



# UNDERSTANDING GOVERNMENT AND RAILROAD STRATEGY FOR CRUDE OIL TRANSPORTATION IN NORTH AMERICA



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## Motivations

### Ongoing Keystone XL Debate



Source: TransCanada

### Lac-Mégantic Accident

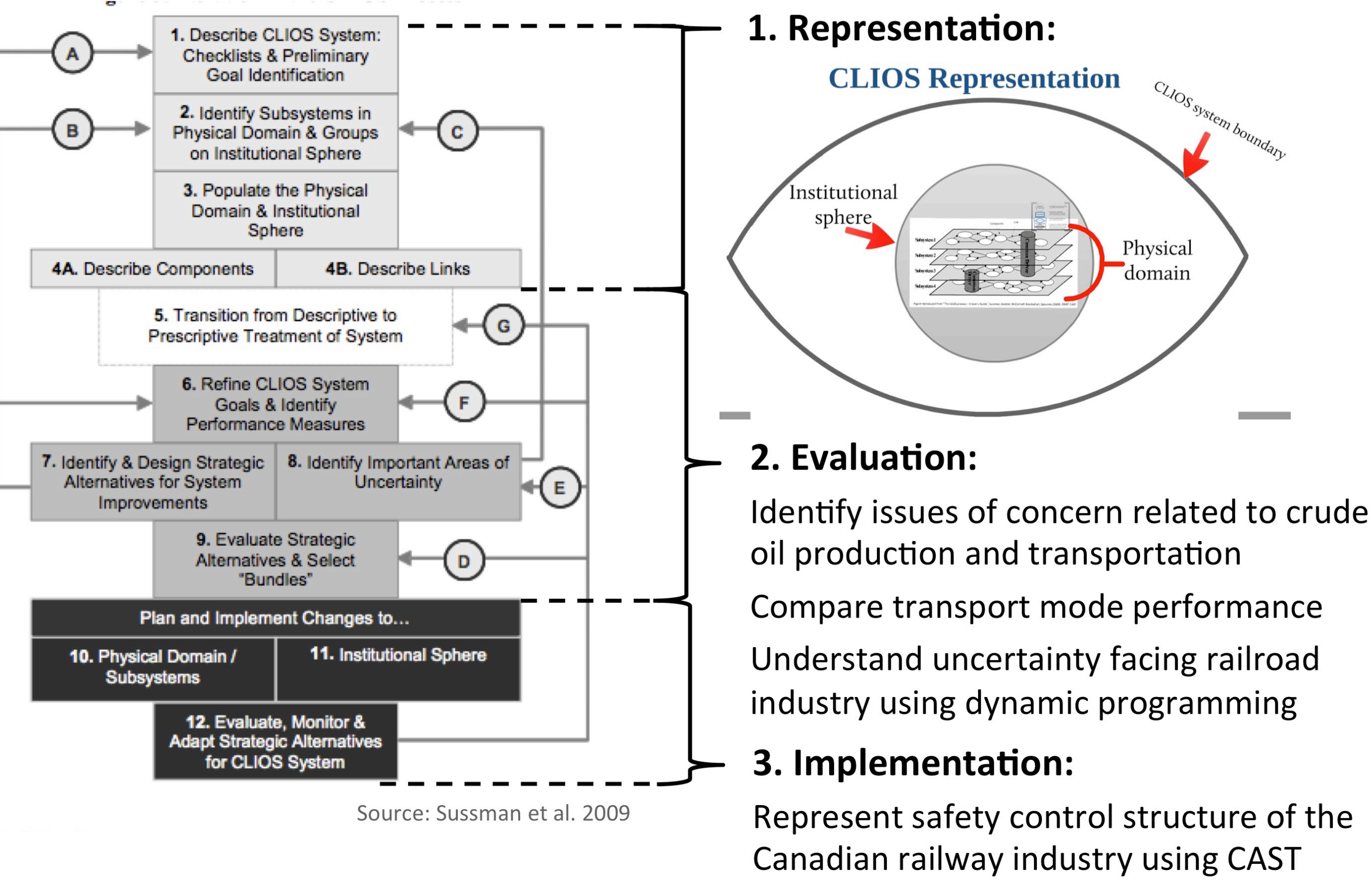


Source: Transportation Safety Board of Canada

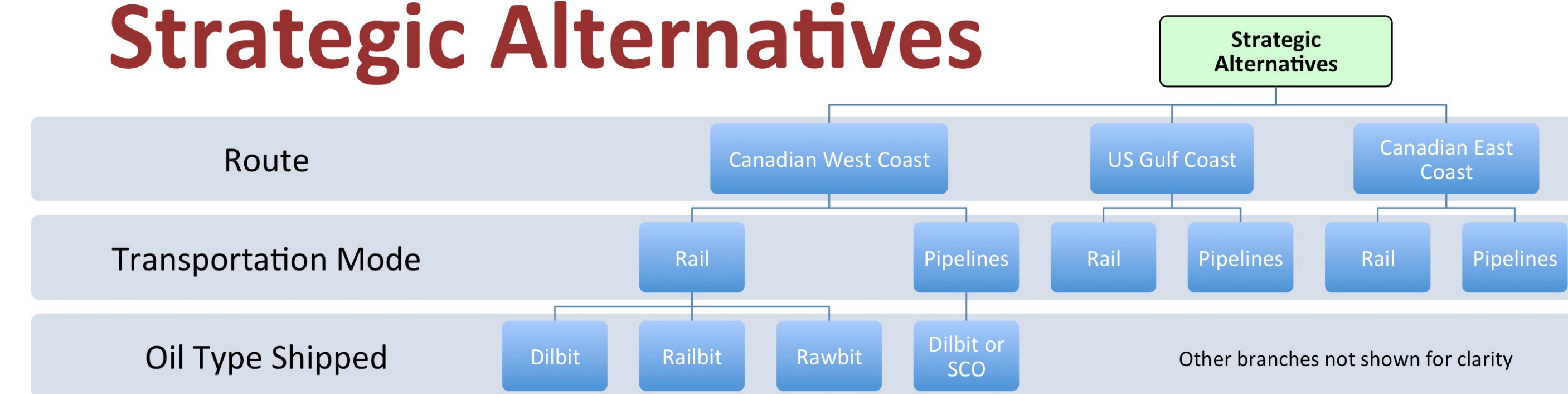
There is concern about the *local* and *global* implications of crude oil transportation capacity expansion. Could/would railroads transport crude oil if pipelines are not approved? *Should* railroads transport significant quantities of crude oil?

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## Approach: The CLIOS Process



## Strategic Alternatives



- Several *pipelines* are proposed to transport diluted bitumen to the coasts of North America
- Alternatively, *unit trains* (70-120 cars) can transport large volumes of crude oil across the North American railroad network

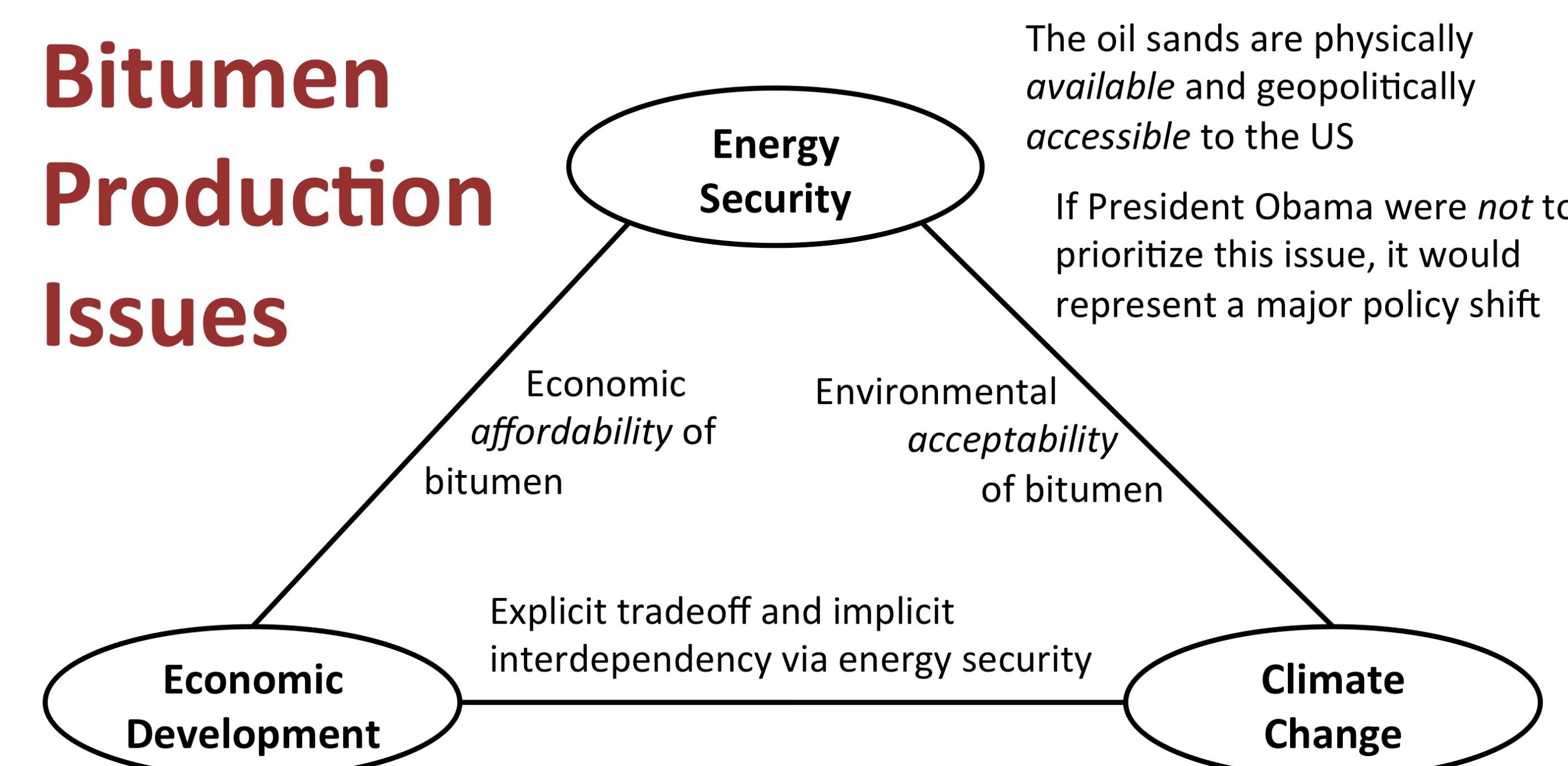


## Keystone XL: Issues and Actors

*Pipelines make good politics, they just do. There is so very much to sink your teeth into: energy, environment, money, Canada-U.S. relations. The list is almost endless.*

- Rosemary Barton, Journalist, CBC News (2013)

## Bitumen Production Issues



Potential for significant economic benefits in Canada (e.g. \$311 billion in taxes for the federal government), making developing (some) export capacity a priority for the three largest parties

Much more debate in the US about the potential economic benefits

A barrel of bitumen emits 2% to 19% more well-to-wheel GHG than comparable heavy oils imported to the US

President Obama's test: will the Keystone XL contribute "significantly" to climate change? P.M. Harper: "It's almost nothing globally"

## References

- Association of American Railroads (AAR). 2013a. "Moving Crude Oil by Rail."
- Barton, Rosemary. 2013. "Mulcair and NDP Plan New Approach to Pipeline Politics." CBC News, October 6. <http://www.cbc.ca/news/politics/mulcair-and-ndp-plan-new-approach-to-pipeline-politics-1.1913189/>
- Carlson, S.J. 2014. Understanding crude oil transportation strategies in North America. MIT Master's Thesis.
- Carlson, S.J., and Sussman, J.M. 2014. Understanding Crude Oil Transport Strategies in North America. Presentation at the 49th Annual Canadian Transportation Research Forum Annual Conference June 2-4, Windsor, Ontario, Canada.
- Canadian Association of Petroleum Producers. 2013. "Crude Oil: Forecast, Markets, and Transportation."
- Fitzpatrick, Meagan. 2013. "Keystone XL Pipeline 'Needs to Go Ahead,' Harper Tells U.S." CBC News, May 16. <http://www.cbc.ca/news/politics/keystone-xl-pipeline-needs-to-go-ahead-harper-tells-u-s-1.1396697/>
- Freudenberg, William R., and Robert Gramling. 2012. *Blowout in the Gulf: The BP Oil Spill Disaster and the Future of Energy in America*. Cambridge, MA: The MIT Press.
- GEA Writing Team. 2012. *Global Energy Assessment Toward a Sustainable Future*. Cambridge: Cambridge University Press.
- Honarvar, Alshin, Jon Rochon, Dinaara Millington, Thom Walden, Carlos A. Munillo, and Zoey Walden. 2011. "Economic Impacts of New Oil Sands Projects in Alberta (2010-2035)". Study No. 124. Calgary, Alta.: Canadian Energy Research Institute (CERI).
- Hoberg, George. 2013. "The Battle Over Oil Sands Access to Tidewater: A Political Risk Analysis of Pipeline Alternatives." *Canadian Public Policy* 39 (3): 371-92.
- National Energy Board. 2013. "Canada's Energy Future 2013: Energy Supply and Demand Projections to 2035". Cat. No. NE2-12/2013E-PDF. Calgary, Alberta: National Energy Board.
- Sussman et al. 2009. "The CLIOS Process: A User's Guide."
- Tarnoczi, Tyler. 2013. "Life Cycle Energy and Greenhouse Gas Emissions from Transportation of Canadian Oil Sands to Future Markets." *Energy Policy* 62 (November): 107-117.
- US Department of State. 2014. "Final Supplementary Environmental Impact Statement (SEIS) for the Keystone XL Project". Washington, DC.
- US Energy Information Administration (EIA). 2012a. "Annual Energy Outlook 2013 Early Release." *US Energy Information Administration (EIA)*, December 5. [http://www.eia.gov/forecasts/aeo/er/ executive\\_summary.cfm](http://www.eia.gov/forecasts/aeo/er/ executive_summary.cfm).

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## Railroad and Pipeline Performance

Rail transport costs are generally more than pipeline costs per barrel, but are similar if raw bitumen is transported

The US State Department finds that denying pipeline permits would largely not constrain oil sands production, but uncertainty remains

Pipelines are more energy efficient and typically produce less GHG emissions than unit trains per barrel transported (Tarnoczi 2013)

It is difficult to say whether denying a pipeline permit would reduce or increase GHG emissions

However, for transport from Alberta to the US Gulf Coast, there is conflicting study findings, so more research is worthwhile

Railroad and pipeline safety data are difficult to compare and may not be applicable to present circumstances

Emphasis should be on improving transport safety, as well as further understanding the potential issues associated with the transport of diluted bitumen and raw bitumen

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## Uncertainty: Dominates in the short term

A dynamic program was used to study whether railroads should invest in bitumen transportation capacity given pipeline permitting uncertainty

### Model Results

In the *absence* of uncertainty, investment in crude oil capacity is lucrative for the railroads

In the *presence* of uncertainty, it appears undesirable for railroads to invest in capacity, unless the capacity is inexpensive



## Railroad Energy Markets

### EXISTING MARKET

#### Coal



Source: <http://www.smarttinc.com/>

Largest railroad market by revenue  
US Class I annual coal traffic was down by 1.51 million carloads from its peak of 7.71 million carloads in 2008 (AAR 2013a)

### EMERGING CRUDE OIL MARKETS

#### Tight or Shale Oil



Source: Bakken.com

A light crude oil found in low-permeability rock formations; produced by "fracking"  
Production growth: From 2.3 MMbbl/d in 2012 to 4.8 MMbbl/d in 2021 (EIA 2012)

#### Oil Sands Bitumen



Source: CAPP

An extra-heavy crude oil deposited with sand and clay; produced by mining and steam injection  
Production growth: From 1.8 MMbbl/d in 2012 to 5.0 MMbbl/d in 2035 (NEB 2013)

## Closing Thoughts

Decision-making for energy resource transportation is *value-laden*, the current models provide *ambiguous* results, and the decisions being made are subject to significant *uncertainty*

The emphasis of this research was on improving the understanding of important *tradeoffs* and *interdependencies*

*Improving* environmental performance and *improving* safety should be focused on whenever possible

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