BRAZILIAN AND CANADIAN OIL&GAS INDUSTRIES – SIMILARITIES, DIFFERENCES, CHALLENGES AND PERSPECTIVES FOR A SUSTAINABLE INDUSTRY

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Is the sustainable engineering as widespread in other industries as it is in the building industry? If not, why?
Outline:

1. Introduction

1. Current Scenario
   - Green buildings vs. the oil and gas industry
   - Embodied energy/GHG emissions of industrial projects

2. Research Proposals
   - An oil and gas rating system
   - The use of BIM to optimize the carbon footprint of oil and gas projects

3. Challenges

1. Conclusion
1. Introduction – Some facts

- Some expect that the unconventional oil resources of Canada and Brazil will help keep up the oil offer around the globe (Kerr, 2011, 2012a, 2012b)
- The recent fall in oil price have cancelled or postponed several projects;
- This has caused impacts on oil and gas projects around the world;
- Many projects will continue;
1. Introduction

Challenge of the oil and gas industry:

- To confront opposing arguments that its projects cannot be designed to mitigate environmental impacts and therefore comply with the best practices of sustainability.
3. Green Buildings
- Designed to minimize the potential impacts over the life cycle;
- Contribute to reduce GHG emissions;
- Several dimensions to be addressed:
  ✓ Energy efficiency
  ✓ Efficient use of water
  ✓ Environmentally friendly materials
  ✓ Waste management, etc.
- Green rating systems: decision-making tools created to measure the sustainability of green constructions which are assessed by third-parties.
- LEED, BREEAM, HQE, ENVEST, AQUA, and many others!
- Most of them are just applied to the building industry.
3. Embodied energy of industrial projects

- Embodied energy: total primary energy used until the installation is ready to operate;
- Phases included: manufacturing, transport and construction;
- With low-energy operational buildings, embodied energy increases its relative important.
- Buildings account for one third of total energy use (Harvey, 2010);
- But industry also represents at least one third;
- Most works involving LCEA relate to buildings;
- Possible causes:
  ✓ Complexity of the industry;
  ✓ Variety of materials;
  ✓ The other industrial sectors are not as standard as the AEC industry;
4. Research Proposals

- An Oil and Gas Rating System
- The use of BIM to optimize carbon emissions and embodied energy of oil and gas projects
4. An oil and gas rating system

- Why? The complexity of the industry does not permit a full application of the current green building codes;
- The list of regulatory requirements is long;
- Most projects are located in remote areas;
- Some remarkable studies: Wa-pa-su (Poveda, 2014) and Envision (Harvard, n.d.);
- Further analysis is required to verify the adaptability of these frameworks into other sectors;
4. An oil and gas rating system

<table>
<thead>
<tr>
<th>Type of projects</th>
<th>Wa-Pa-Su</th>
<th>Envision</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oil Sand and Heavy oil</td>
<td>Infrastructure: roads, bridges, dams,</td>
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<tr>
<td></td>
<td>projects</td>
<td>highways, pipelines, etc.</td>
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<tr>
<td>Developer</td>
<td>University of Alberta</td>
<td>Harvard/ISI</td>
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<tr>
<td></td>
<td>(Poveda)</td>
<td></td>
</tr>
<tr>
<td>Geographical area of</td>
<td>Local</td>
<td>Worldwide</td>
</tr>
<tr>
<td>application</td>
<td></td>
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<tr>
<td>Focus</td>
<td>On the assessed projects</td>
<td>Assesses the overall impacts on</td>
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<tr>
<td></td>
<td></td>
<td>communities</td>
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<tr>
<td>Need for additional</td>
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<td>Recommended, as it is not</td>
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<td>assessments to deal with</td>
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<td>intended to replace any</td>
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<td>specific aspects</td>
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<tr>
<td>Question the real purpose</td>
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<td>Yes</td>
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<tr>
<td>of the project</td>
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<tr>
<td>considering the</td>
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<td>community?</td>
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<td>Can the framework be</td>
<td>Further analysis is</td>
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<td>extended to other</td>
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<td>industrial sectors?</td>
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</table>
4. The use of BIM to optimize carbon emissions and embodied energy of oil and gas projects

- Goal: greenhouse effect and climate change;
- UNCCC 2015 (Paris): will its outcome impose on nations more stringent and quantitative carbon emission?
- Developing countries still need to develop their infrastructure;
- This will demand huge amounts of energy, processed materials and construction works;
- BIM/LCA: key role;
- 1st step: The calculation and analysis of the embodied energy and overall emissions to develop benchmark parameters for the industry.
4. Oil and Gas rating System x BIM/Embodied energy/Emission

<table>
<thead>
<tr>
<th>SD dimensions</th>
<th>An Oil and Gas Rating System</th>
<th>BIM/Embodied Energy/Emissions</th>
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</thead>
<tbody>
<tr>
<td>Focus</td>
<td>On environmental/social impacts</td>
<td>On global warming/climate change</td>
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<td>Type of analysis</td>
<td>quantitative/qualitative</td>
<td>quantitative</td>
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<tr>
<td>Main goals</td>
<td>Measure the SD, how the project can reduce impacts and maximize opportunities</td>
<td>Benchmark parameters, minimization of carbon emissions</td>
</tr>
</tbody>
</table>
5. Challenges

- The variety and complexity of the oil and gas industry;
- Size of projects;
- Multi-disciplinary research
- Long list of material specs and equipment;
- Many different manufacturing processes for the same materials;
- Simulation of the construction phase (BIM/LCA);
- How to input the operational energy of the facilities (BIM/LCA);
- The definition of the boundary conditions and interactions with other projects.
6. Conclusions

- The energy demand still relies on the oil and gas sector;
- Beyond the energy demand => petrochemicals and fertilizers;
- The oil and gas industry needs to catch up with the building industry;
- Two main proposals:
  ✓ An oil and gas green rating system
  ✓ The use of BIM to optimize the carbon emissions and embodied energy of oil and gas projects
- The oil and gas sector is willing to evolve by aiming at benchmark results
THANK YOU!

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