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# **Scenario Based Logic Modeling Tool for Planning and Mitigation of Terrorist Events**

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# Overview

- Scenario Based Logic Modeling Tool Concept
- Secondary Flashpoint and Tertiary Impact
- Impact of secondary and tertiary events on response ability
- Summary



# Basic Concept

## Scenario Based Logic Modeling Tool

### WHAT?

- Conceptual computer-based model to allow emergency management to anticipate the Secondary and Tertiary events post-CBRNE attack.

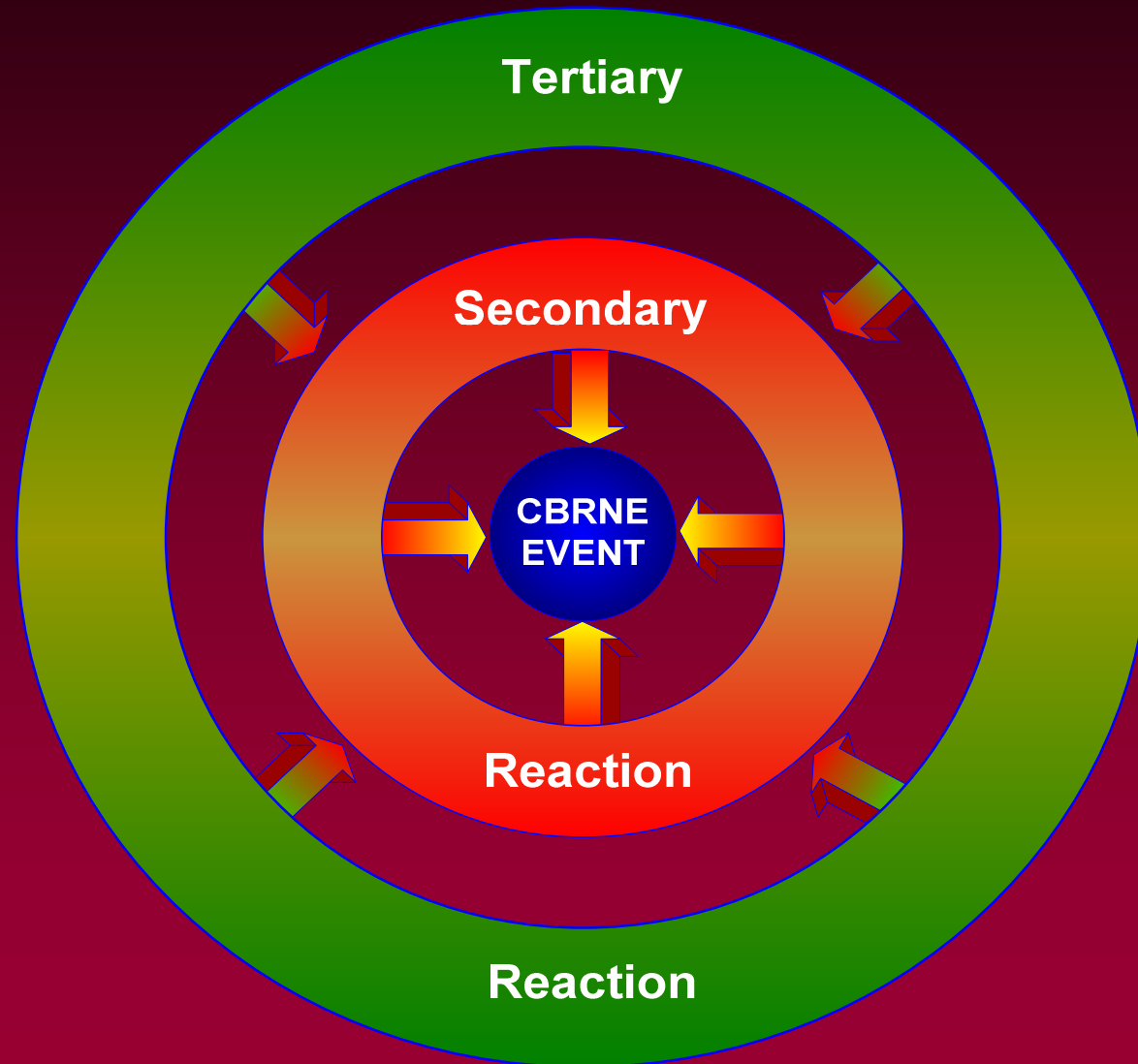
### WHY?

- Mitigate secondary and tertiary geometric impact of a CBRNE terrorist attack.



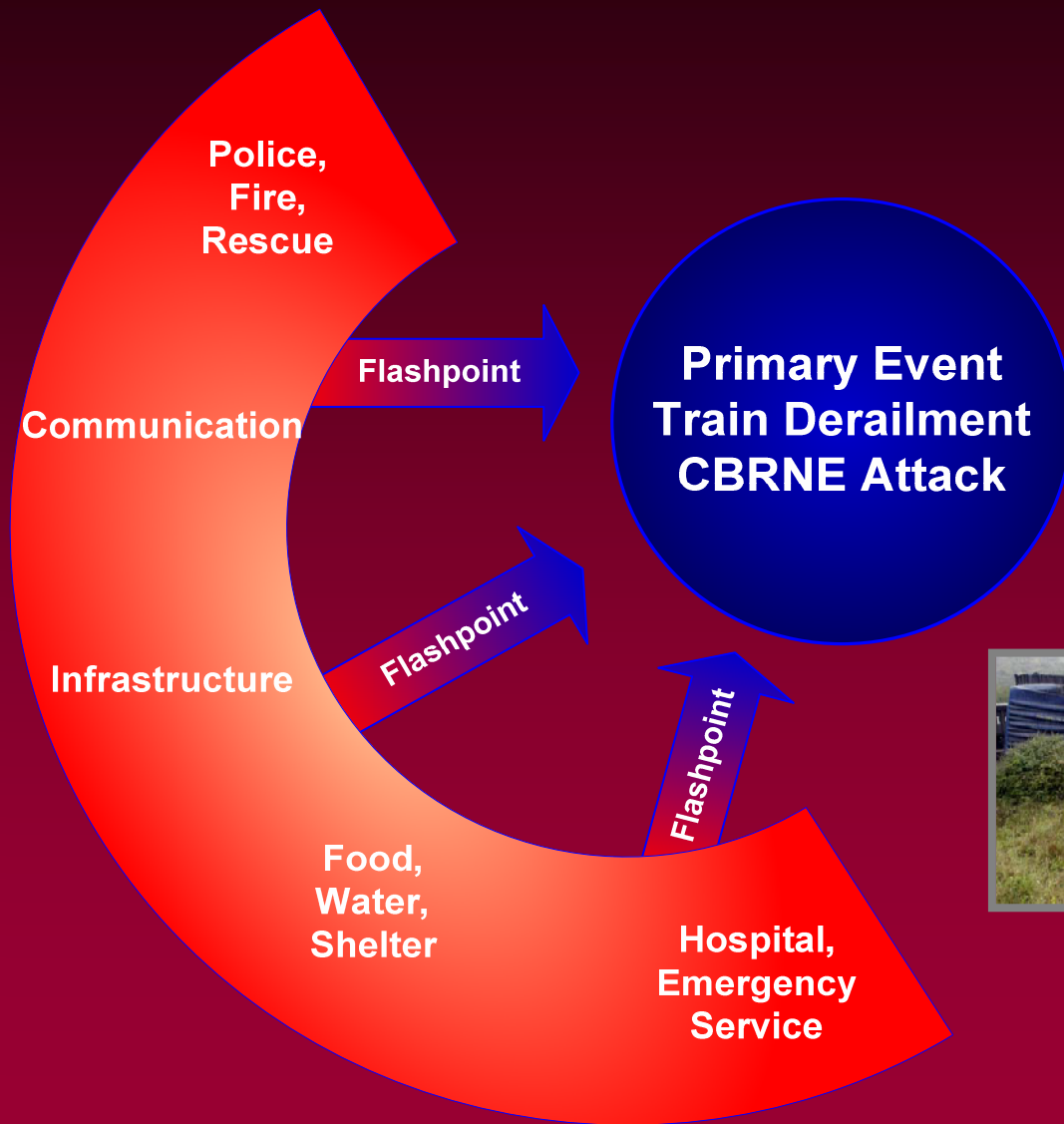
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# Big Picture



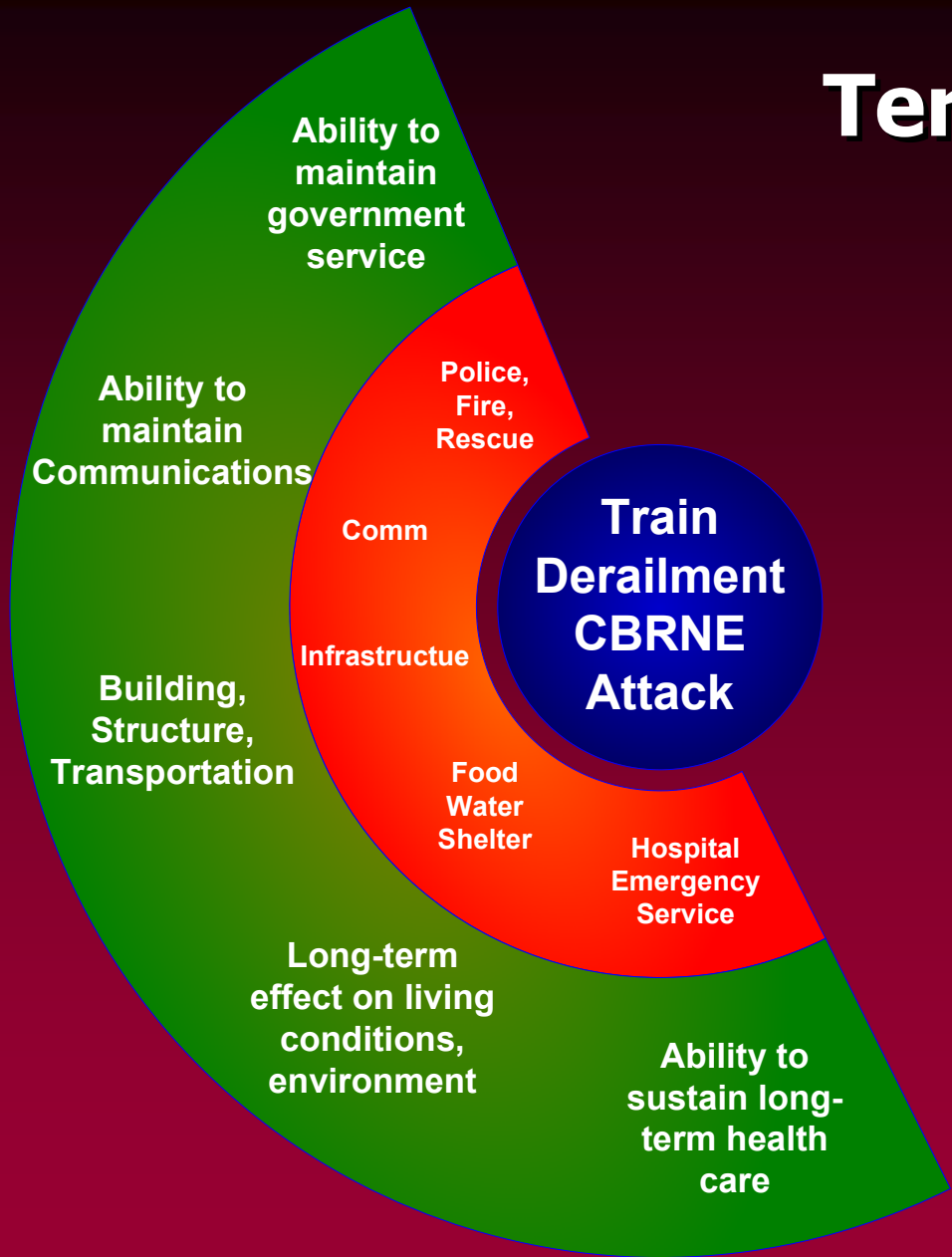
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# Secondary Flashpoint



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# Tertiary Impact



# Scenario Based Logic Modeling Tool - Concept

- Planning
  - Provide insight to improve decision makers
    - Situational Awareness
    - Long-Term Response Mitigation
    - Ability to facilitate timely effective response
      - When taking Secondary Flashpoint and Tertiary Impact into consideration



# Scenario Based Logic Modeling Tool - Concept

- Execution Tool
  - Provide first responder command element with:
    - Enhanced span of control
    - Relevant information to provide effective response
      - Secondary Flashpoint
      - Tertiary Impact
  - Provide decision makers with:
    - Short and long-term effect on:
      - Infrastructure, Communication, Emergency Care, Basic Necessities (Food, Water, Shelter), Police and Rescue Response





# Scenario Based Logic Modeling Tool - Technical

- Database containing (examples)
  - After action reports
  - Known effects of CBRNE event
  - Long-term after effects of CBRNE event
  - Contamination ROE
  - Medical material needed after a CBRNE event
- Logic application
  - Using basic modeling concepts, such as Boolean and Fuzzy Logic, probabilities can be established that support mitigation planning

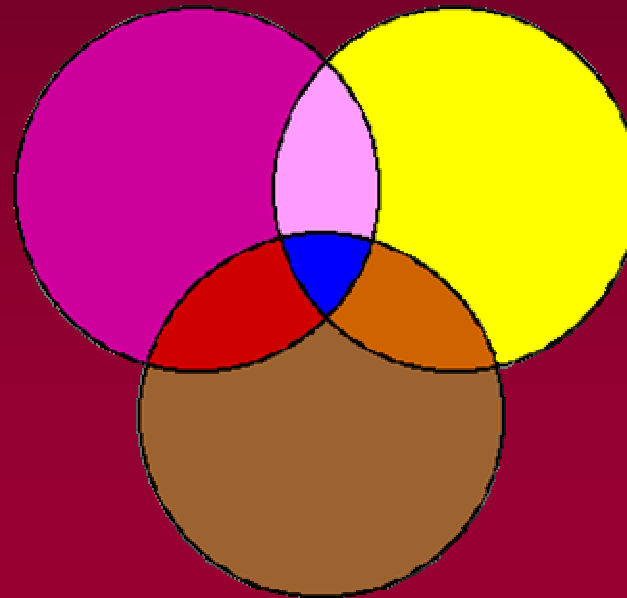


# Boolean Logic

## Scenario Based Logic Modeling Tool

- Use of Boolean and Fuzzy Logic
  - Boolean Logic
    - And Not Or Nor

~~Suttsokldressy yuz/Minilla and Chocolate~~



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# Fuzzy Logic

## Scenario Based Logic Modeling Tool

- Fuzzy logic is a superset of conventional (Boolean) logic that has been extended to handle the concept of:
  - Partial truth -- truth values between "completely true" -- "completely false"
- Uses **If/Then** concept

**If** the company president and all the company directors sell all of the stock they own, **then** we must sell.



# Fuzzy Logic

## Scenario Based Logic Modeling Tool

- A set of input data from an array of sensors is fed into the control system.
  - "Fuzzification" converts the discrete values into a range of values.
  - Fuzzified inputs are evaluated against a set of production rules.
  - Output data are "defuzzified" as distinctive control commands.
- Adding the human thought pattern is very important.
  - **If** the engine is hot, **then** turn the engine off.
  - **If** a chemical agent has been used, **then** check the water for contaminants.



# Combining Boolean and Fuzzy Logic

- The key is to combine these two logic concepts to arrive at the “best possible solution.”

**If** a train is de-railed **and** it has CBRNE/HAZMAT on board **and** it is **not** near a large city **then** your next action will be to ??????

**If** a train is de-railed **and** it has CBRNE/HAZMAT on board **and** it is near a nuclear facility, **not** near a large city, **then** your next action will be to ??????



# Impact on Secondary and Tertiary Response

- What impact does a CBRNE attack have?
  - What are the Secondary flashpoints?
  - What is the Tertiary Impact?
- What are the post-event flashpoints?
  - Examples of previous post-event flashpoints.
  - Examples of previous post-event Impact.



# Sarin Gas Attack on Tokyo, Japan

- On March 20, 1995, an unprecedented terrorist attack took place in Japan. On this day, a highly toxic chemical, sarin, was dispersed inside a subway killing 12 people and poisoning an additional 3,794. This infamous case, known as the "Sarin Subway Attack", was a CBRNE terrorist attack masterminded by Chizuo Matsumoto, also known as Shoko Asahara, the leader of the religious cult "Aum Shinrikyo."



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# Sarin Gas Attack on Tokyo, Japan

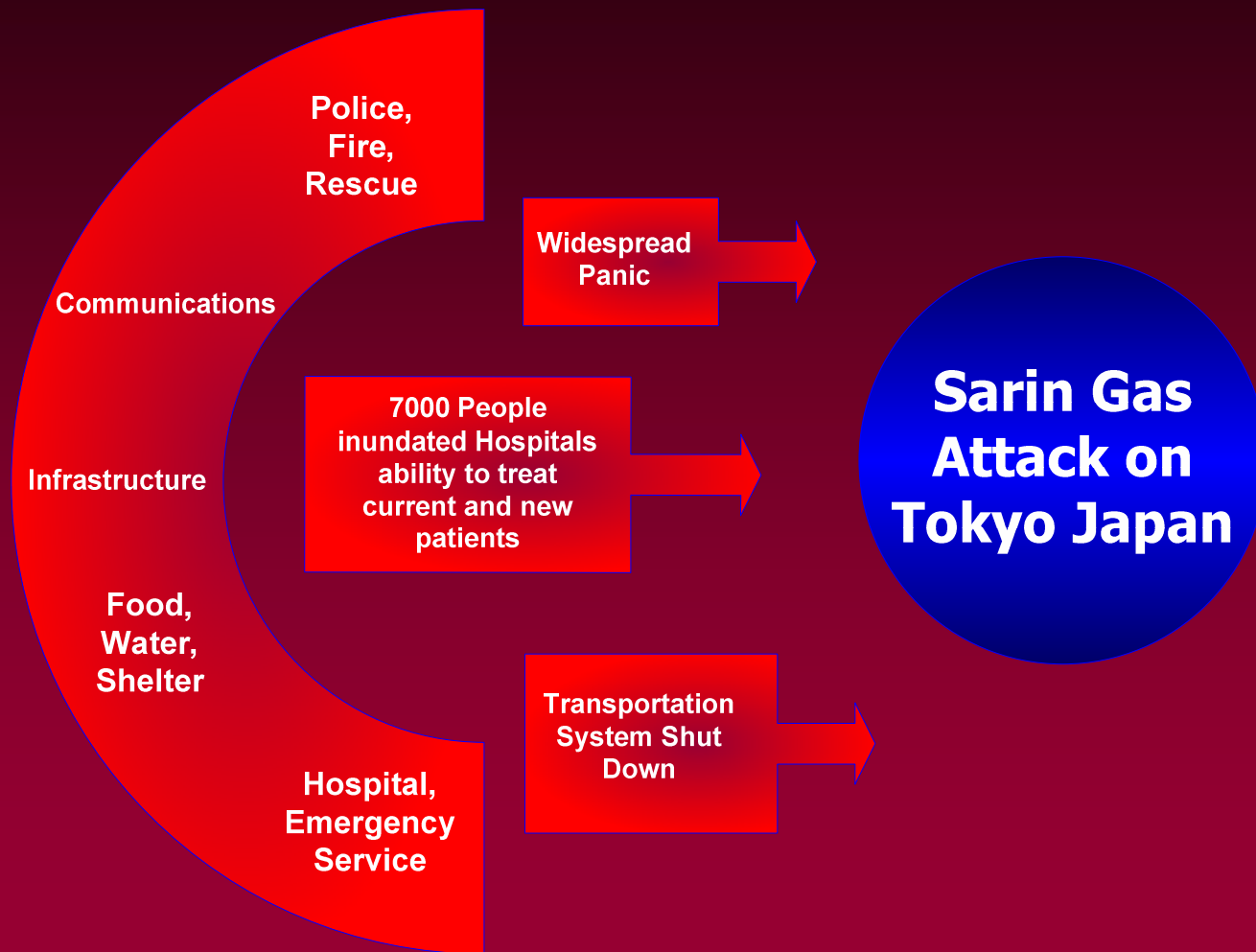
- Secondary Reaction
  - More than 7,000 people inundated hospitals in the area
    - 12 fatalities
  - Transportation system shut down
  - Widespread panic
- Tertiary Reaction
  - 3 to 4 weeks later
    - Animals in the area found dead
    - Discovered that air-conditioning systems contributed to infected victims
    - Water in surrounding area contaminated



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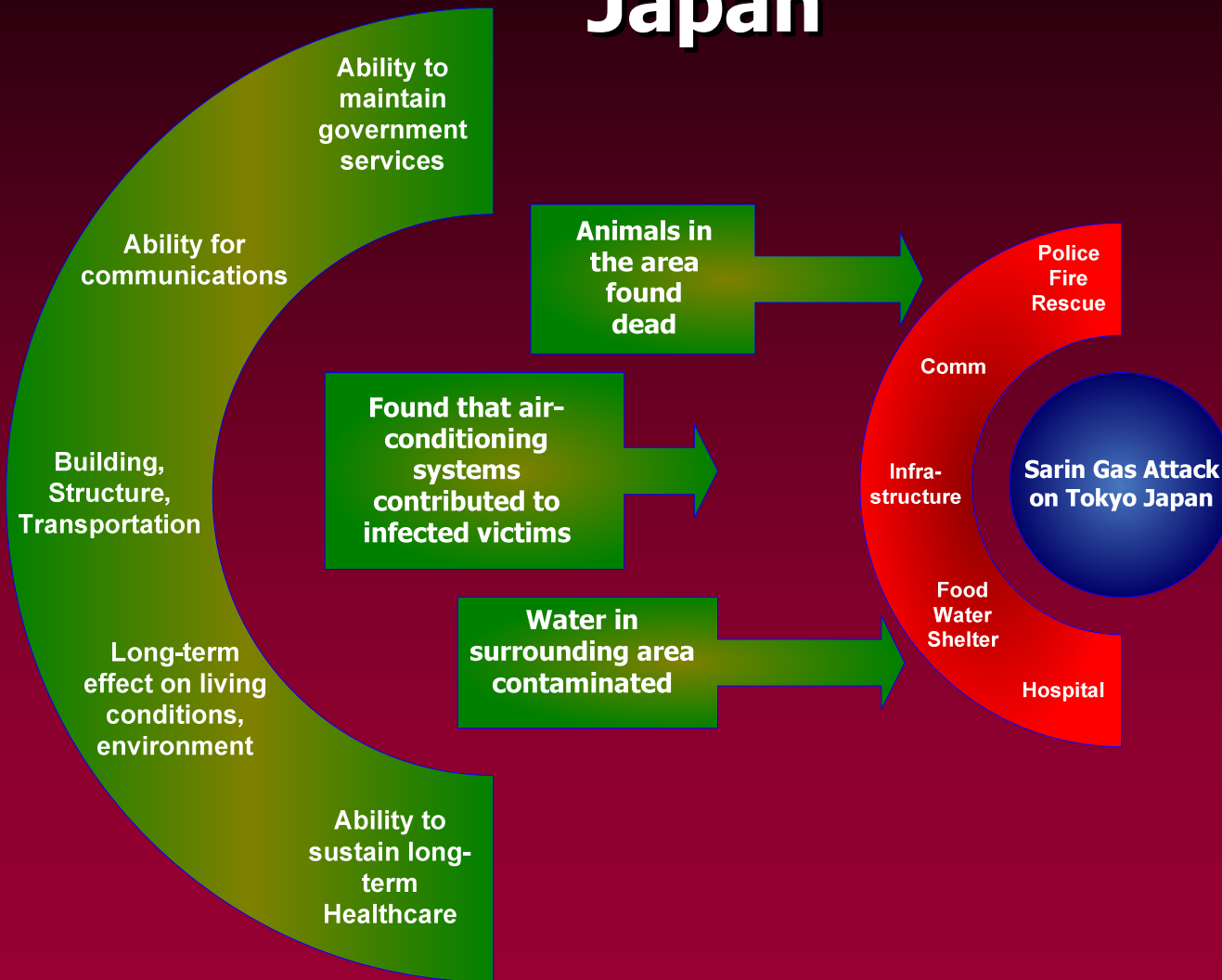


# Sarin Gas Attack on Tokyo, Japan



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# Sarin Gas Attack on Tokyo, Japan



# Sarin Gas Attack on Tokyo, Japan

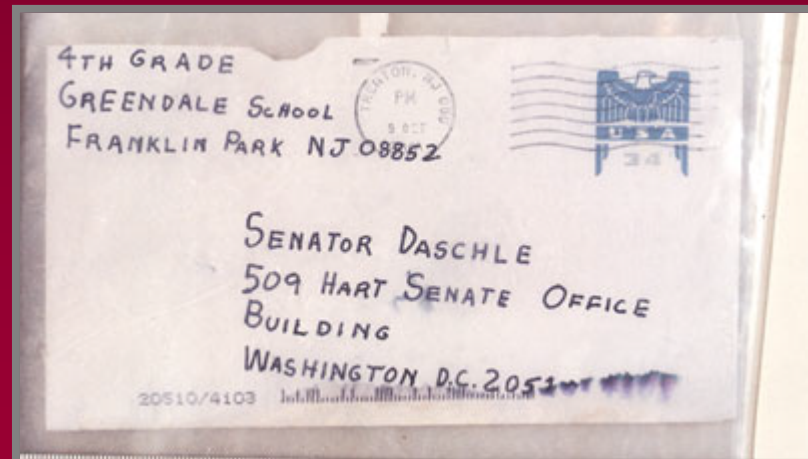


- Final investigation and report showed:
  - “We must be involved in managing the consequences when an act of chemical terrorism occurs.”



# Anthrax Attack on the U.S.

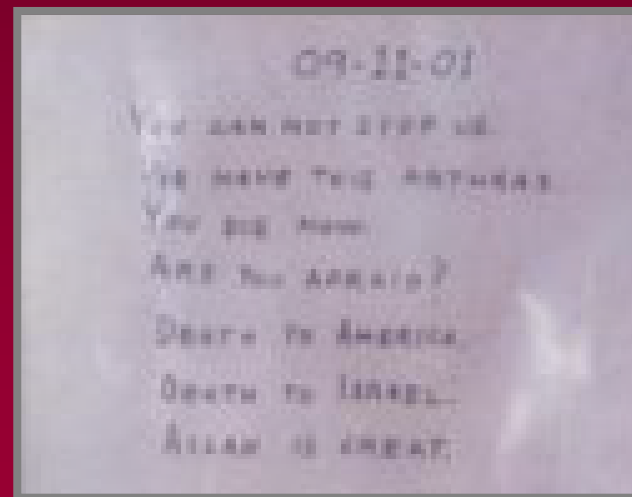
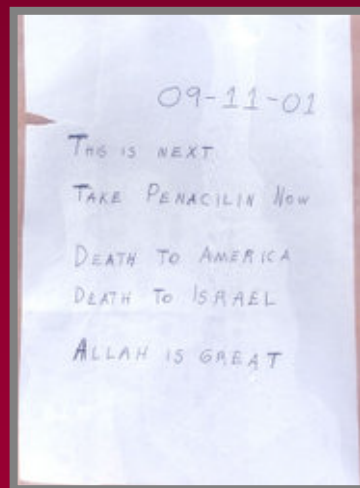
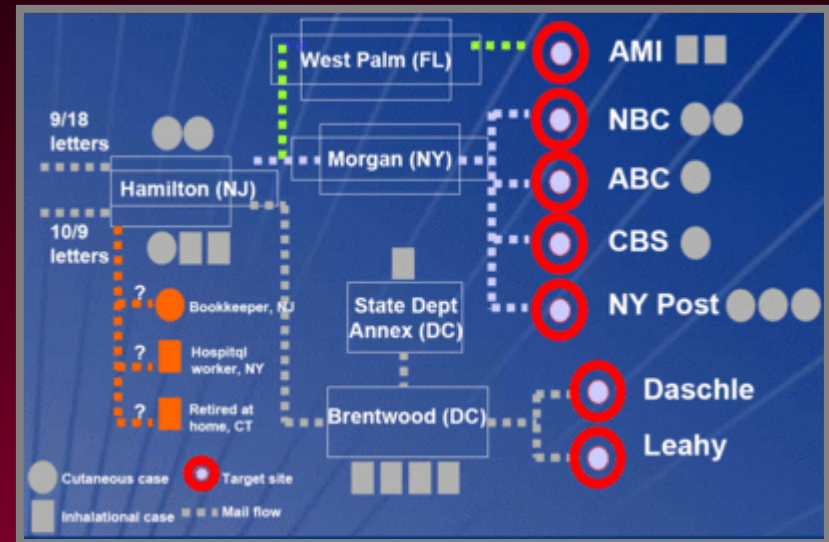
- The **2001 anthrax attacks** in the U.S. occurred over the course of several weeks beginning on September 18, 2001 (after the September 11, 2001 attacks). Letters containing anthrax bacteria were mailed to several news media offices and two U.S. Senators, killing five people.



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# Anthrax Attack on the U.S.

- Seven letters are believed to have been mailed, resulting in twenty-two infections. Five people died.



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# Anthrax Attack on the U.S.

- The secondary effects of the Anthrax attack
  - First Responders
    - Potential contamination of responder personnel
    - Contamination of postal workers
    - Contamination of government personnel
  - Infrastructure
    - Contamination of postal buildings
    - Contamination of government offices
  - Health Care Issues
    - Potential contamination of health care providers



# Anthrax Attack on the U.S.

- The tertiary effects of the Anthrax attack
  - Contamination and Clean-up
    - Infrastructure
      - Long-term building closures, contamination of personnel
      - Long-term postal service closures
  - Political Effects
    - Millions spent in legislation
    - Long-term public panic (more than seen with 911 attack)
  - Health Effects
    - Long-term contamination effects and health problems



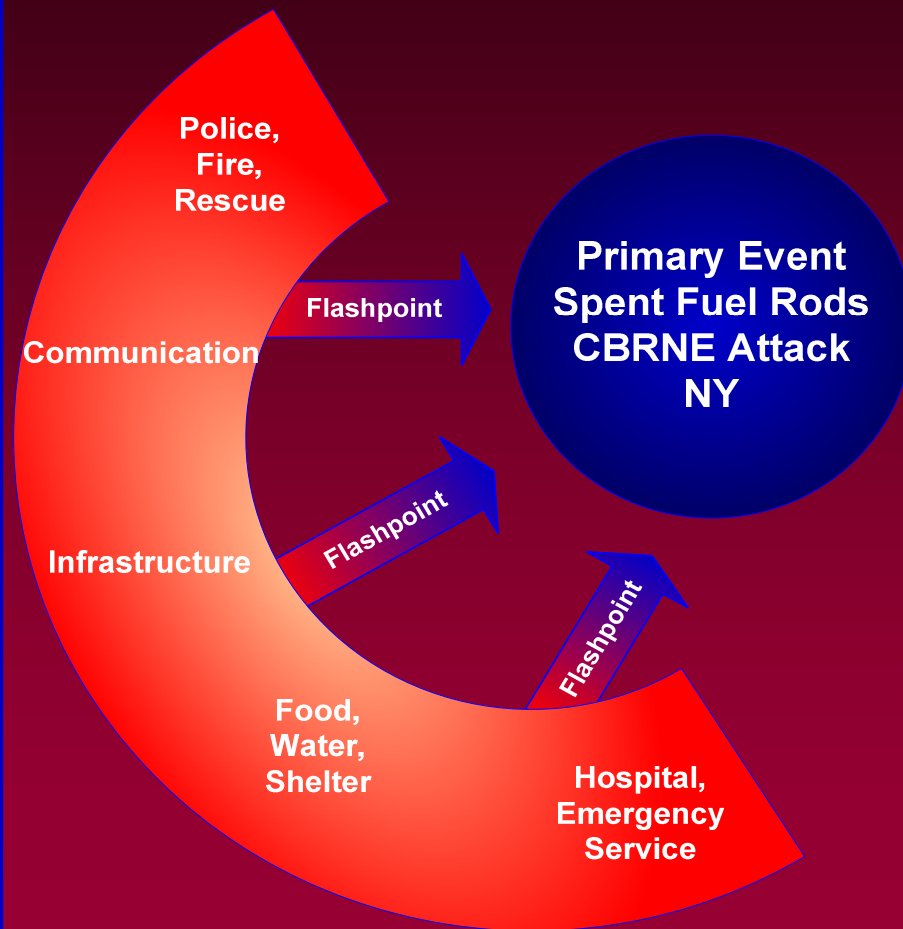
# CBRNE Conference Scenario #1

- Spent nuclear fuel rods are supplied by Iran and shipped in a cargo container to Colombia then flown to Mexico and loaded on human mules used to smuggle drugs across the border. They are met in Arizona by sleeper cell agents who take the fuel rods by car toward its final destination.
- Three men get off subway cars at three different locations in downtown New York and head toward the New York Stock Exchange. Simultaneous explosions echo down the densely packed street. The immediate area around the Exchange is shut down for months as decontamination efforts take place. Major financial transactions in the U.S. are slowed immensely due to the loss of the NYSE. Casualties after the event continue to mount as those in the immediate vicinity demonstrate varied levels of contamination. Several hospitals in New York finally begin to open due to contaminated patients being brought to them after the attack, prior to knowledge that the explosions were actually dirty bombs.



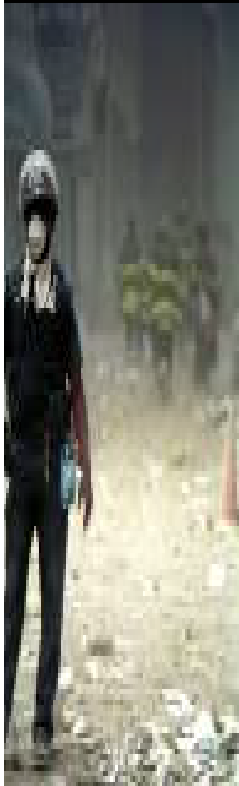
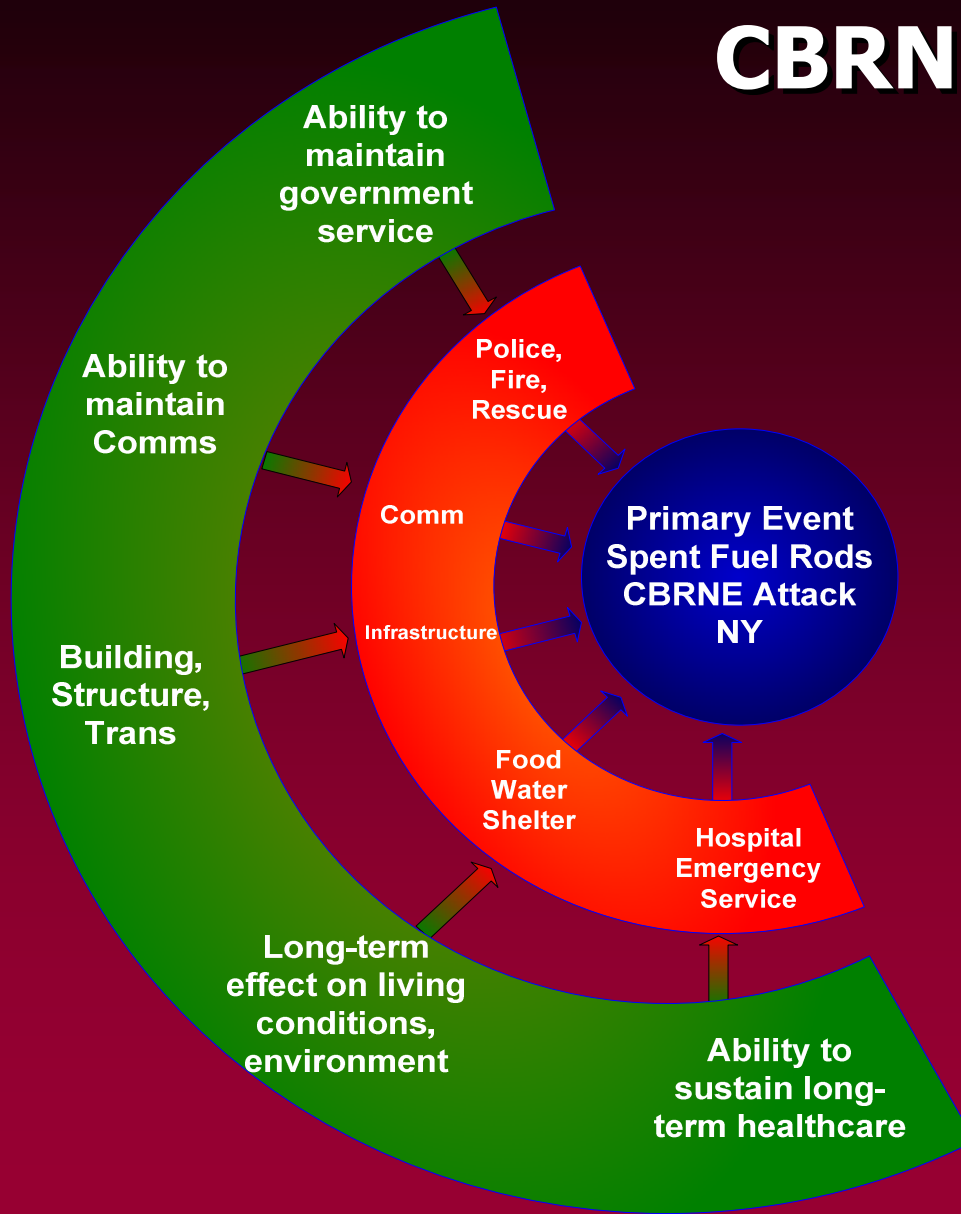


# CBRNE Scenario #1



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# CBRNE Scenario #1



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# CBRNE Scenario #1

- Police, Fire and Rescue
  - Short-term (explosion/unknown event)
    - Cordon within 15 Minutes
    - Detection within 2-3 hours
    - Triage with 30 minutes
    - This gives a 2-2 1/2 hour period of unknown contaminated population
  - Long term
    - Situational control of contaminated area
    - Provide services outside affected area



# CBRNE Scenario #1

- Communication and Infrastructure
  - World Financial Market
    - Short-term
      - NYSE unusable
        - Stock Prices
        - Value of dollar
    - Long-term
      - Interest rates/investments
      - Job loss, general inflation
  - Transportation
    - Short-term explosion
      - Subway and road closures
    - Long-term contamination
      - Subway, busses, taxis, ferries, airports



# CBRNE Scenario #1

- Shelter, food and water
  - Short-term and long-term contamination
    - Detection, Containment and Decontamination
  - Physical building damage
  - Access to and from contaminated area (after detection)
  - Containment of potential radiation (after detection)
    - Psychological effects of containment

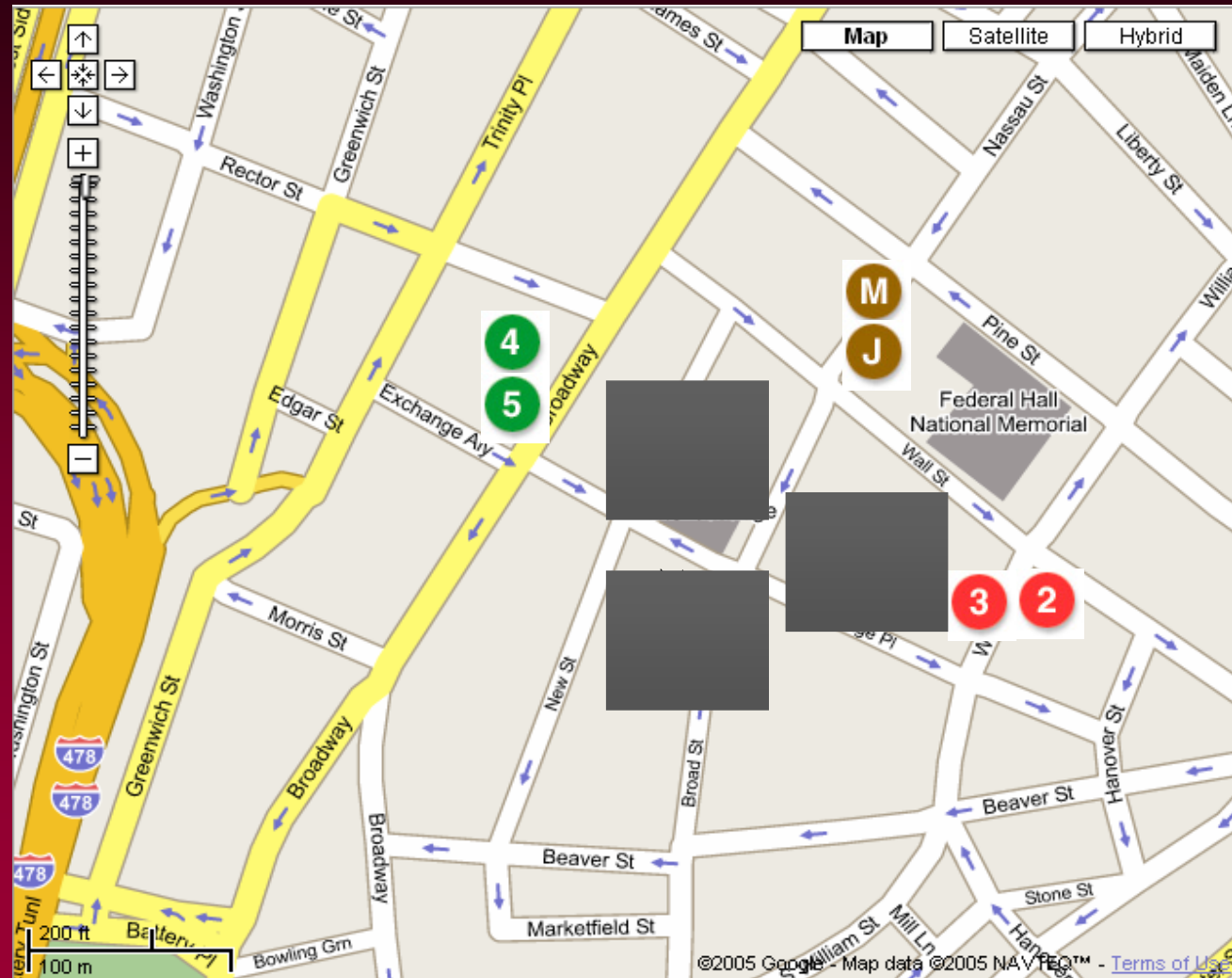


# CBRNE Scenario #1

- Hospital, Emergency Care
  - Short-term (2-3 hours)
    - Radiation not detected
      - Route, Ambulance, Hospital, Personnel
      - Casualties with unknown situation
    - Radiation detected (after 3 hours)
      - All personnel and infrastructure affected is lost
      - Huge decontamination situation
      - Inundated by patients (NY)
  - Long-term (24 hours to years)
    - Effects of personnel and patients
      - Months or years before hospitals are usable
      - Chronic radiation sickness



# New York Stock Exchange

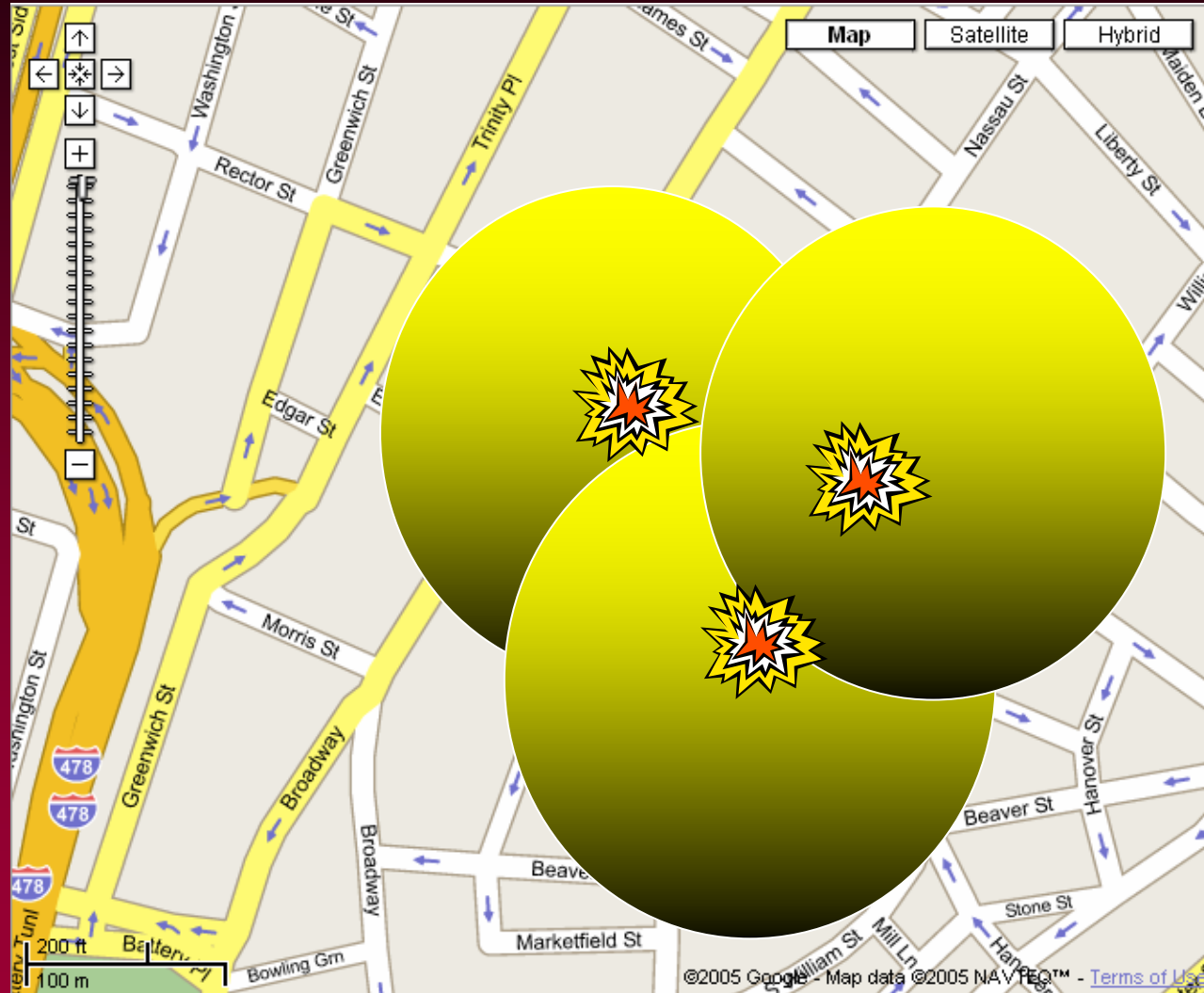


Typical explosive cordon (300 m)



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# New York Stock Exchange



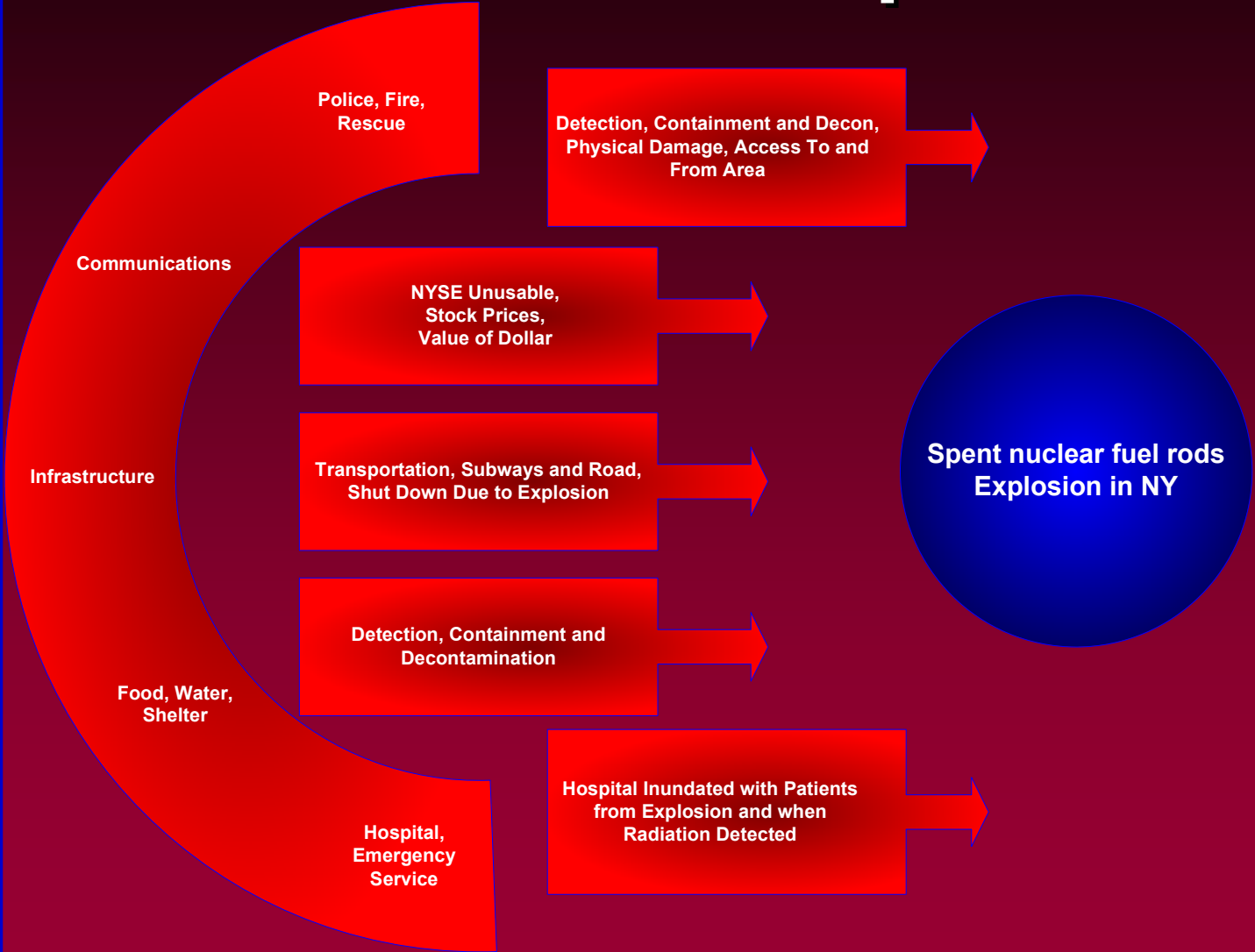
Potential Hazard Area – Not to scale



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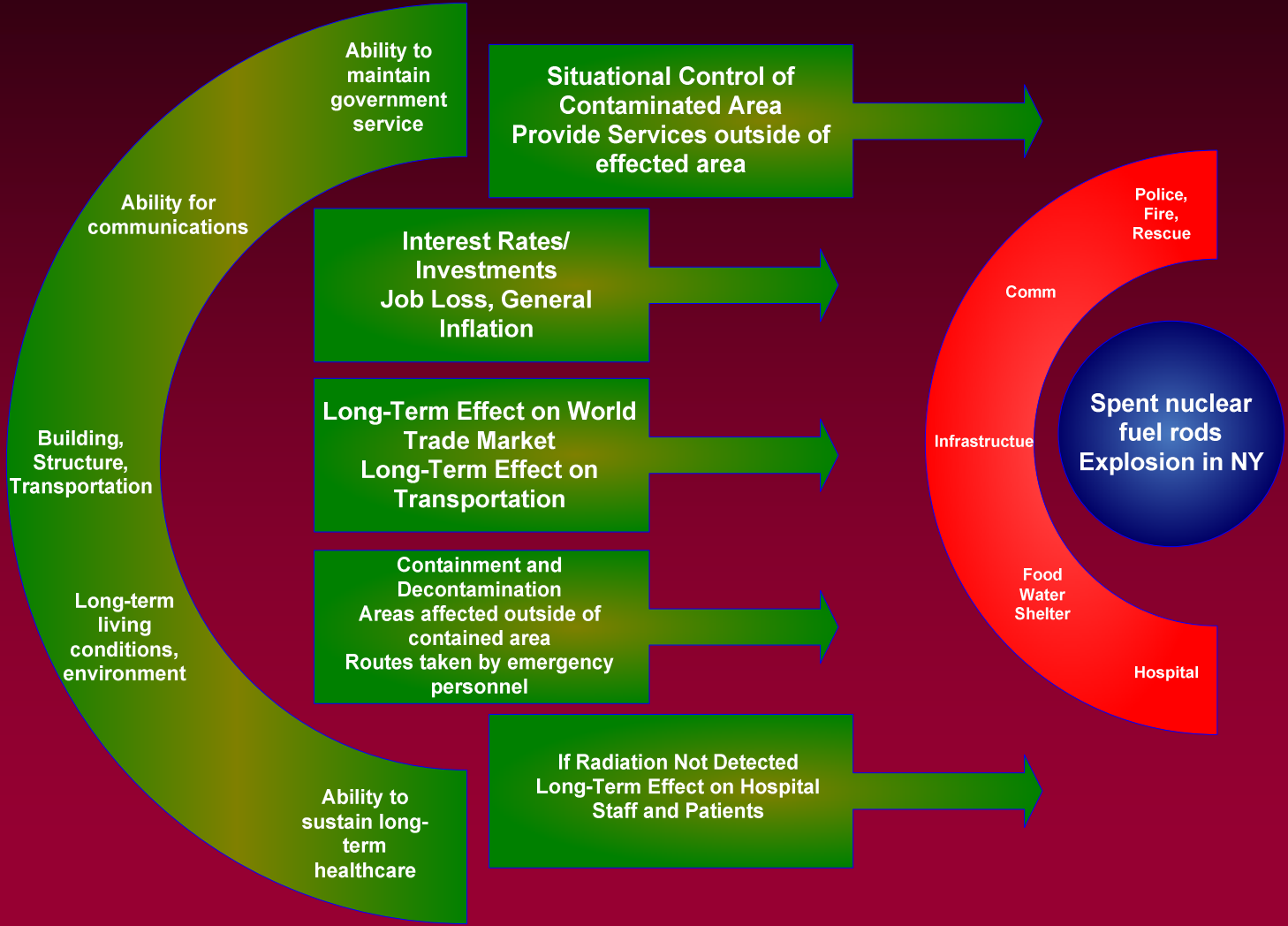


# Nuclear Fuel Rod Explosion in NY



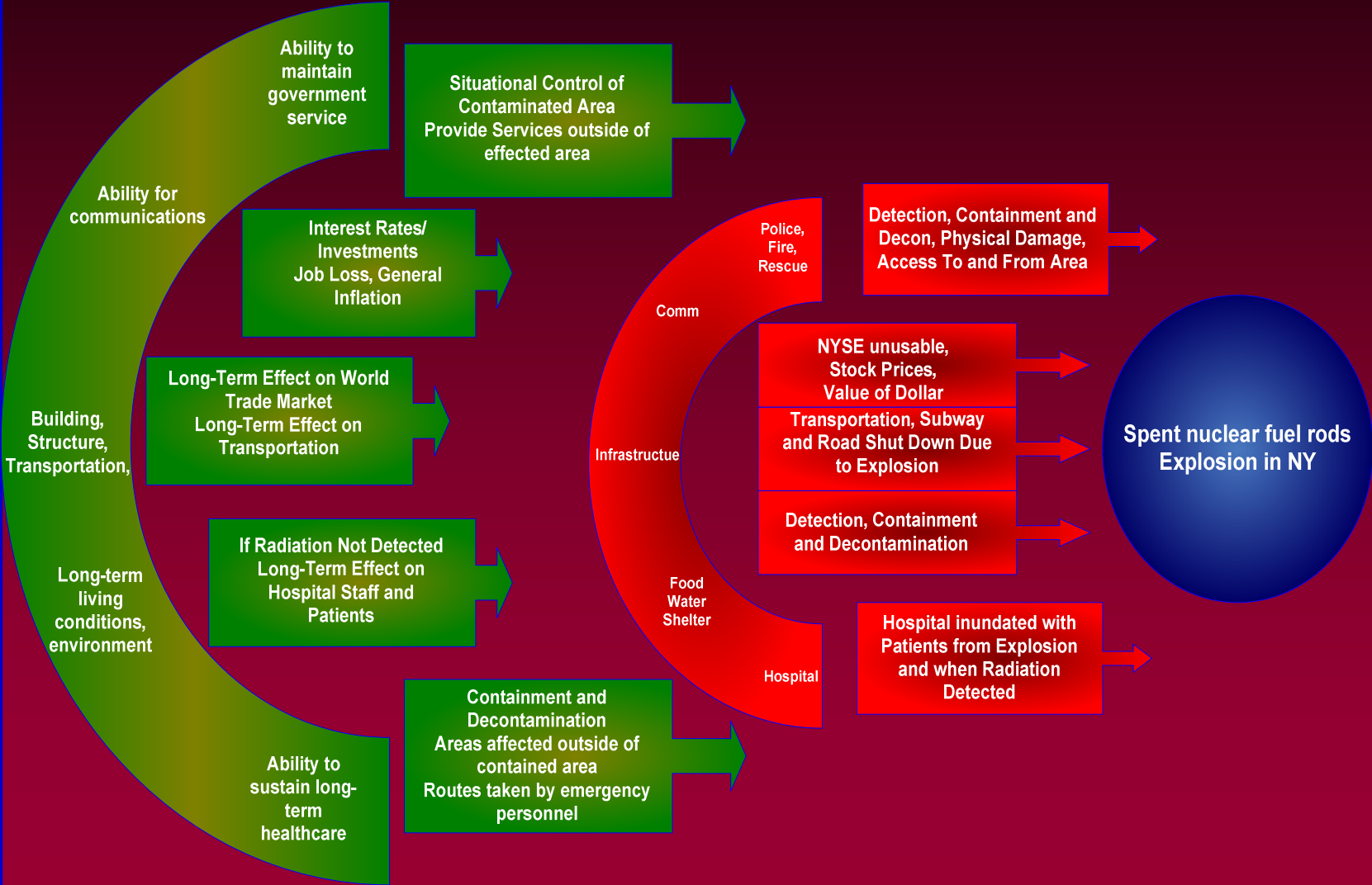
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# Nuclear Fuel Rod Explosion in NY



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# Nuclear Fuel Rod Explosion in NY



# Summary

## WHAT?

- Conceptual computer-based model to allow emergency management to predict the Secondary and Tertiary events post-CBRNE attack.

## WHY?

- Mitigate secondary and tertiary geometric impact of a CBRNE terrorist attack.



# Bottom Line

- We have spent billions of dollars on security and response of a terrorist attack
  - Not enough time and effort is put into mitigating the long-term response effect of a CBRNE Terrorist attack
  - Understanding what effect a CBRNE Terrorist Attack has and what can happen weeks, months or even years after that event, could help us be better prepared to handle the long-term response efforts



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Thank you for your time

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“It’s not a question of *if* but *when* a CBRNE Terrorist Attack on the United States will happen.”



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