



# Critical infrastructures at risk: The lessons learned from the Lac-Mégantic Oil Spill

Anaïs Valiquette L'Heureux, PhD  
Assistant professor Master of public administration program, Cal State Northridge

# Presentation : Part I

What happened on July 6<sup>th</sup>, 2013?



**The accident**

**The impacts**

**The aftermath**

1.6 million  
gallons of  
mislabeled  
crude oil  
released

## The accident

A 4700-foot train transporting petroleum crude oil that was left overnight unattended, carrying 72 cars (DOT-111) of crude oil from the Bakken region

On July 6<sup>th</sup>, "a 4700-foot train transporting petroleum crude oil from Irving Oil was left overnight unattended, in Nantes, near the small town of Lac-Mégantic, in Estrie, Canada, on the main track, without derail was parked on the main track

The train caught fire. The fire was put out by local firefighters and MMA personnel left the train unattended again.

A pressure leak occurred at smaller pace than a secondary breaking system could detect.

- > an **Automatic safety system failed to engage:**

The convoy travelled 7.2 miles down a descending grade, gained speed, (under 1% descending grade) and derailed at 65 mph in the town of Lac-Mégantic, Quebec".

Out of the 1.7 million gallons transported, 1.6 million gallons were released;

# The crash caused 47 casualties, no injuries

## The impacts

The crude oil cars began crashed, in a curve, and piled up. The crude inflamed.

47 people died, several members of the same families.

The “Musicafé” (local bar) as well as houses neighboring the old train station in the were engulfed in flames.

30 buildings were immediately destroyed

36 additional houses and commercial buildings in the historic heart of the city were contaminated and had to be demolished (which furthered the grievance, damages and losses)

Most of the crude released burned.

# The aftermath

The catastrophe is the largest land-based oil spill in North America to this day;

77 acres of  
land were  
contaminated

The MMA blamed the firefighters that turned off the locomotive's engine. An estimated 26 000 gallons spilled into the water systems though surface flow, underground infiltration, and sewer systems in Mégantic Lake and the Chaudière River; 31 hectares of land (77 acres) were contaminated.

MM&A's liability insurance was insufficient to cover the cleanup costs expected to exceed \$400 million and led them to declare bankruptcy

The hydrocarbon recovery and cleanup operation began as soon as the fire was extinguished and the site was stabilized, approximately 2 days after the derailment;

The community suffered immeasurable social and psychological impacts.









Post-Derailment Image  
Lac-Mégantic, one day  
after the disaster.  
(July 7, 2013)  
DigitalGlobe 2013



Pre-derailment Image ( June 29, 2012)  
DigitalGlobe 2012



Three months after the crash (September 30, 2013)  
DigitalGlobe 2013





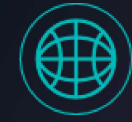
# Presentation: Part 2

The “blame game”

# Presentation: Part 2

## Blame avoidance

### Causes of the tragedy as perceived by Federal-level agencies representatives



1- Human error



2- Politicians

Policy amendments postponed because of the interruption caused by elections / minority parliaments



3- Lack of data / Data base under construction

Compliance rates not accessible, years of delay in constructing the centralized compliance data base



4- Unions

Union's rigidity was finger pointed (prompted de-regulation reforms)

# Presentation: Part 3

Issues identified and lessons learned



# Issues identified

The "atrophy of vigilance"

A blame culture / "sloppy management" (Freudenburg 1992)

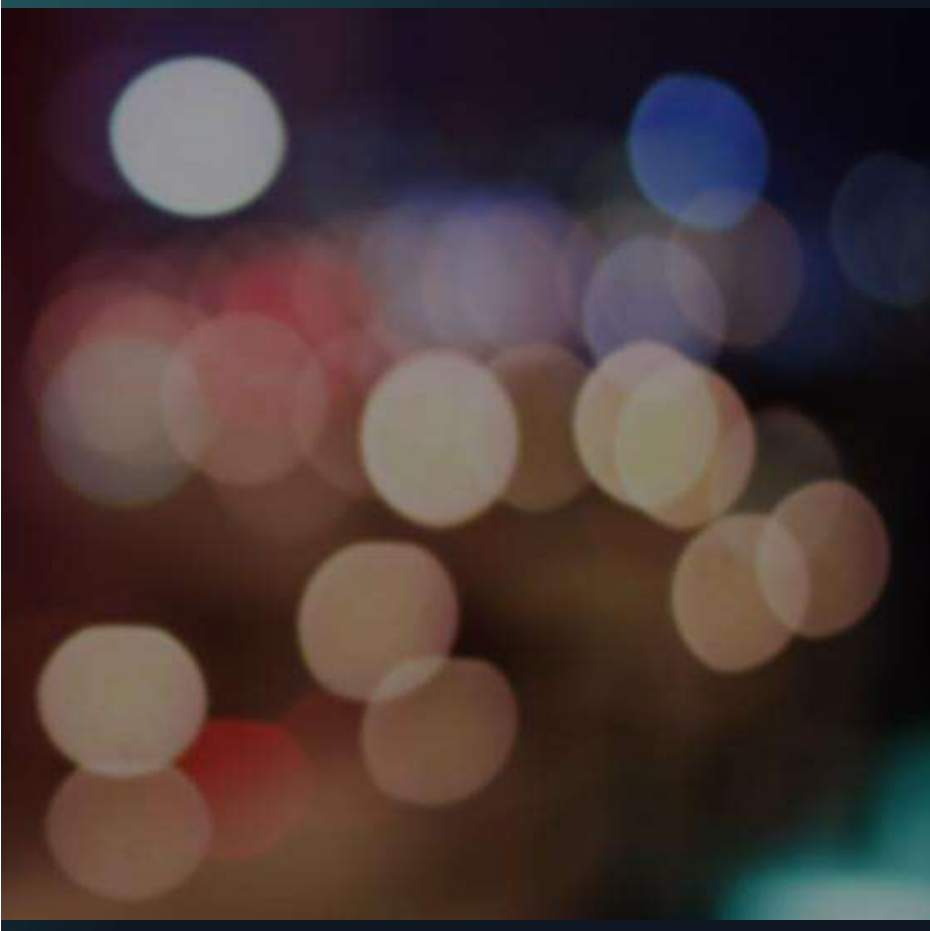
- > Employee "disengagement"

Double binds (contradictory sets of rules)

- > Mandatory rest time, vs #of mechanical brakes to activate to comply w regulation.
- > Shutting locomotive engine down vs air brake test (\*Canada + USA regulations);

"Fragmentation effects"

- > Fragmentation of the network inhibited collaboration
- > Bureaucracies work in silos, which sometimes needed decisions.





# Issues identified

## Understanding risks from a multidisciplinary perspective

### Underestimation of risks

- > haz. mat. wrongly label – category 3 – underestimation of ignition capacity

### Mismanaged policy reforms;

- > Inspector's powerlessness & lack of leadership support for sanctions.

### Ignoring warning signs from governmental watchdogs reports

- > Environment commissioner & Transportation of dangerous goods act,
- > TSB's identified SMS regulation was a failure

# Issues identified

## Threats to reliability and resilience

- Lack of consideration for human dimensions in risk analyses
  - Safety measures considered “non-productive”
- Complacency
  - > routine breaches of SOP by MMA (awareness of ritualized and minimal compliance)

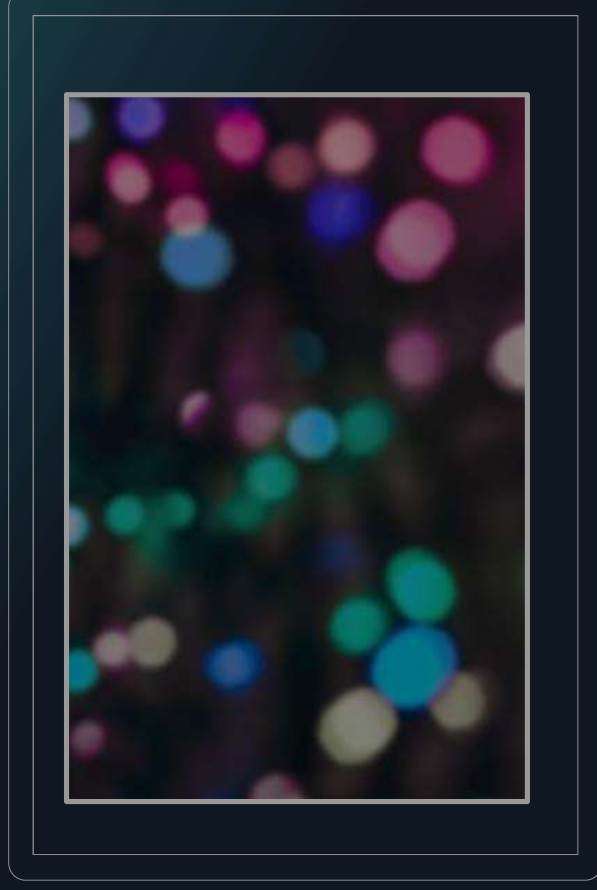




# Lessons learned ?

## Paradigm shift towards a systemic (socio-technical) analysis of risks

- Need for a better understanding of systemic vulnerabilities
- Need for a transparent dialogue regarding safety thresholds



## Key Takeaways

- Bureaucracies tend to underestimate/rationalize the complexity and dynamism of risk sources to our water networks.
- To understand the systemic causes of industrial and environmental risks we need a paradigm shift.
- Regulatory regimes must move away from a traditional managerial (reductive) approach to risk, towards a multi-level and sociotechnical vulnerability analysis.

# The future of water quality and its potential risks

## California's prevention policies?

- Some initiatives (like the funding per barrel) may represent “best-practices” with regards to prevention effectiveness

## How to maintain the independence of watchdogs?

- Remaining issues of the inclusivity of decision-making processes, inequity in exposure to risks

## Social justice/action research

- Calls for a Hydrofluoric acid ban

## Use of policy instruments







# Thank you!

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I welcome your questions and/or comments:

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Anais Valiquette L'Heureux

*Email:*  
**Anais.ValiquetteLHeureux@csun.edu**

*Website:*  
**<https://www.researchgate.net/profile/Anais-Lheureux>**

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