

# RISK CONTEXT FOR RADIOLOGICAL MATERIAL: HOW TO ASSESS THREATS AND CONSEQUENCES



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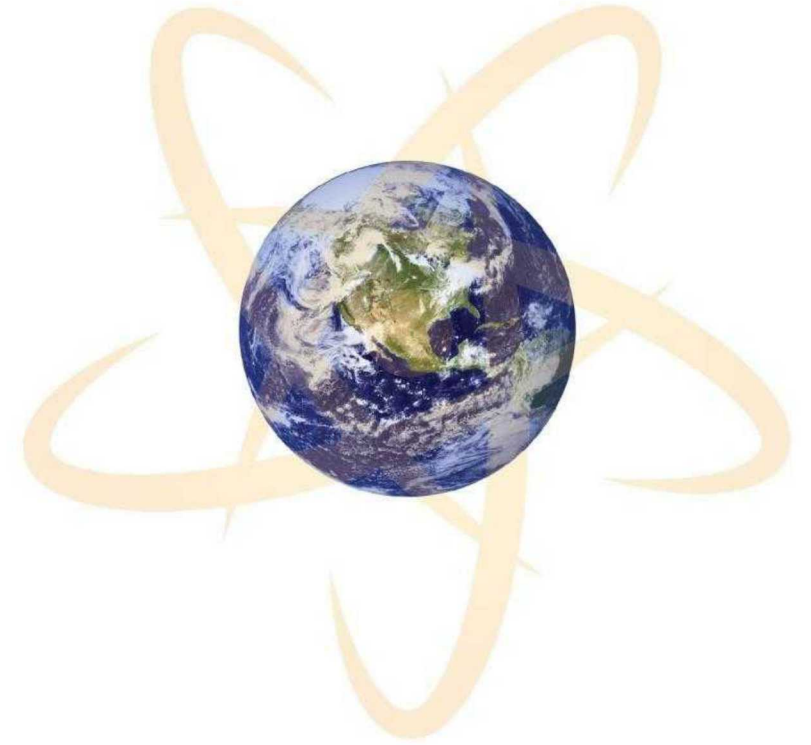
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# OUTLINE

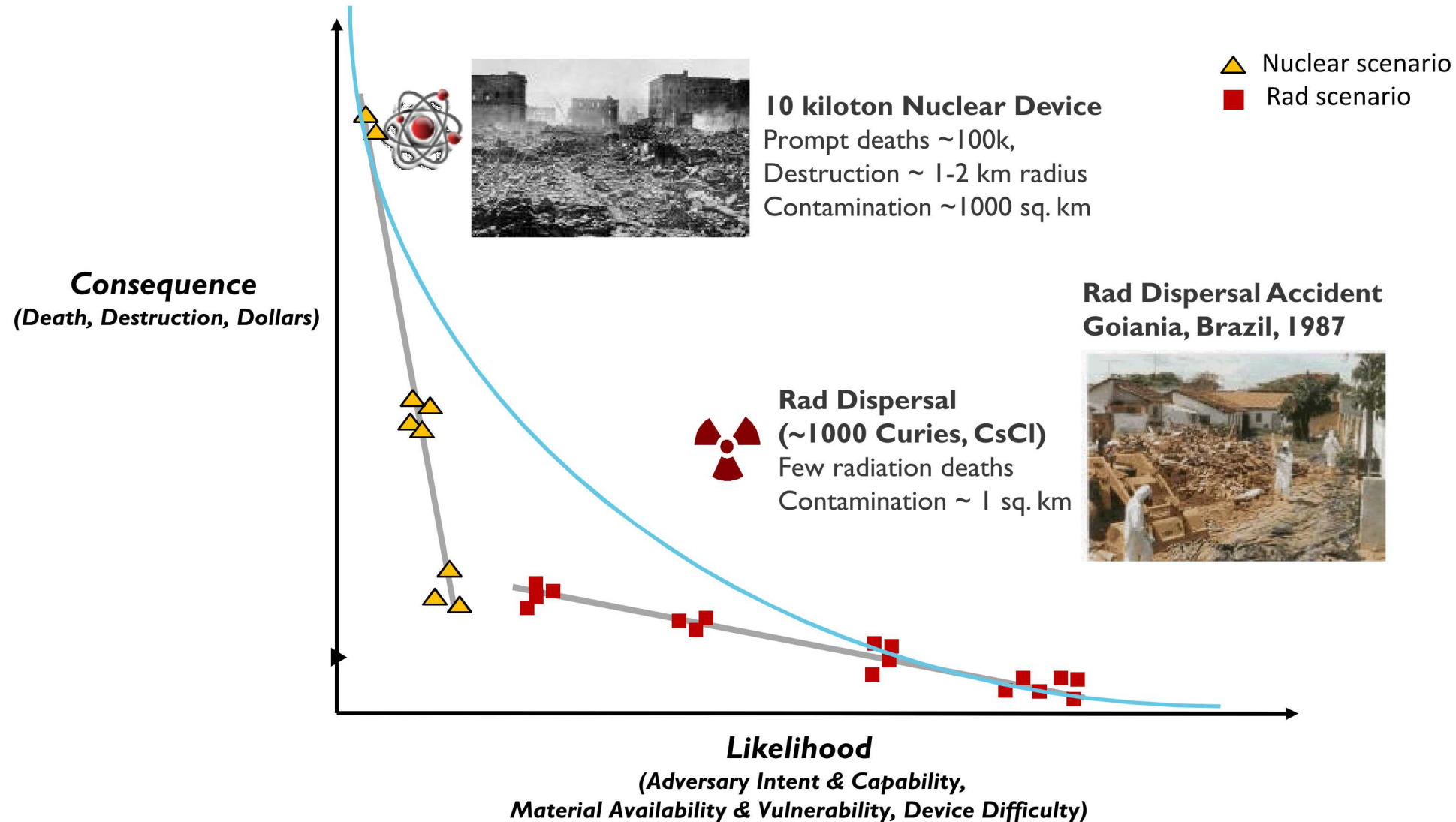
How to assess threats and consequences of radioactive material?

- Context & Framework
- Likelihood factors
- Consequence factors
- Conclusion



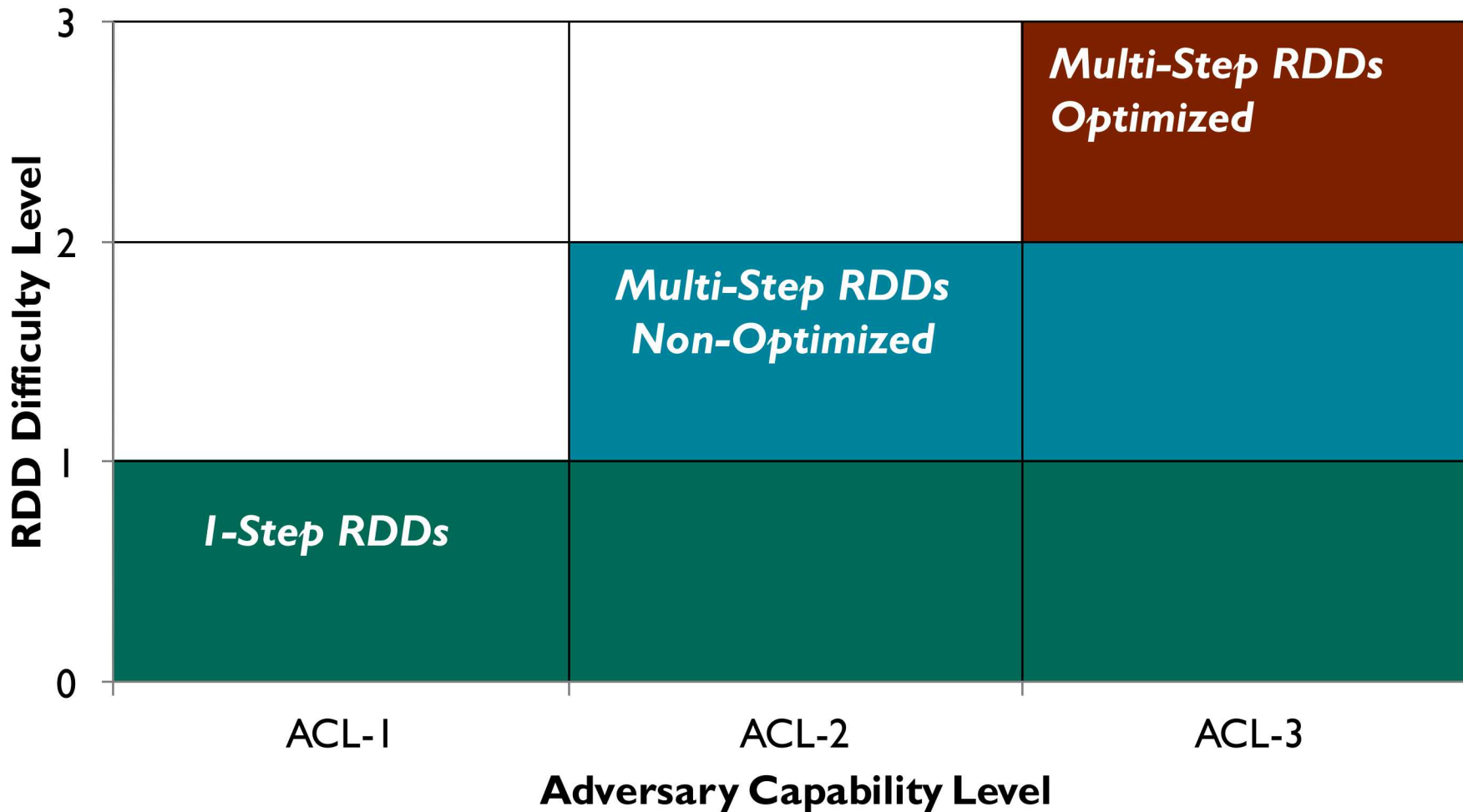
# RISK CONTEXT (NOTIONAL)

*Risk = C x P. Some probability factors are hard to quantify.*



# ADVERSARY CAPABILITY MODELING

*More capability opens up more complexity in attack design.*



## Capability Assessment

- Technical Knowledge
- Device /Explosive Skills
- Financial Resources
- Organizational Skills
- Specific Group Assessment

# SOURCE THEFT VULNERABILITY

*Is it too hard to remove the source?*

**Difficulty of attack key part of risk assessment for self contained irradiator.**

**Attack testing established timelines for response and site vulnerability assessments.**

- Technologist used for attack assessment.
- Required radiation effects and mechanical knowledge.
- Tests demonstrated the ability to obtain source is relatively short time.

## **Exposure Analysis**

- Teletherapy: 0.3 - 2.3 rems (3 – 23 mSv).
- Typical Cs-137 blood irradiators: 4 – 24 rems (40 – 240 mSv).

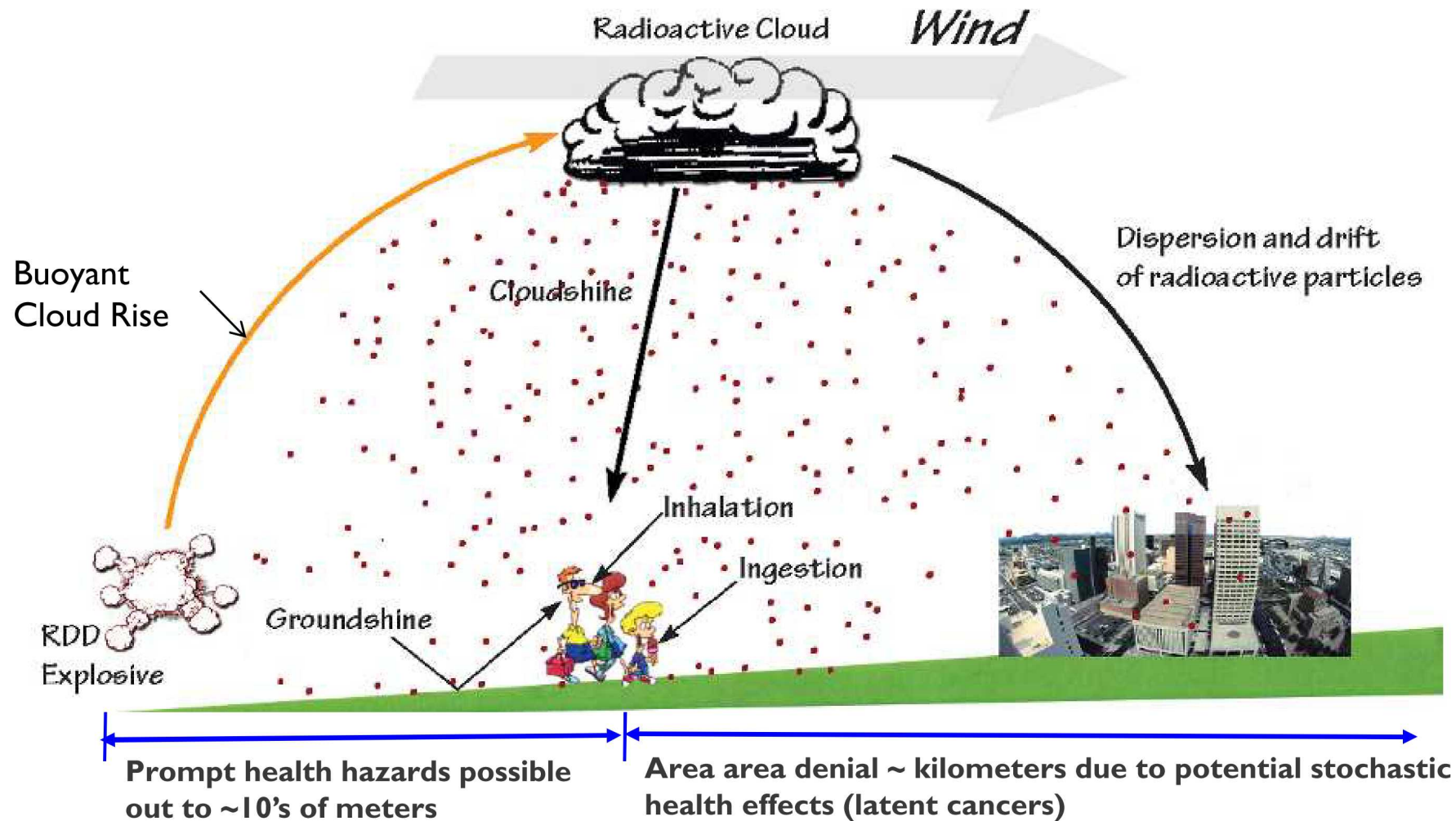
**Results motivated USA interagency consensus to move forward with security enhancements throughout the US.**



*IBL 437c blood irradiator contains ~5500 Ci of Cs-137; weighs ~2100 kg (2+ tons).*

# CONSEQUENCES FOR THE EXPLOSIVE RDD

*Radioactive ground contamination can have a lasting, mass effect by creating an “area denial.”*



# CONSEQUENCE FOR Cs-137 RDD IN NEW YORK CITY

*Representative, not worse case, scenario defined.*

## Scenario

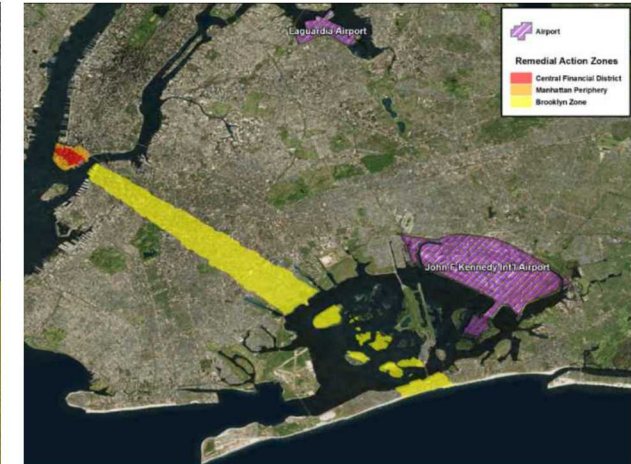
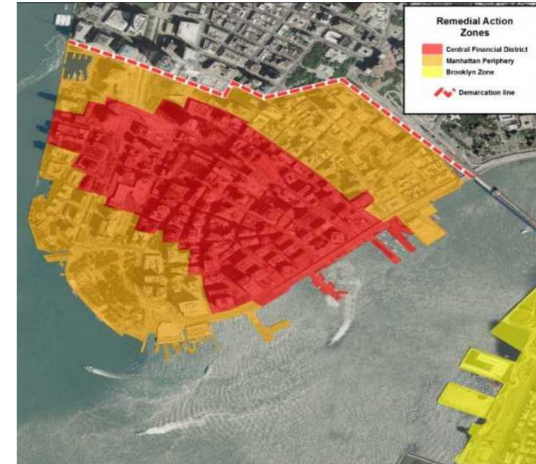
- Prevalent weather conditions.
- Tall buildings accounted for.
- Device design aligned with threat definition.

## Assumptions

- Threshold of action defines actions and area of concern.
- Prompt and effective response protocols for analysis.

## Results

- US GDP impact tens of billions (\$USD)
- Some deaths/serious injuries from dispersion explosion
- 195,000 people evacuated.



*Plume large but missed air and seaports.*

**The study used the US relocation threshold of 500 mrem/2yr (5mSv/2yr), which is guidance, not the law.**

# PSYCHOSOCIAL IMPACTS OF AN RDD ATTACK ARE THE LARGEST CONTRIBUTOR TOWARDS THE ECONOMIC IMPACTS

## General Avoidance Behaviors

- Tourism.
- Consumer spending patterns.

## Property Values

- Determined by both characteristics of the house and the external factors.
- Fears of safety near contamination.

## Mental Health

- People evacuated.
- People relocated.
- Worried well.



# CONCLUSION: USE A FRAMEWORK TO DEFINE A RISK THRESHOLD

*A curve defines equivalent risk but it's easier to define unacceptable risk in terms of consequence.*

