

A photograph of an industrial facility, likely a refinery or chemical plant, at night. The scene is illuminated by numerous bright yellow lights, creating a high-contrast, glowing atmosphere. Tall distillation columns and complex piping structures are visible against the dark sky. The overall tone is industrial and somewhat somber due to the nighttime setting.

Mainstreaming Lessons Learnt from Natechs into Risk Management Practice

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Introduction

- Natural disasters can:
 - can down power lines,
 - cause landslides
 - damage lifeline systems
 - trigger hazardous materials (hazmat) releases

Natechs

Natural disaster-induced
technological disasters



**Damage to lifeline systems
Portugal, 2001**



**Releases of *hazardous materials*
Turkey, 1999**



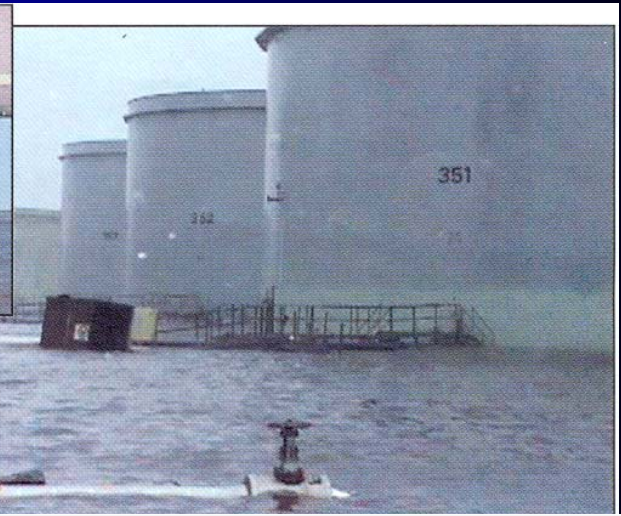
**Damage to oil and gas pipelines
France, 2002**

Natech disasters

- Kocaeli earthquake in Turkey in 1999: multiple hazmat releases, threat to earthquake victims and rescue teams forces evacuation and abandonment of search and rescue activities
- Chlorine release during floods in the Czech Republic in the summer of 2002 results in emergency state, victims are asked to shelter in place

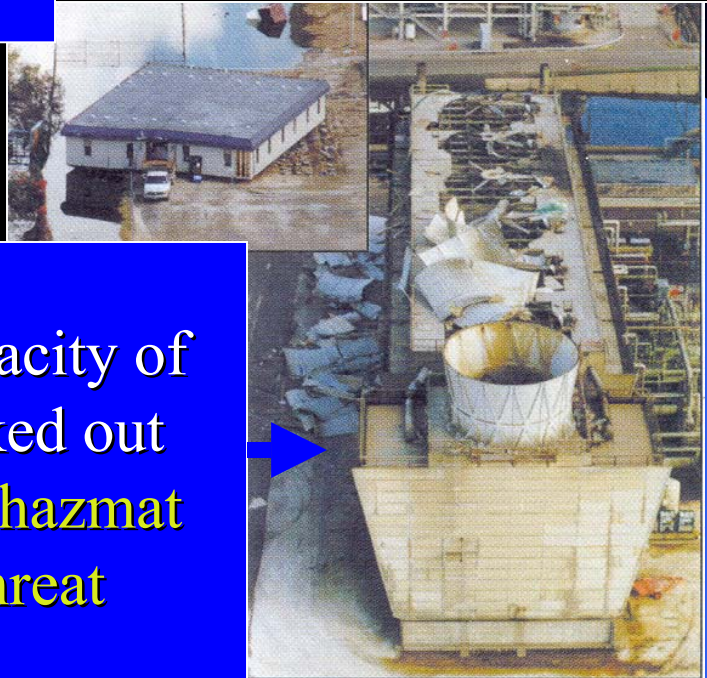
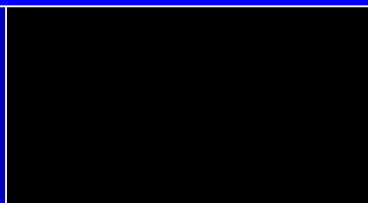
Tropical cyclone induced natech at oil refinery

- Oil spills caused by flooding and wind
- Water and oil mix damages plant equipment including fire trucks



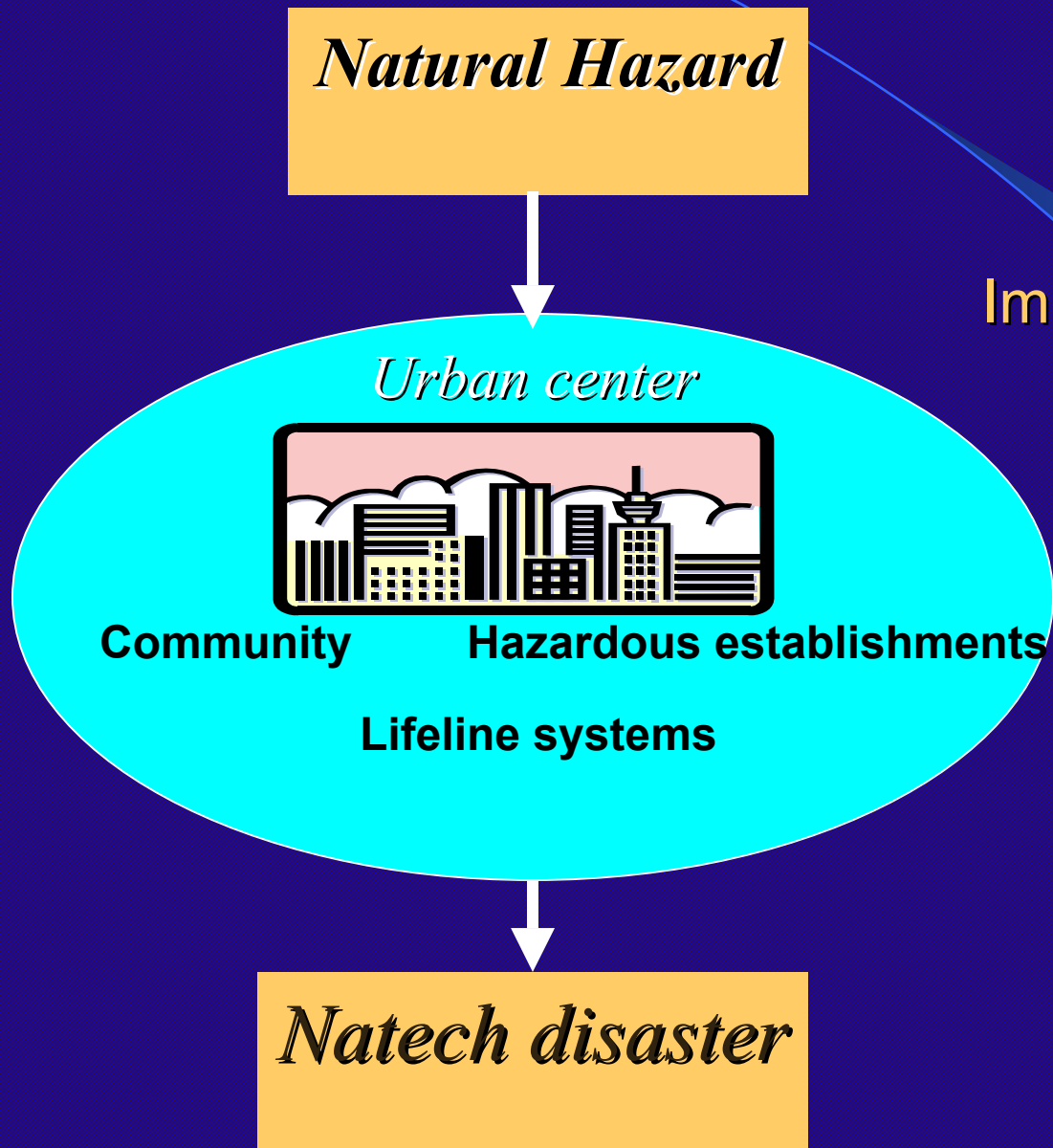
Damage:

- safety systems
- 10,000 pumps and motors



Cooling capacity of plant knocked out by tornado: **hazmat release threat**

Natechs in Urban Environments



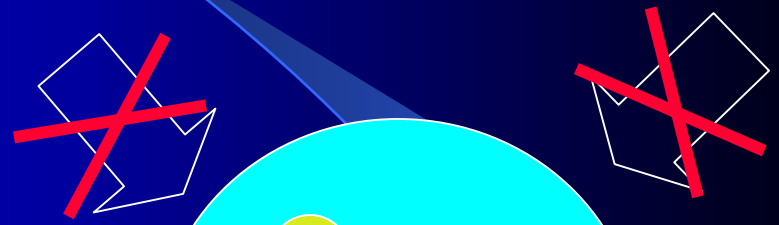
Implications for urban settings

- More people and property at risk
- More complex and interdependent systems
- Increased potential for cascading events

Nature of natech risk:

Technological event

Natech event



Natech disasters pose tremendous risks to regions which are unprepared for these events

Mitigation and emergency response

Lessons learned:

“Natech disasters are particularly problematic”

- Simultaneous response efforts required to attend both natural disaster and technological disaster
- Natural disasters are likely to trigger simultaneous releases from single or multiple sources
- Lifeline systems needed for mitigation and response are likely to be unavailable
- Warning systems (to protect residents) may not be functional (e.g., shelter in place may not be feasible if buildings are no longer safe)
- Although safety techniques have implemented to contain hazmat accidents, they are typically not designed to accommodate releases triggered by, and simultaneous with natural disasters

Lessons learned (Cont.):

Local government/community/emergency officials

Industrial safety officers often work separately from those in charge of natural disaster management

Lack expertise to establish risk management programs for and respond to natechs

Risk management practices often do not require hazardous plants to address external risks and consequences beyond their own establishments

Resulting in little or no knowledge of dangers associated with natechs

The problem

- Little systematized information on actual risk of natechs
 - Little recording of natech incidents
 - Little or no valuation of monetary losses or costs
- Few studies on what governments and communities are doing to prevent and prepare for natechs

Recommendations for future natech risk reduction:

- **To promote education and training concerning**
- **To design prevention and preparedness plans specific for multiple simultaneous disasters in urban areas**
- **To collect data and disseminate information on natech events**
- **To continue promoting research of natechs and other multiple simultaneous hazards that threaten urban areas**

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