

Sustainable Development, Forestry and Renewable Energy



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Some Concepts of Sustainable Development

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Brundtland Report


- Report: *Our Common Future*
World Commission on Environment and Development
1987
aka *Brundtland Report*, named after the Chair of the Commission, Mrs. Gro Harlem Brundtland (former Prime Minister of Norway)
- Definition of Sustainable Development:
Development that meets the needs of the present without compromising the ability of future generations to meet their own needs




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Brundtland Report - Application

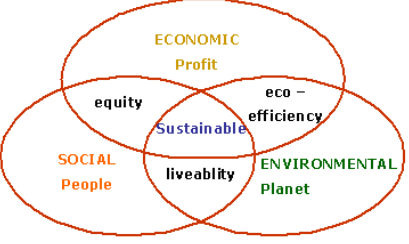
- The ***Triple Bottom Line***:
Economic Prosperity
Social Equity
Protection of the Environment




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Brundtland Report – Application (cont.)

- The ***Triple Bottom Line***:



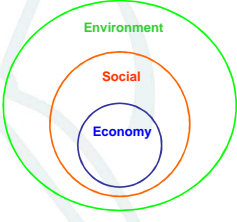

Source: UNEP Life Cycle Initiative




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Brundtland Report – Application (cont.)

- The ***Triple Bottom Line***: Another view

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The Science of Climate Change

The Greenhouse effect

SUN
Solar radiation is reflected by the atmosphere and to Earth's surface. **Changing Earth's temperature 100 Watt per sq. m.**

GREENHOUSE GASES
Some solar radiation is reflected by the atmosphere and to Earth's surface. **Changing Earth's temperature 100 Watt per sq. m.**

ATMOSPHERE
Some solar radiation is reflected by the atmosphere and to Earth's surface. **Changing Earth's temperature 100 Watt per sq. m.**

Earth's surface
Solar radiation passes through the clear atmosphere, heating Earth's surface. **340 Watt per sq. m.**

Surface
Some of the infrared radiation is absorbed and re-emitted by the greenhouse gas molecules. The amount is in the warming of the long wave bands and the wavelength.

Surface gases
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Source: www.unfccc.int

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The Science of Climate Change (cont.)

Observed changes of concentrations in the atmosphere (IPCC)

1. Carbon Dioxide
2. Methane
3. Nitrous Oxide

Source: www.ipcc.ch

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The Science of Climate Change (cont.)

Atmospheric Carbon Dioxide Concentration and Temperature Change

CO₂ concentration (ppmv)

Temperature change (°C)

Current Level

CO₂ concentration predicted in 2100 (675 ppmv)

CO₂ concentration for global temperature increase of 2C (450 ppmv)

CO₂ concentration measured in 2005 (379 ppmv)

Source: www.ipcc.ch

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The Science of Climate Change (cont.)

Future scenarios: Equilibrium global average T (IPCC)

Historical emissions

Stabilization level

World CO₂ emissions (GtCO₂/yr)

Equilibrium global average temperature increase above pre-industrial (°C)

GHG concentration stabilisation level (ppm CO₂-eq)

Source: www.ipcc.ch

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The Science of Climate Change (cont.)

Observed changes of in the atmosphere (IPCC)

1. Global average surface temperature
2. Global average sea level
3. Northern Hemisphere snow cover

(a) Global average surface temperature

(b) Global average sea level

(c) Northern Hemisphere snow cover

Source: www.ipcc.ch

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Températures globales de surface observées

Global

Global Land

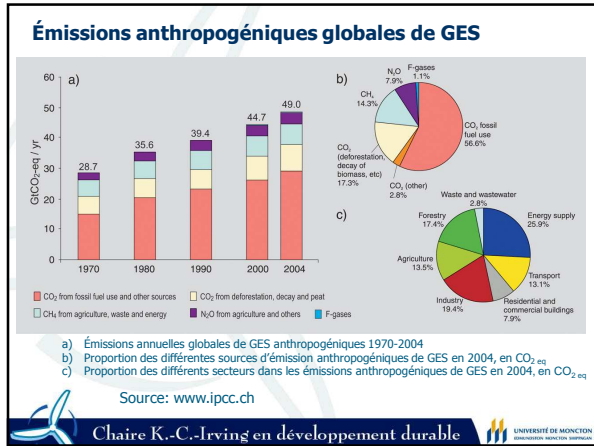
Global Ocean

Temperature anomaly (°C)

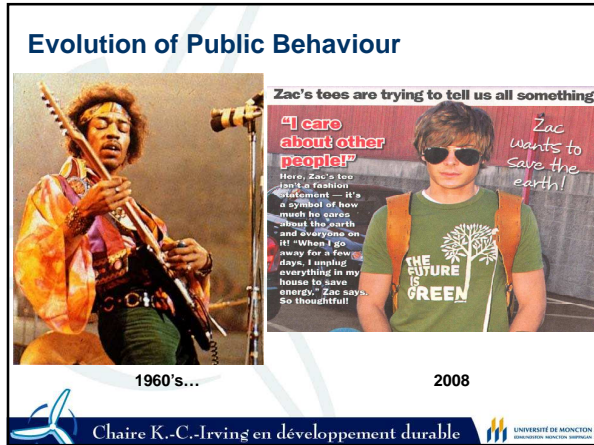
Year

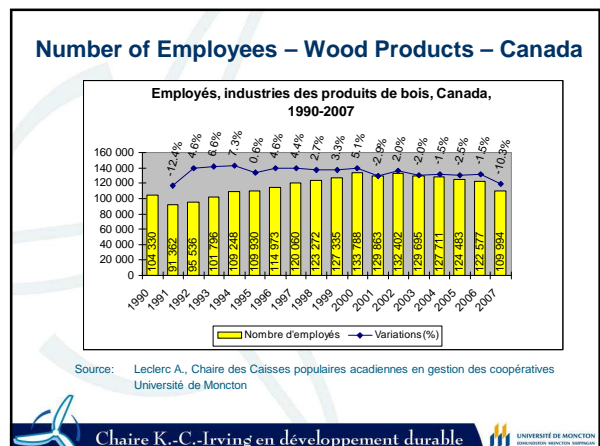
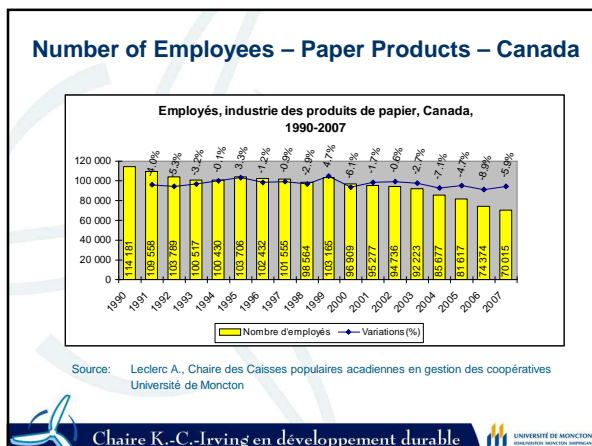
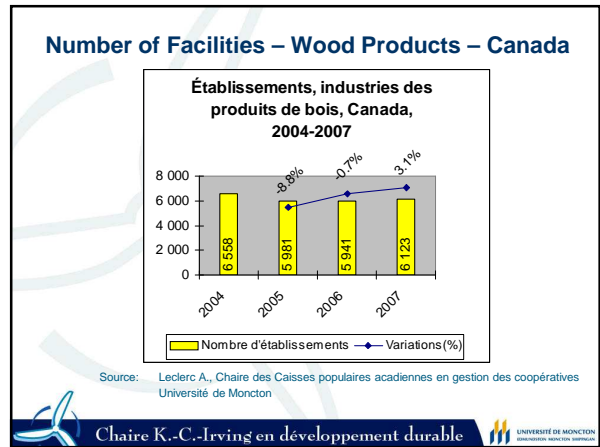
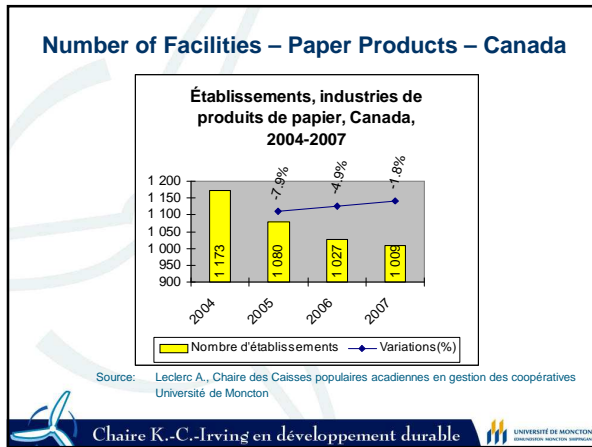
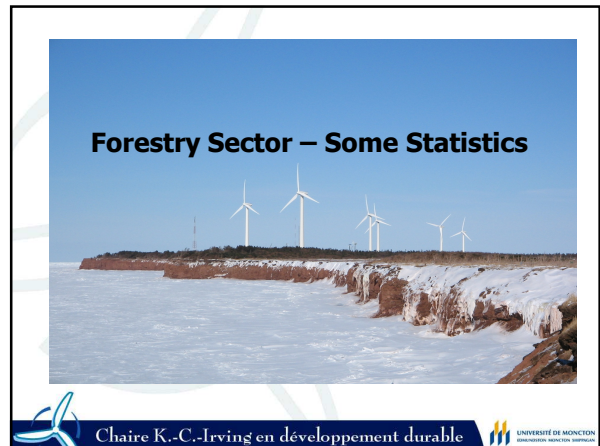
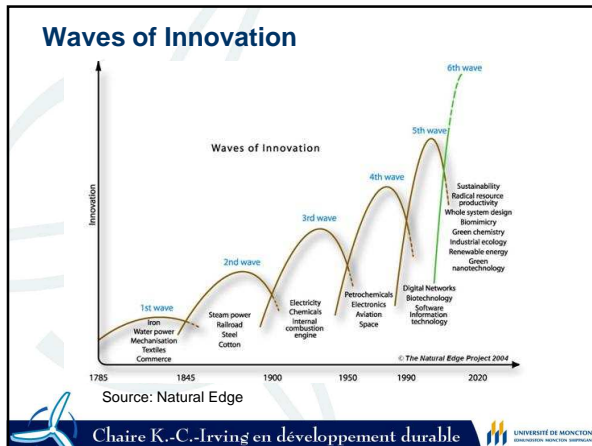
Source: www.ipcc.ch


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- ### Approach to Address Climate Change
- Adaptation
 - Adjustment to climate change to moderate potential damage, to take advantage of opportunities or to cope with the consequences
 - Addresses the effects of climate change
 - Mitigation
 - Action taken to permanently eliminate or reduce the long-term risk and hazards of climate change
 - Addresses the causes of climate change
 - Precautionary Principle
 - When there are threats of serious and irreversible damage to the environment, the lack of full scientific certainty shall not be used as a reason for postponing actions to prevent environmental deterioration







Innovation in the Forestry Sector

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AV Nackawic, New Brunswick

- Member of the Aditya Birla Group, India (Fortune 500 corporation)
- 2008: Conversion from hardwood paper grade pulp to the production of dissolving pulp
- Dissolving pulp: Main raw material used in the manufacture of Viscose Staple Fibre (rayon used in the clothing industry)
- Innovation: Conversion of a plant to produce a higher value added product

Source: AV Nackawic, www.av-group.ca

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Thurso, Québec

- Until 2009: Kraft pulp, Fraser Papers
- June 2009: Closing of the mill by Fraser Papers
- Fortress Paper: Specialized in money paper and passport paper (active in Europe, owned by a Canadian)
- 2010: Purchase of the Thurso plant and conversion from kraft pulp to the production of rayon (Company: Fortress Cellulose Spécialisée)
- Innovation: Conversion of a plant to produce a higher value added product

Source: L'Actualité, October 4, 2010

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Cascades, Québec

- Innovation: Development of "Intelligent Papers"
- Initial product (2010): Antibacterial paper towel
 - Paper containing an ammonia largely used in shampoos and disinfectants
 - Fabricated at the Lachute (Qc) plant from 100% recycled fibre
 - Available now in Canada; in the process of FDA approval in the USA
- Markets: Hospitals, day cares, schools, food industry
- Other intelligent papers in development:
 - Drug detecting paper
 - Specialized wrapping paper for the food industry

Source: Le Devoir, October 10, 2010

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Groupe Savoie, New Brunswick

- Established in 1978, family business in hardwood products
- Products:
 - Pallets
 - Hardwood lumber
 - Harwood components, custom-cut, mouldings and ready to assemble pieces
 - Sanded and custom-cut glued panels
 - Flooring
 - Manufactured fire logs
 - Wood chips and sawdust
- Innovation: Optimal use of the wood fibre to manufacture products

Source: www.groupesavoie.ca

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Distributed Power Generation

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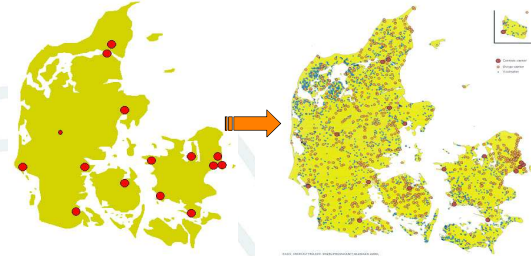
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Wind Energy in Denmark - Status

- Wind installed capacity = 3 200 MW (average of 20% of electricity demand; some days, 100% of electricity demand)
- Strong manufacturing sector (2008):
 - 21 000 jobs / 5 billion euros (8 G\$) per year
- Half of wind energy is installed on the distribution grid
- Standard Offer Contracts / Feed-in Tariffs
- Seamless integration of electricity on the grid (technical and market participation)
- Target: 30-50% of electricity consumption by 2025

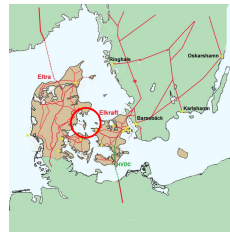
Power Generation in Denmark

Centralized production in the mid 80's Decentralized production of today (2008)



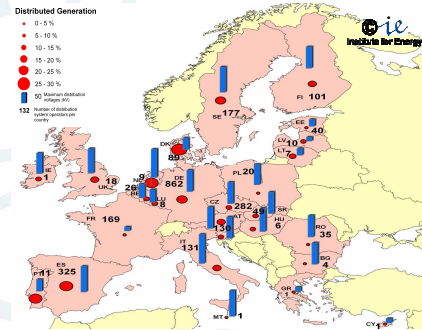
Samsøe Island, Denmark

- Island in the center of Denmark
- 4 000 inhabitants
- 100% self-sufficient for electricity
 - Wind energy
 - Biomass
- 100% carbon offset for transport



Net-Zero Carbon for the Energy Consumed on the Island

Shares of Distributed Generation Capacity and Distribution System Features in EU-27



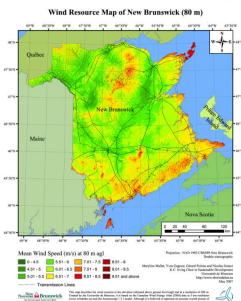
Source : JRC European Commission

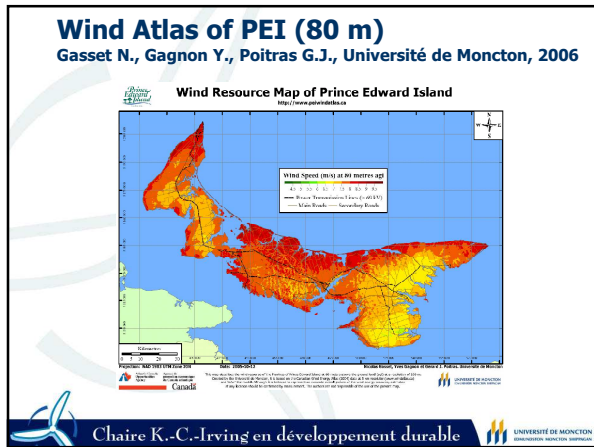
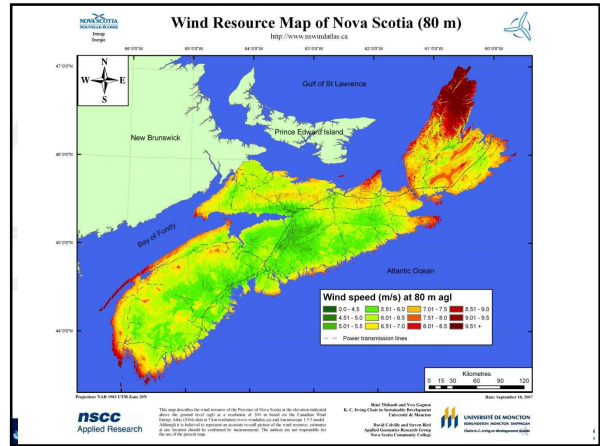
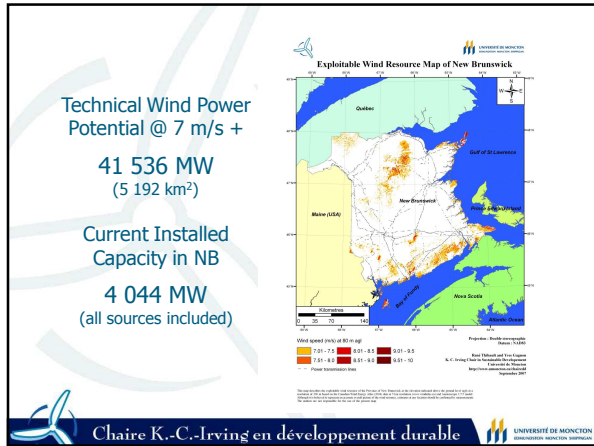
Resource Assessment – Renewable Energy



Wind Atlas of New Brunswick (80 m)

Mallet M., Gagnon Y., Poitras G., Gasset N.; Université de Moncton, 2007





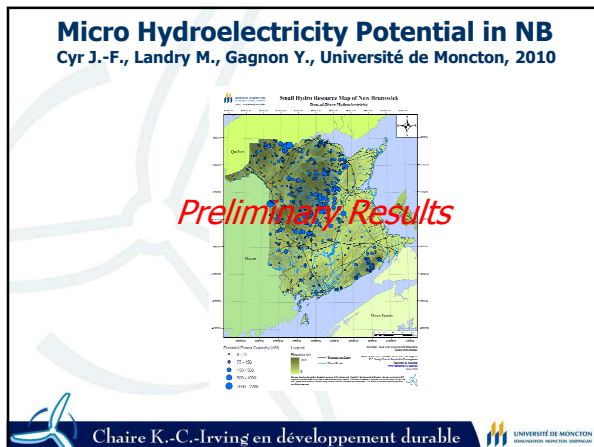
Examples of Micro Hydroelectricity Systems

Elmer NY, 1.5 MW

St. George NB, 15 MW

Source: Low Impact Hydro, 2008

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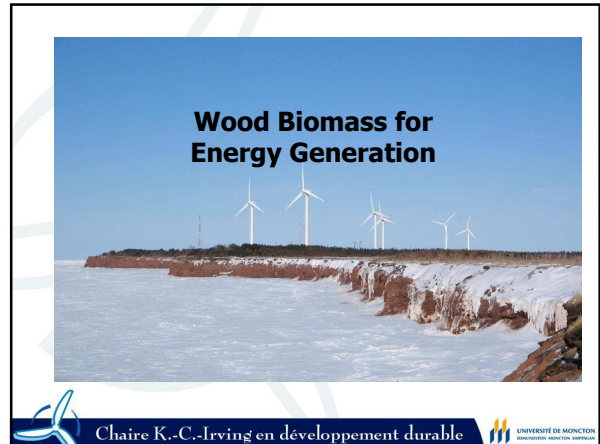
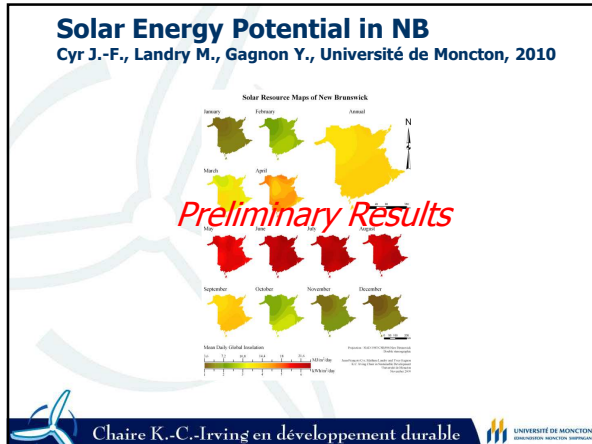


Solar Energy for Electricity Generation

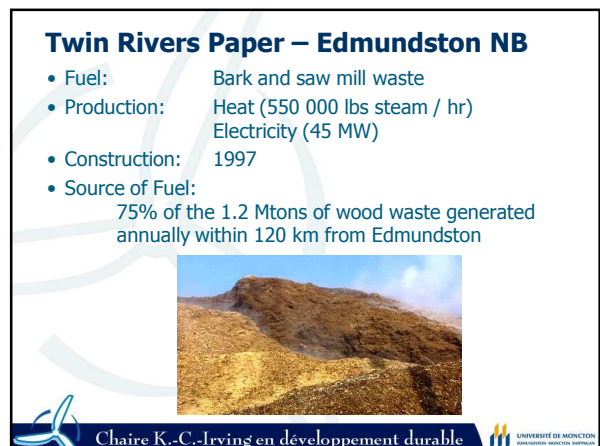
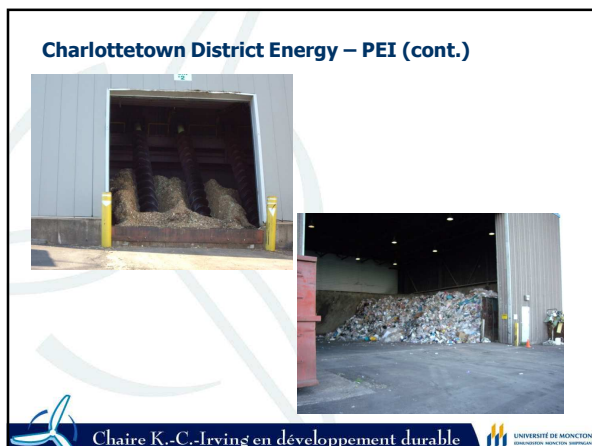
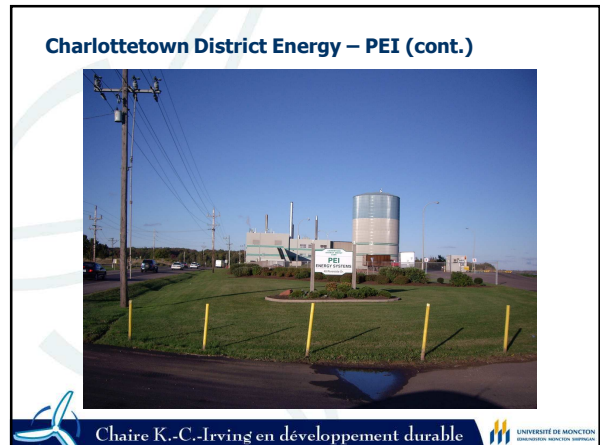
Concentrated Solar Power, France

Photovoltaic System, South Korea

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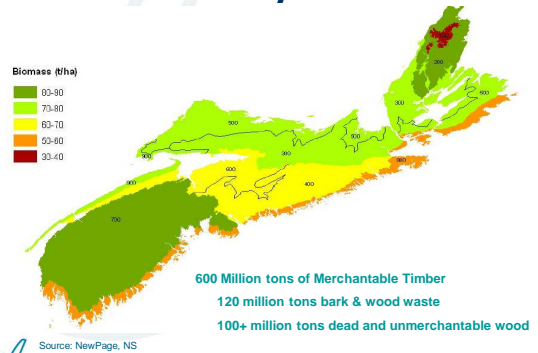
- ### Charlottetown District Energy – PEI
- Fuel: Municipal waste (33 000 t/yr)
Saw mill waste (33 000 t/yr)
Oil (10%)
 - Production: Heat
Electricity (1.2 MW)
 - Construction: 1998 (most recent plant)
 - Owner/Operator: PEI Energy Corporation
 - Clients: Heat: Buildings in C'Town (84)
Electricity: Maritime Electric
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NewPage – NS Power Co-Generation Project

- Co-generation project
 - 60 MW of electricity generation
 - Steam for the NewPage Port Hawkesbury paper mill
- Approved by the NS Utilities and Reviews Board (Oct. 13, 2010)
- Annual biomass required: approx 700 tons
 - 385 green tons of harvest biomass
 - 350 tons from paper mill and saw mill waste

Biomass Availability in NS



Biomass – Some Current Issues for Power Generation

- Supply: Resource assessment needed to quantify the technical power potential of the wood biomass in region
- Sustainable harvesting of the biomass; Ecological values
- Low carbon harvesting and exploitation of the biomass
- Co-generation (heat and electricity)
- Social acceptance



Conclusion

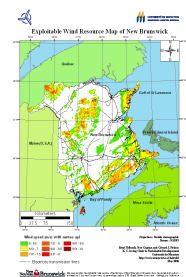


Conclusion

- Climate change is a reality
- A wide spectrum of actions must be taken to reduce GHG emissions and reduce our impact on the environment
- Forestry sector is in a phase of transformational change
 - Need to find new ways to add value to the forestry sector, in the context of sustainable development
 - Importance of innovation in the forest and wood sectors
 - Potential of wood biomass as a new, large scale source of renewable energy for electricity generation

Sources of Funding for Research Work Presented

- Natural Sciences and Engineering Research Council (Canada)
- Government of New Brunswick
- NB Environmental Trust Fund
- New Brunswick Innovation Foundation
- Government of Nova Scotia
- PEI Energy Corporation
- Atlantic Canada Opportunities Agency (ACOA)
- Université de Moncton
- Research Contracts



web.umoncton.ca/chairedd