International Forest Biorefining Conference 2017

Policy and Techno-Innovation Impacts on Forest Bioeconomy Advancement

Peter Milley, PhD Candidate
Queen’s University
Presentation Overview

- Introduction – research context
- Overview – market and industry changes / disruptions
- The Canadian forest bioeconomy policy environment –
  - Pre-Change Stability 2000 - 2004
  - Disruption and Decline 2005 - 2010
  - Towards Transformation? 2011 – 2015 ...
- Preliminary Analysis / Conclusions
- Preliminary comparisons with other jurisdictions
- Accelerating the forest bio-economy – directions to a new, sustainable industry structure?
Introduction – Research Context

• Research examines three key themes –
  – Impacts of policy, technology, infrastructure and innovation environments on forest biorefinery / bioeconomy development
  – Policy as inhibitor or enabler for technology, infrastructure and innovation to interact and combine to create ‘whole tree’ utilisation industries as foundation for new forest biorefining environments
  – Forest bioeconomy policy initiatives in Canada, the EU, Sweden and Finland, and expected impacts on forest bioeconomy advancement
Overview – Industry Changes / Disruptions

- Dramatic declines in newsprint production – from >9.2 million tonnes to <3.5 million tonnes – 62% decline in fifteen years
- Production of other paper grades also down – 40%
- 20 newsprint mills closed, plus several hundred sawmills
- Sector direct employment declined > 50% -- >171,000 jobs lost

Source: FAOStat
Overview – Industry Changes / Disruptions

Source: RISI, PPC, NRCan, Halifax Global Estimates, American Assoc. of Newspaper Publishers, SEC
Overview – Industry Changes / Disruptions


- Single Family Starts - 83.0% of Total 2005
- Multi-Family Starts - 17.0% of Total 2005
- Multi-Family Starts as % of Total (Right Axis)
- Single Family Starts - 65.5% of Total 2015
- Multi-Family Starts - 34.5% of Total 2015

Source: US Census Bureau
Overview – Industry Changes / Disruptions

- Lumber production also significantly down
- Panel production picture almost identical
- Almost 100,000 jobs lost in wood sector
- New SLA disagreement with US in play
- Market diversification a key topic – *again*!

Source: Cansim Table – 303-0064

Cumulative Production Decline ≈ 250 million m³
Overview – Industry Changes / Disruptions

- Net result -- significantly decline in harvest activity
- Reduced harvest volumes do not include potential biomass supplies from ‘harvest residues’
- Significant volumes of underutilised forest biomass – potentially > 200 million m³
Overview – Industry Changes / Disruptions

• Changes in markets disrupting traditional symbiotic relationship between wood products / sawmills segment and pulp and paper segments

• Without a new ‘symbiotic relationship’, ability to achieve complete resource utilisation challenging
Canadian Forest Bioeconomy Policies

• More than 130 forest biorefining / bioeconomy focussed policy and program initiatives identified 2000 - 2015
  – All Provinces included – 110 identifiable initiatives
  – Federal departments – 24 identifiable initiatives

• Initiatives included have potential to advance forest biorefining / bioeconomy – with direct or indirect influence
  – Initiatives focused exclusively on other sectors – eg. agriculture – excluded

• Timing determined by date of initiation
  – Some expired / closed initiatives absorbed into subsequent versions
Canadian Forest Bioeconomy Policies

• Analysis focused on period 2000 – 2015

• Several initiatives identified that pre-date analysis period –
  – Federal Excise Tax Exemption on renewable fuels introduced 1992
  – Federal accelerated Capital Cost Allowance introduced 1996 for investments in clean energy technology and energy conservation
  – Prairie Agriculture Machinery Institute established 1975 as applied R & D and testing institute; evolved to biomass harvesting and transformation for purpose grown energy crops, including agro-forestry
  – Forest harvest residue utilisation policies introduced in MB – 1988 and in ON – 1994
  – Sustainable development legislation introduced in MB - 1997
Canadian Forest Bioeconomy Policies

• Four main categories of classification / analysis –
  – Industry sector focus
    • eg. conventional forest products, bio-renewable energy, forest bioeconomy, multi-sector bioeconomy, etc.
  – Forest industrial process stage focus
    • eg. feedstock, conventional products conversion, bioproducts conversion, etc.
  – Policy categorisation
    • eg. circumstantial versus enabling, with taxes, mandates, incentives, etc.
  – Primary policy domain focus
    • eg. forest biomass utilisation, bioproducts-biomaterials production, climate change, sustainable economic development, etc.
Three Policy Periods

- **Pre-Change Stability** (2000 - 2004)
- **Disruption & Decline** (2005 - 2010)
- **Towards Transformation?** (2011 – 2015 ...)

---

**Paper Production - Forest Bioeconomy Policy Initiatives, Canada - 2000-2015**

- **Total Paper Production tonnes, (Left Axis)**
- **Forest Bioeconomy Policies count, (Right Axis)**


- **Paper Production (Upper Graph):**
  - Disruption & Decline (2005 - 2010) showing significant decrease.

- **Forest Bioeconomy Policies (Lower Graph):**
## Industry Sector Focus

<table>
<thead>
<tr>
<th>Industry Sector Focus</th>
<th>Pre-Change Stability</th>
<th>Decline &amp; Distruption</th>
<th>Towards Transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Forest Products - Conventional</td>
<td>40.0%</td>
<td>4</td>
<td>8.2%</td>
</tr>
<tr>
<td>Forest Products - Transformation</td>
<td>0.0%</td>
<td>0</td>
<td>6.8%</td>
</tr>
<tr>
<td>Forest-based Bioenergy</td>
<td>0.0%</td>
<td>0</td>
<td>12.3%</td>
</tr>
<tr>
<td>Multi-sector Bioenergy / Renewable Energy</td>
<td>10.0%</td>
<td>1</td>
<td>20.5%</td>
</tr>
<tr>
<td>Multi-sector Energy/Bioenergy</td>
<td>0.0%</td>
<td>0</td>
<td>6.8%</td>
</tr>
<tr>
<td>Multi-sector Clean Energy / CleanTech</td>
<td>30.0%</td>
<td>3</td>
<td>27.4%</td>
</tr>
<tr>
<td>Forest Biorefining / Bioproducts</td>
<td>10.0%</td>
<td>1</td>
<td>4.1%</td>
</tr>
<tr>
<td>Multi-sector Biorefining / Bioproducts</td>
<td>10.0%</td>
<td>1</td>
<td>8.2%</td>
</tr>
<tr>
<td>Forest Bioeconomy</td>
<td>0.0%</td>
<td>0</td>
<td>1.4%</td>
</tr>
<tr>
<td>Multi-sector Bioeconomy</td>
<td>0.0%</td>
<td>0</td>
<td>2.7%</td>
</tr>
<tr>
<td>Not Applicable</td>
<td>0.0%</td>
<td>0</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

Totals 100.0% 10 100.0% 73 100.0% 44

- **Multi-sector orientation and focus towards clean tech and bio/renewable energy increase in importance from 2005**
- **Focus on forest products transformation, biorefining and bioeconomy sectors increasingly evident as outcome from decline and disruption**
Focus on supporting forest products sector during ‘decline and disruption’ period evident in policy focus on feedstocks, wood products conversion, and forest bioenergy / bioproduct market development.

Feedstock-focused initiatives encourage forest biomass utilisation – but mostly constrain new entrants.

Later period focus on multi-sector and non-stage specific seems to indicate shift away from direct focus on forest products sector to wider inclusion of multiple ‘bio-oriented sectors’.
### Policy Categorisation

<table>
<thead>
<tr>
<th>Category</th>
<th>Pre-Change Stability</th>
<th>Decline &amp; Distruption</th>
<th>Towards Transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Circumstantial - Resource</td>
<td>20.0%</td>
<td>2</td>
<td>11.0%</td>
</tr>
<tr>
<td>Circumstantial - Mandate</td>
<td>20.0%</td>
<td>2</td>
<td>12.3%</td>
</tr>
<tr>
<td>Circumstantial - Multi-Element</td>
<td>0.0%</td>
<td>0</td>
<td>31.5%</td>
</tr>
<tr>
<td>Circumstantial - Financial / Tax</td>
<td>10.0%</td>
<td>1</td>
<td>6.8%</td>
</tr>
<tr>
<td>Circumstantial - Market Certainty</td>
<td>0.0%</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Enabling - Incentive</td>
<td>0.0%</td>
<td>0</td>
<td>6.8%</td>
</tr>
<tr>
<td>Enabling - Investment</td>
<td>30.0%</td>
<td>3</td>
<td>17.8%</td>
</tr>
<tr>
<td>Enabling - Market Certainty</td>
<td>0.0%</td>
<td>0</td>
<td>9.6%</td>
</tr>
<tr>
<td>Enabling - Multi-Element</td>
<td>10.0%</td>
<td>1</td>
<td>4.1%</td>
</tr>
<tr>
<td>Enabling - Tax</td>
<td>0.0%</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Enabling - Market Development</td>
<td>10.0%</td>
<td>1</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>100.0%</td>
<td>10</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

- **Circumstantial** policies create circumstances where forest bioeconomy transformation could happen
  - 60% of initiatives since 2005 categorised as ‘circumstantial’
- **Enabling** policies create a situation more directly focused on facilitating desired transformation
### Primary Policy Domain Focus

<table>
<thead>
<tr>
<th>Pre-Change Stability</th>
<th>Decline &amp; Distruption</th>
<th>Towards Transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Climate Change - GHG Reduction</td>
<td>20.0%</td>
<td>2</td>
</tr>
<tr>
<td>Sustainable Economic Development</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Forest Resource Management</td>
<td>10.0%</td>
<td>1</td>
</tr>
<tr>
<td>Forest Biomass Utilisation</td>
<td>10.0%</td>
<td>1</td>
</tr>
<tr>
<td>Bio/Renewable/Clean Energy Production</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Bio/Clean Technology Development</td>
<td>10.0%</td>
<td>1</td>
</tr>
<tr>
<td>Biofuels Production</td>
<td>20.0%</td>
<td>2</td>
</tr>
<tr>
<td>Bioproducts / Biomaterials Production</td>
<td>10.0%</td>
<td>1</td>
</tr>
<tr>
<td>Forest Industry Development</td>
<td>20.0%</td>
<td>2</td>
</tr>
<tr>
<td>Resource Industries Development</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Biorefinery / Technology Development</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>10</strong></td>
</tr>
</tbody>
</table>

- The linkage between forest bioeconomy policies and GHG reduction and climate change mitigation has become increasingly evident since 2005.
- Forest industry development and related resource management and biomass utilisation have also remained a significant policy domain focus.
Preliminary Conclusions from Analysis

• Introduction of new forest bioeconomy related policy / program initiatives reactive to changes being experienced by industry
  – But, lagged onset of disruption by nearly three years
  – Likely reflected common perception (at time) that change was cyclical – fundamental disruption not fully recognised
• Early initiatives focused on responses to specific situations – eg. black liquor tax credit in US and PPGTP in 2009
• Shifts in focus of ‘policy umbrellas’ – eg. bioenergy / renewable energy to GHG Reductions / Climate Change seemed to reflect shifts in political priorities of government of day
Preliminary Conclusions from Analysis

• Absence of defined, national strategic framework or future strategic direction
  – No stated objective of what ‘future forest bioeconomy’ will be
• Very limited focus on need for shift to ‘forest bioeconomy’
• No recognition of ‘bioeconomy’ as collection of sectors / sub-sectors
  – Programs generally focus on single conversion technologies – not on connected combination of technologies to achieve whole tree utilisation
• No apparent linkages / integration of programs and policies to wider ‘technology and innovation management’ strategies
Other Forest Bioeconomy Policies

• Sweden and Finland both developing ‘national bioeconomy strategies’ as guiding platform for policy and program development
  – Both countries – and EU – explicitly recognise importance of forest sector as key base for ‘leveraging’ wider bioeconomy growth – focused on ‘forest biorefineries’ as key instrument of development of bioeconomy

• Both also working within larger EU strategy for bioeconomy 2030 – “Innovating for Sustainable Growth: A Bioeconomy for Europe” [EC 2012]
Other Forest Bioeconomy Policies

• EU has established at least 10 policies / initiatives relevant to bioeconomy development
  – Including directives related to renewable energy / biofuels use, a climate and energy framework, and an industrial bioenergy initiative

• Potentially useful model for Canada, given our federal structure

• Evident from policies / initiatives, and from literature, [eg. Palgan et al], strategies and policies to strengthen innovation increasingly linked to bioeconomy strategies – and vice versa
Accelerating the Forest Bioeconomy

• Development / implementation of a strategic framework needed to focus direction / resources and improve outcomes
  – CCFM forest bioeconomy platform potentially a good start

• Need for recognition that disruption / decline has created situations where adding ‘biorefinery’ to existing mill not feasible
  – Options for bioeconomy development in greenfield / or sawmill-based situations need to be assessed
Accelerating the Forest Bioeconomy

• Literature [Näyhä and Pesonen, Palgan et al] and my research identify multiple factors constraining forest biorefinery development –
  – Financing, political, economic challenges
  – Limited R & D / innovation experience / capacity
  – Feedstock / raw material supply

• Coordinated approach needed to address various complex issues in parallel
Accelerating the Forest Bioeconomy

• Important actions needed include –
  – Define targets and policies to drive transformation
    • Compilation and analysis of current base situation data essential
  – Ensure alignment of visions, goals, activities of specific initiatives with broader strategy
  – Strengthen infrastructure, capacities, competencies needed to support transformation
  – Collaboration with / buy in of all stakeholders essential
Thank You