

Lac Mégantic's disaster: environmental impacts and the lessons to be learned

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One year later, important information about the environmental effects of the spill is still unknown

- Levels of some contaminants (dioxins, furans) have never been measured and others only indirectly (BTEX)
- Not enough consideration given to cumulative effects of this “soup” of contaminants
- Long term effects on species along food chain unknown
- One of the biggest oil spills on land in Canadian history

ASPECTS TO BE CONSIDERED:



Source

Parameters

- Contaminants
- Concentration
- Toxicity
- Localisation
- Duration
- Transformation

Actions:

- Eliminate source
- Control /confinement
- Limit the extent
- Treat



Pathway

Parameters

- Media
- speed of migration
- inputs/sinks

Actions:

- Identification
- Interruption
- Limit
- Eliminate



Receptors

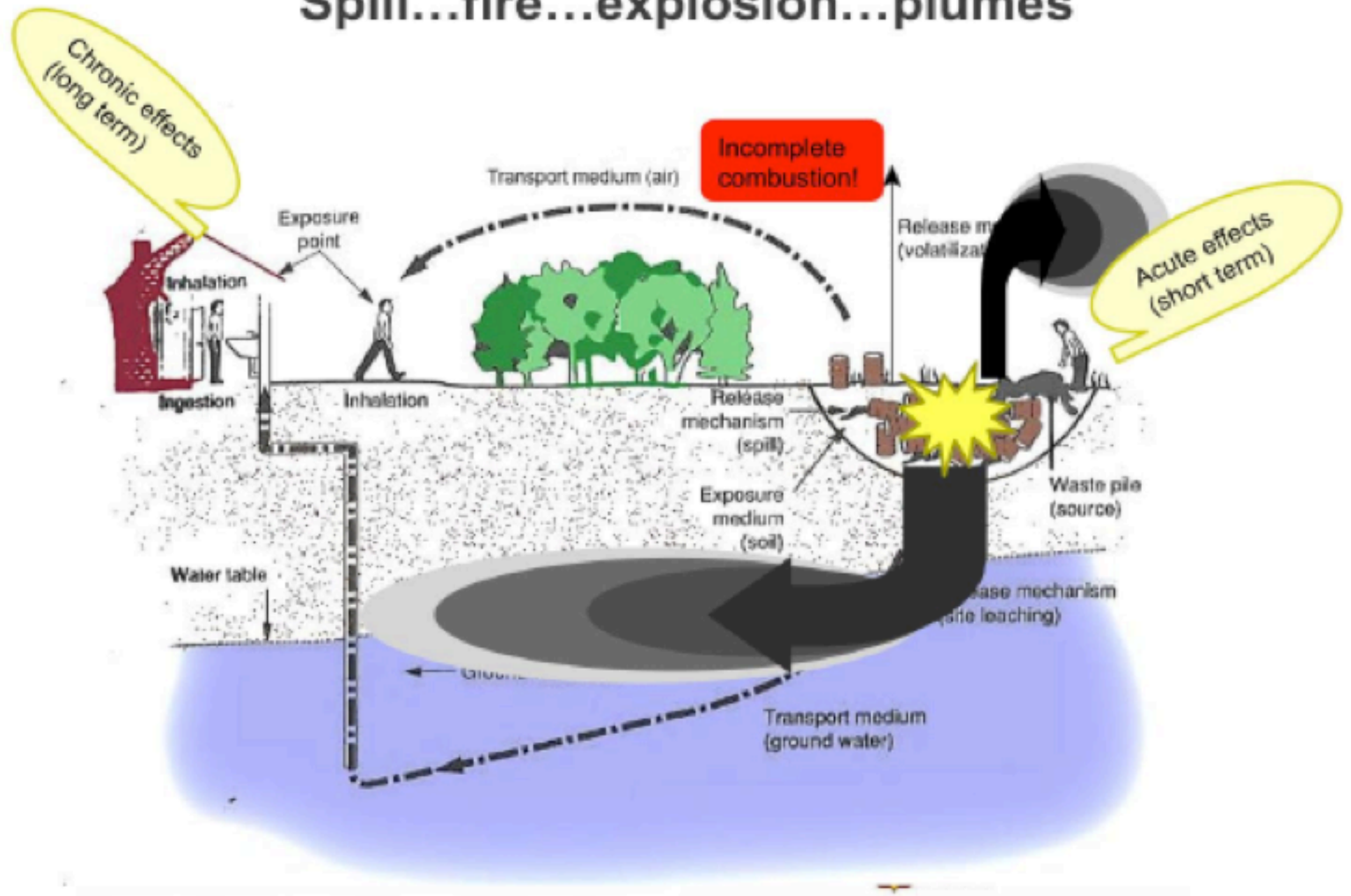
Parameters

- Types
- Vulnerability
- Exposure
- Concentration
- Number

Actions:

- Impact monitoring
- Relocate receptor
- Control of exposure
- Protection of receptor

Spill...fire...explosion...plumes



INITIAL SOURCE

- No information on exact original chemical composition
- Light oil: BTEX (benzene, toluene, ethyl benzene and xylene)
- 1500 - 3000°C: Combustion by-products? **Dioxins/furans**
- Additives (250 + products such as solvents, alcohols, biocides, surfactants, acids / bases, corrosion inhibitors ...)

POLLUANTS

Toxicity

Benzene

Human: mutagenic and cancerogenic
Ecosystem: impact on growth, toxic to all forms of aquatic life

Dioxin & furans

Human: skin problems, hepatic problems, effects on immunity, endocrine, reproductive systems, cancerogenic



Pathway/ Matrix	Location	Pollutant – Concentration (MDDEFP, U. Laval)
Air	Ville de Lac Mégantic	<ul style="list-style-type: none"> • NO₂ : exceeded criteria over 24h • Benzo (a) pyrene : exceed atmospheric criteria • Dioxins and Furans??
Water	Lac Mégantic	<ul style="list-style-type: none"> • C₁₀ - C₅₀ : 8,8 - 15 mg/L • C₁₀ - C₅₀ : 4,2 mg/L • Toluene : 16 mg/L et Phenanthrene 6 µg/L • Phenanthrene : 4,7µg/L • Traces BTEX

Concentration vs Criteria – **INCOMPLETE** evaluation because:

- No account of species specific vulnerability
- Non exceeding may still indicate trace levels ...long term impacts
- No indication of accumulation (soup) effects
- Who decides how many parameters need to exceed before action?

PRESENT CONTAMINANT BUDGET

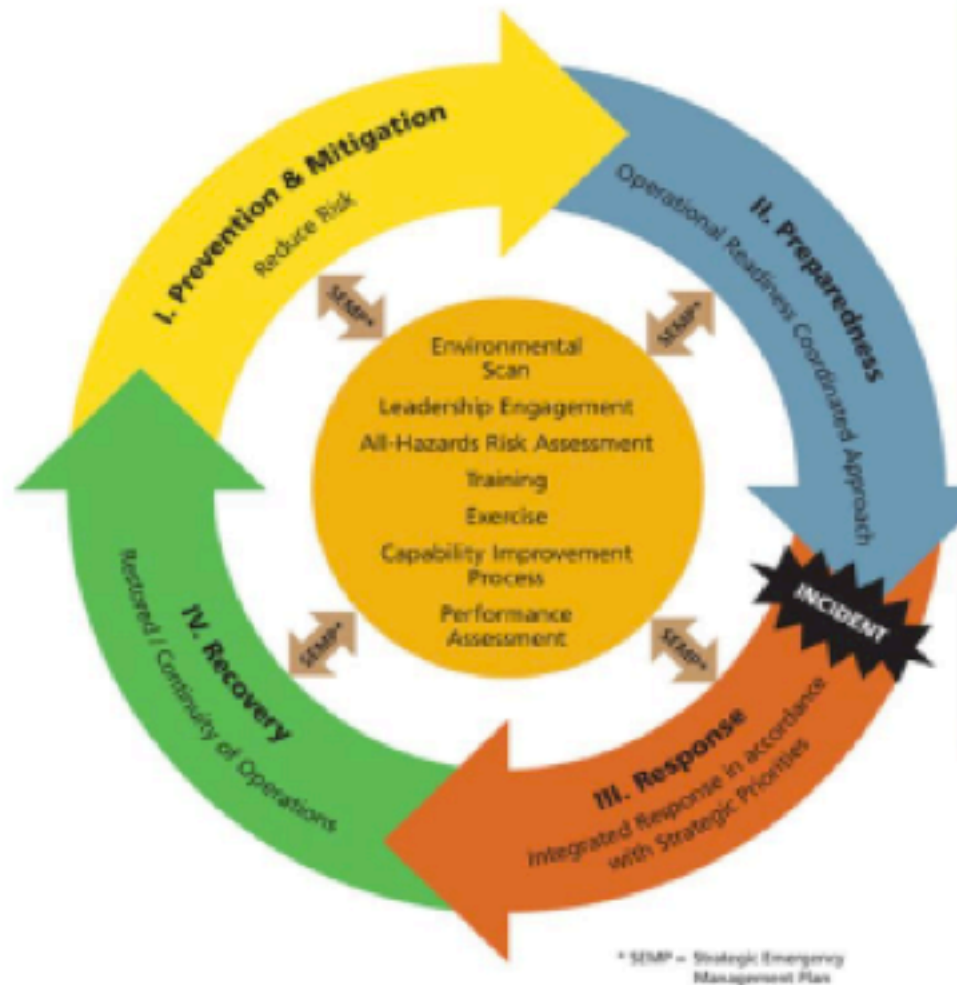
- No estimate of oil recovered
- Contaminants changed with time: degradation, combustion by-products, additives (more or less toxic?)
- Release of wastewater (pathogens?).
- Oil in sediments: short term impact (benthic, riparian); long term (fish, mammals)
- Fumes travelled with wind ... agricultural produce affected? (PAHs, Dioxins and furans)

Impacts on ecosystem:

- Petroleum, additives, by products: persistence? bioaccumulation?
- Biodiversity, sensitive species, water resources?
- Confirmed negative impact on benthic layer → invertebrates, fish, birds, wildlife
- Impact on species: growth, reproduction, mortality ? Use of integrated evaluation method?
- Loss of habitat, restoration plans?
- Contaminated soils Lac Mégantic: 115K tons; treatment: biodegradation, chemical washing, thermic

How to be better prepared

Emergency Management Continuum



PREVENTION

- Revision/implementation of transportation regulations
- Detailed inventories of companies and their resources based on transport routes and risks.
- Revision of railway lines
- Devices / infrastructure in case of emergency
- Update contingency plans:
- Communication among stakeholders → Transparency!

WHEN EMERGENCY:

- Faster response
- Rapid containment of the source
- Organization of citizens
- Update environmental assessment tools

THANK YOU!