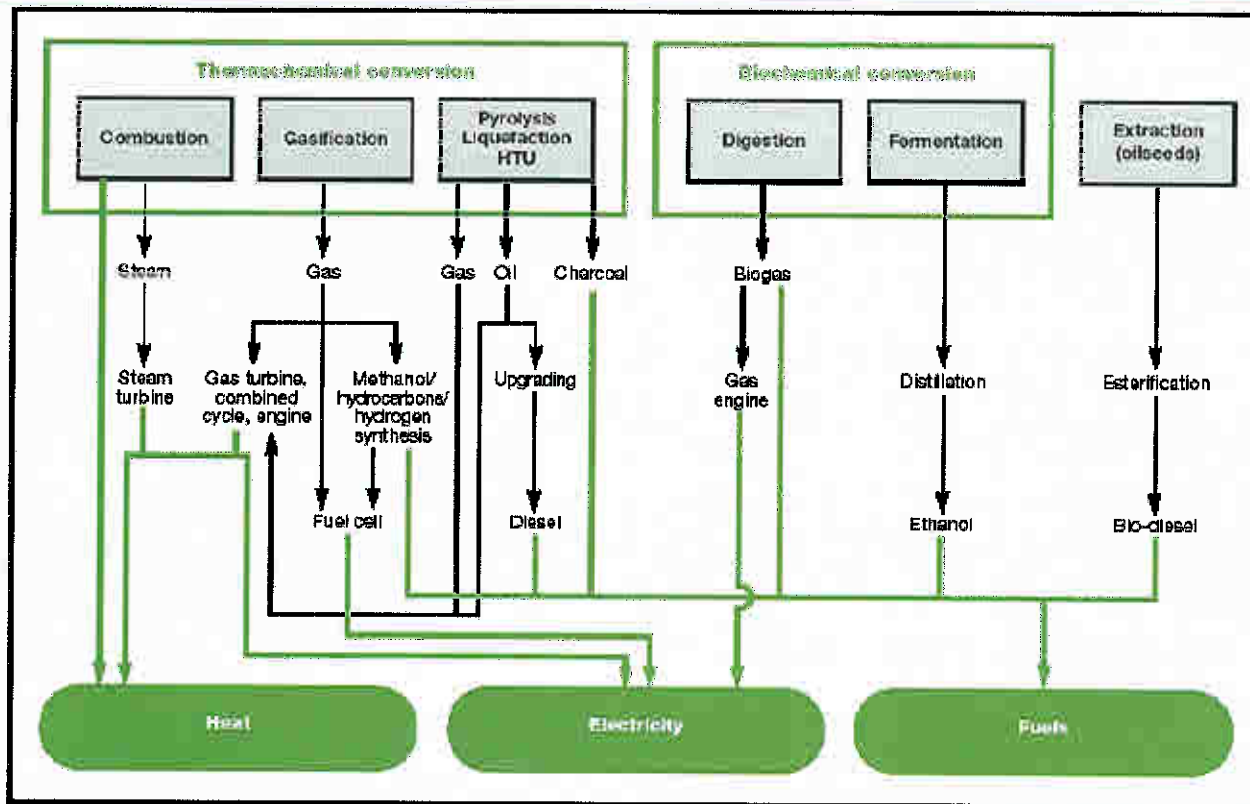


# Think About Energy

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- Energy is \$80 billion per year in Canada
- Gasoline is \$45 billion per year in Canada
- Forest biomass could provide 50% of Canada's energy needs
- The hydrogen economy is coming
- The Kyoto Protocol changes things

# Biomass-To-Energy



# Types of Bioproducts

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- 1) Biomass Feedstocks
- 2) Platform Bioproducts – alcohols, gases, biodiesel
- 3) Versatile Bioproducts – bioplastics, biopesticides, composites
- 4) Forest-Based Food, Nutraceutical and Pharmaceutical Bioproducts
- 5) Decorative and Aesthetic Bioproducts
- 6) Bioprocesses – fermentation, biocatalysis

# Applications For Bioproducts

## A. Automobiles and Transportation

- Textiles and non-woven natural fibres;
- Lubricants (motor oils, transmission fluids) and hydraulic fluids;
- Ethanol;
- Biodiesel

## B. Power Generation

- Direct combustion of biomass feedstocks or bio-oil derived from biomass feedstocks;
- Gasification of biomass feedstocks and combustion of syngas or condensed fuel (i.e. ethanol, methanol, Fischer-Tropsch diesel)

## C. Construction Industry

- Adhesives;
- Engineered lumber, boards and panels;
- Paints and coatings

## D. Pulp and Paper Industry

- Non-wood fibres for pulp and paper production (agricultural residues, fibre crops);
- Steam and/or power generation

## E. Printing Industry

- Vegetable-based inks and biosolvents

## F. Packaging

- Biopolymers (polylactic acid polymer)

## G. Environment Industry

- Solid waste and water biotreatment;
- Biofiltration and bioremediation

## H. Pharmaceuticals and Consumer Products

- Medicines and nutraceuticals
- Personal care products (soaps, lotions)

# Selection Criteria

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- Minimize distance between source of biomass, processing facility and value-added or end-users
- Market forces
- Availability of technologies
- Access to capital
- Long term supply of feedstocks

# Barriers to Bioproducts

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- Understanding markets and technologies
- Securing long-term and low-cost supplies of biomass
- Developing markets
- Legal and regulatory requirements
- Competition - gold rush mentality

# Bioproducts & The Forest Industry

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- The forest industry is already engaged in the Bioproducts industry
- Complementary in time and space
- Symbiosis
- Independence
- Conflict

# First Nations & Bioproducts

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- Take advantage of traditional knowledge
- Use treaty rights to increase access to unused material from the forest
- Secure position at the centre of the emerging bioeconomy
- Become brokers of knowledge, biomass and bioproducts
- Be ahead of the wave



## Barriers to the adoption of bioproducts

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- Cost-competitiveness with comparable petro-products
- Retooling for the replacement of bioproducts
- Culture is not receptive to the use of replacement products

# The Frankentank-biodiesel

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# Conclusions

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- Bioeconomy is coming as a new economic wave
- Means of production can be owned by small entrepreneurs/communities
- The «Stick it to the Man » aspect of the bioeconomy may be important
- Small scale innovation will be critical in the bioeconomy