The Norwegian seventh scenario

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NKS-B NUCSEM seminar,
Oslo2-3 November 2021

DSA

Direktoratet for strålevern og atomsikkerhet

Norwegian Radiation and Nuclear Safety Authority

The Norwegian Radiation and Nuclear Safety Authority (DSA)

National authority and expert body in matters concerning radiation protection, nuclear safety and non-proliferation, radioactive contamination and radioactive waste

Some key responsibilities:

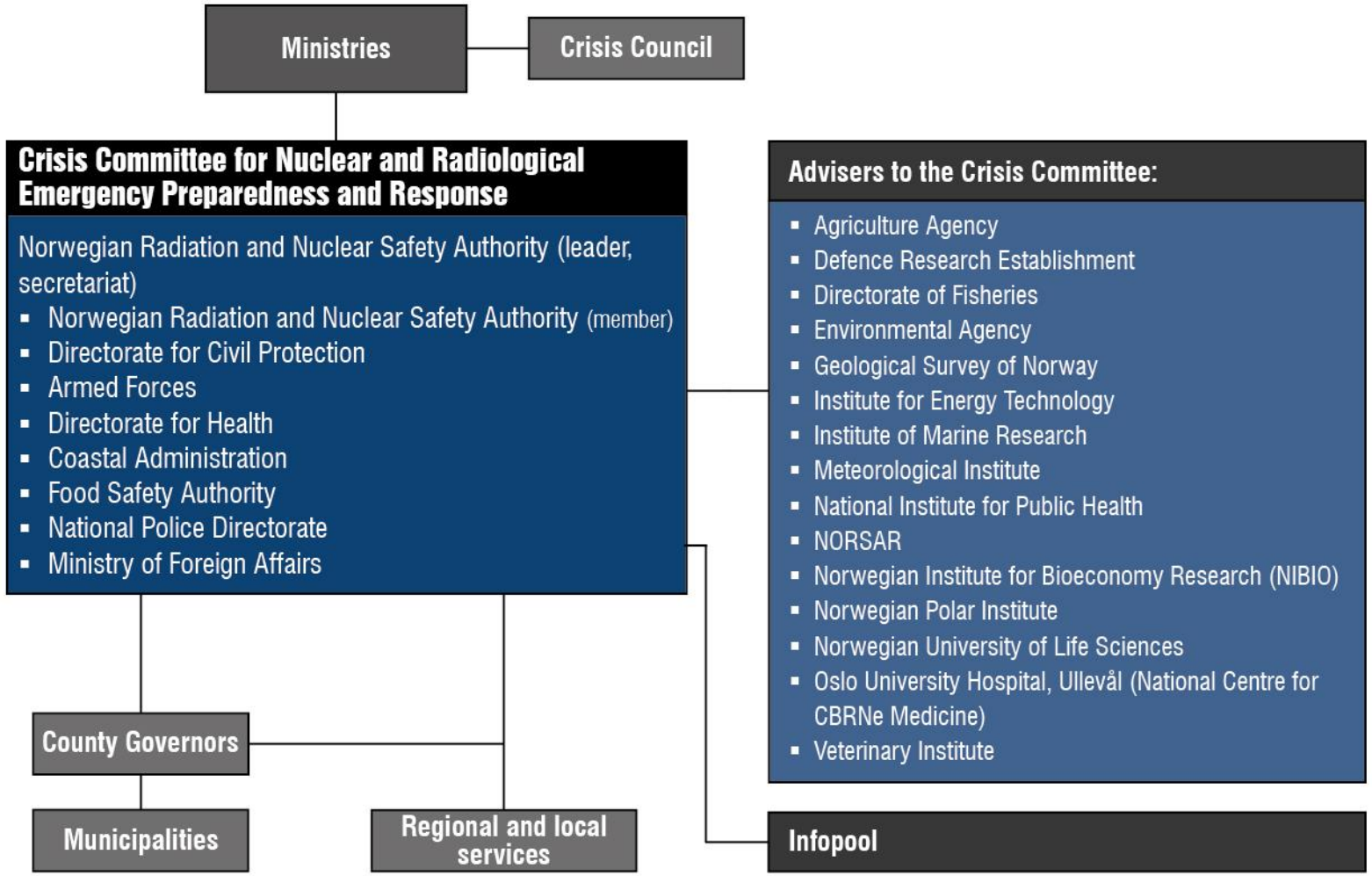
- → Highest national authority on nuclear safety and security, including recommendations on licencing and inspections
- → Chairs the national nuclear emergency preparedness and response
- → Provides advice and guidance to other authorities and the general public

Approx. 130 employees

Main office on Østerås outside Oslo
Regional offices in the High North

Photo: DSA

The Norwegian Crisis Committee for Nuclear and Radiological Emergency Preparedness and Response



- → Established to ensure rapid implementation of measures to protect lives, health, the environment and other important social interests
- → Mandate to make decisions in the early phase
- → Mandate covers peacetime, security crisis and war
- → DSA leader and secretariat

Responsible for maintaining threat and hazard assessments within our field

Some previous publications:

- → StrålevernRapport 2008:11 *(«Atomtrusler»)* – Nuclear and radiological threats
- → StrålevernRapport 2018:10 *(«Endringer i trusselbildet»)* – Changes in nuclear and radiological threats and hazards

Six planning scenarios for the national nuclear and radiological emergency preparedness

→ Decided by the government in May 2010

Statens strålevern
Norwegian Radiation Protection Authority

StrålevernInfo 1·14

Scenarier for planlegging av norsk atomberedskap og krisehåndtering

I mandatet for den norske atomberedskapen ligger det at alle hendelser skal håndteres. Regjeringen har lagt til grunn seks scenarier med ulike typer atomhendelser for å kunne foreta en prioritering av behovene og planlegge en best mulig atomberedskap i Norge.

Illustrasjon: Statens strålevern/Inger Sandved Anfinsen www.koboldesign.no

Alvorlige atomhendelser kan gi store konsekvenser med et stort og umiddelbart informasjonsbehov, store utfordringer knyttet til tiltak, råd og beslutninger og et krevende oppfølgingsarbeid i etterkant. En rekke fagmyndigheter vil bli berørt og håndteringen av atomhendelser krever fagkompetanse fra mange miljøer og sektorer. Alvorlige atomhendelser vil også kreve internasjonal koordinering av håndteringen.

Norsk atomberedskap er organisert for å sikre god krisehåndtering og å ha et tydelig delegert ansvar for planlegging og oppbygging av kompetanse og varslingssystemer i det løpende beredskapsarbeidet. Organiseringen har blitt videreutviklet basert på erfaringer fra atomhendelser og vurderinger som har blitt gjort i beredskapsarbeidet. Den er i dag forankret i kongelig resolusjon av 23. august 2013 «*Atomberedskap – sentral og regional organisering*» og lov av 12. mai 2000 nr. 36 om strålevern og bruk av stråling (strålevernloven).

Atomberedskapsorganisasjonen

Atomberedskapsorganisasjonen består av Kriseutvalget for atomberedskap, Kriseutvalgets rådgivere, Kriseutvalgets sekretariat samt fylkesmennene og Sysselmannen på Svalbard som Kriseutvalgets regionale ledd. Den er opprettet for å stille ekspertise til rådighet for å håndtere atomhendelser og for å sørge for hurtig iverksettelse av tiltak for å beskytte liv, helse, miljø og andre viktige samfunnsinteresser.

Atomhendelser omfatter både ulykker og hendelser som følge av tilsiktede handlinger i

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ISSN 0806-895x (trykt utg.) · ISSN 1891-5191 (online) 4. mars 2014

Scenario 1:
Large airborne release from a foreign site

Scenario 2:
Airborne release from a domestic site

Scenario 1:
Local event at a mobile source

Scenario 4:
Local event developing over time

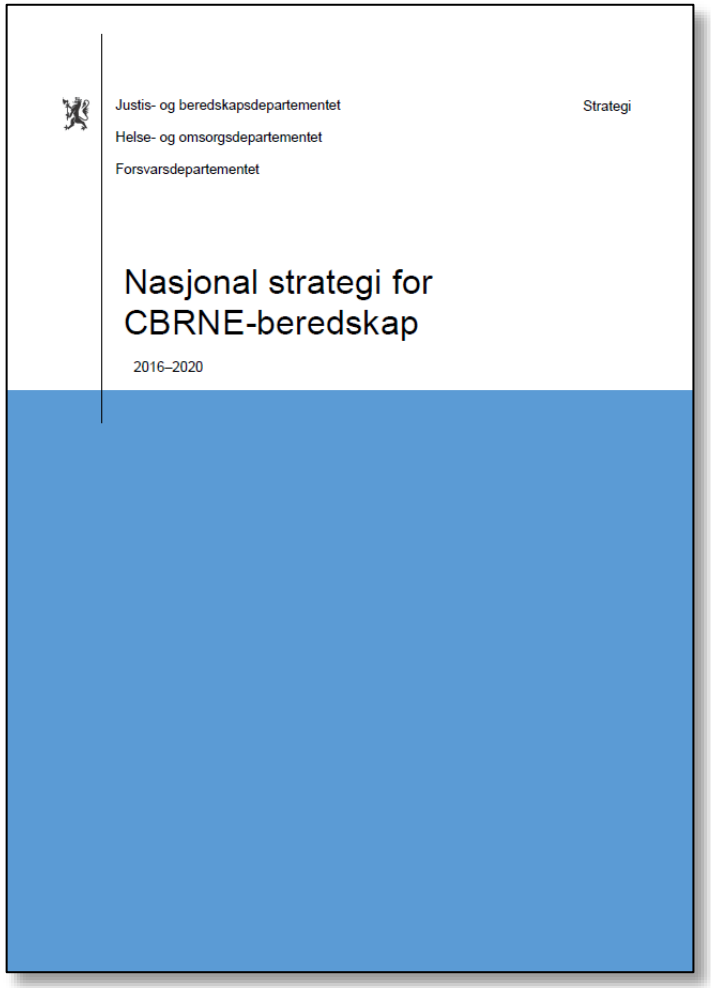
Scenario 5:
Marine release, and/or fear of contamination

Scenario 6:
Severe event abroad without any direct consequences for Norway

Need for a new, seventh scenario

- National Strategy on CBRNE emergency preparedness (2016-2020)
  - Ministry of Justice and Public Security
  - Ministry of Health and Care Services
  - Ministry of Defence

- The Crisis Committee was given the task of extending the existing scenarios with a scenario on use of a nuclear weapons close to or on Norwegian territory, and to work out relevant protective measures in such an event



Source: The Norwegian Government (regjeringen.no)

Working group

- Norwegian Radiation and Nuclear Safety Authority (DSA) (leader)
- Health directorate
- Norwegian Directorate for Civil Protection (DSB)
- Norwegian Armed Forces (rep. by the CBRN & EP School)

With input from:

- Norwegian Intelligence Service
- Norwegian Police Security Service
- Norwegian Defence Research Establishment (FFI)
- Others

Project products

Part 1 – Scenario description (due to be finalized by the end of 2021)

→ Restricted technical document

→ Publicly available scenario summary

Part 2 – Protective measures (due in 2022)

→ Publicly available report

Some framework

→ Needs to be as realistic as possible

→ Needs to be meaningful as a planning scenario

Primary effects

- Fireball (several million deg. hot – mushroom cloud)
- Release of enormous amounts of energy
  - Ca. 50 % overpressure and shock wave
  - Ca. 35 % thermal radiation (heat)
  - Ca. 15 % ionising radiation (initial radiation and radioactive fallout)
- Electromagnetic pulse (EMP)
- Bright light flash, may cause temporary blindness

Photo: Federal Government of the United States

Secondary effects

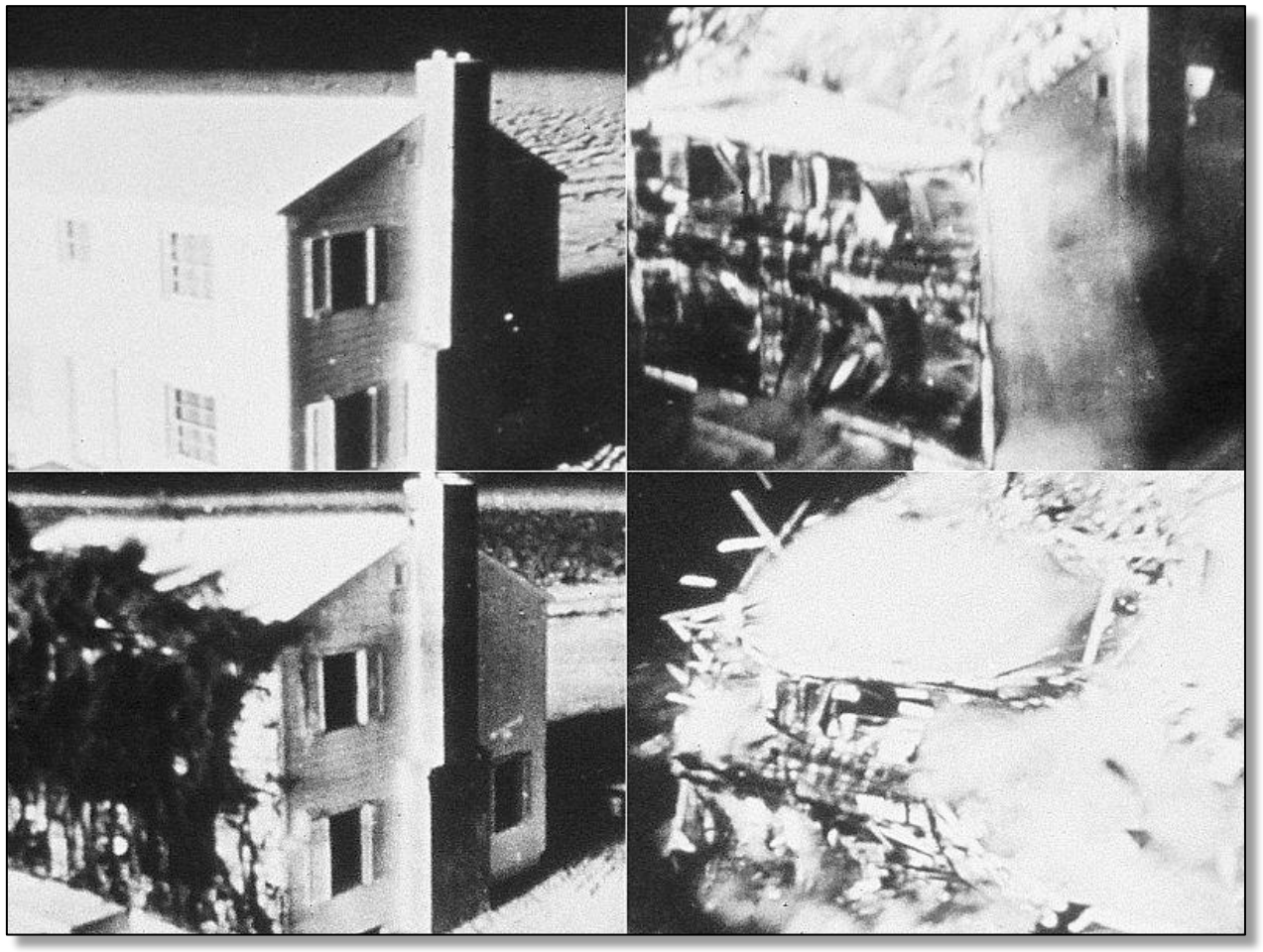


Photo: Federal Government of the United States

- → Fire storms
- → Building collapse
- → Injuries due to glass from shattered windows, splints etc.
- → Loss of critical infrastructure, essential public emergency services, food and water supply etc.
- → Homelessness etc.

Long-term effects

→ Long-term health effects

→ Radiological effects from nuclear fallout

→ Societal effects

Some topics for discussion

- → State actor vs. non-state actor
- → One single detonation vs. multiple detonations (nuclear exchange)
- → Is there a need to consider detonations outside the border?
- → Is there a need to consider the international security situation in assessing the consequences and protective measures?

Likelihood of use of nuclear weapons

- → Nuclear war (exchange of nuclear weapons)
  - → «Mutually assured destruction»
  - → Global or regional nuclear conflicts
- → Limited use of nuclear weapons during a conflict
  - → Incl. use of a single weapon
  - → The concept of «escalate to de-escalate»
- → Use of an improvised/primitive nuclear weapon

On the probability of the scenario, DSA's choice of words in the publicated report of 2018 was

«Not unthinkable»

Two sub-scenarios

Scenario A: Non-strategic use of a nuclear weapon against a target outside a Norwegian city

Illustrations: Tove Holmøy/Tegneglede

Scenario B: Strategic use of a nuclear weapon against a major Norwegian city

Calculations

- General description of detonations of weapons with different yields (1 kt, 10 kt, 100 kt and 1 Mt) at different heights
- Calculations done at different sites to get an understanding of the range of consequences
- Wind and weather data provided by the Norwegian Meteorological Institute
- Demographic data provided by Statistics Norway
- Calculations primarily done by the Norwegian Defence Research Establishment (FFI), but also by DSA using HPAC, Hotspot, Nukemap and others
- Plan to use ARGOS decision support tool for dispersion modelling

Scenario A: Non-strategic use of nuclear weapon against a target outside a Norwegian city

→ 1 kt detonation at ground level and 100 m height

→ Considers most probable weather and worst case weather

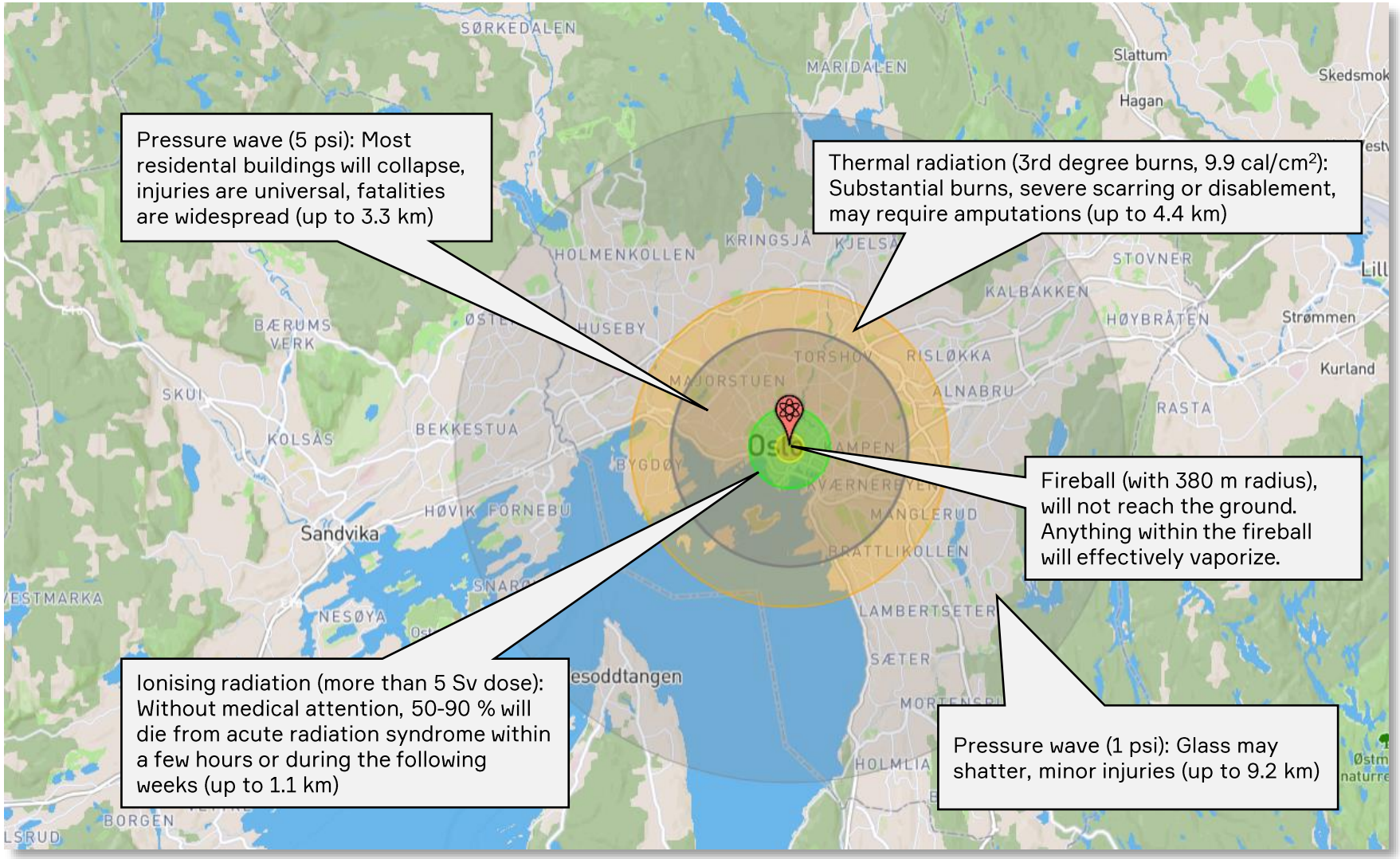
Illustration: Tove Holmøy/Tegneglede

Scenario B: Attack against a major Norwegian city

Illustration: Tove Holmøy/Tegneglede

- Calculations primarily done using Nukemap by Alex Wellerstein
- Weapons effects categorized in five categories based on severity
- Three different detonations have been studied:
  - 10 kt at ground level
  - 100 kt at 850 m height
  - 1 Mt at 2500 m height
- Dispersion modelling of the nuclear fallout

Example I



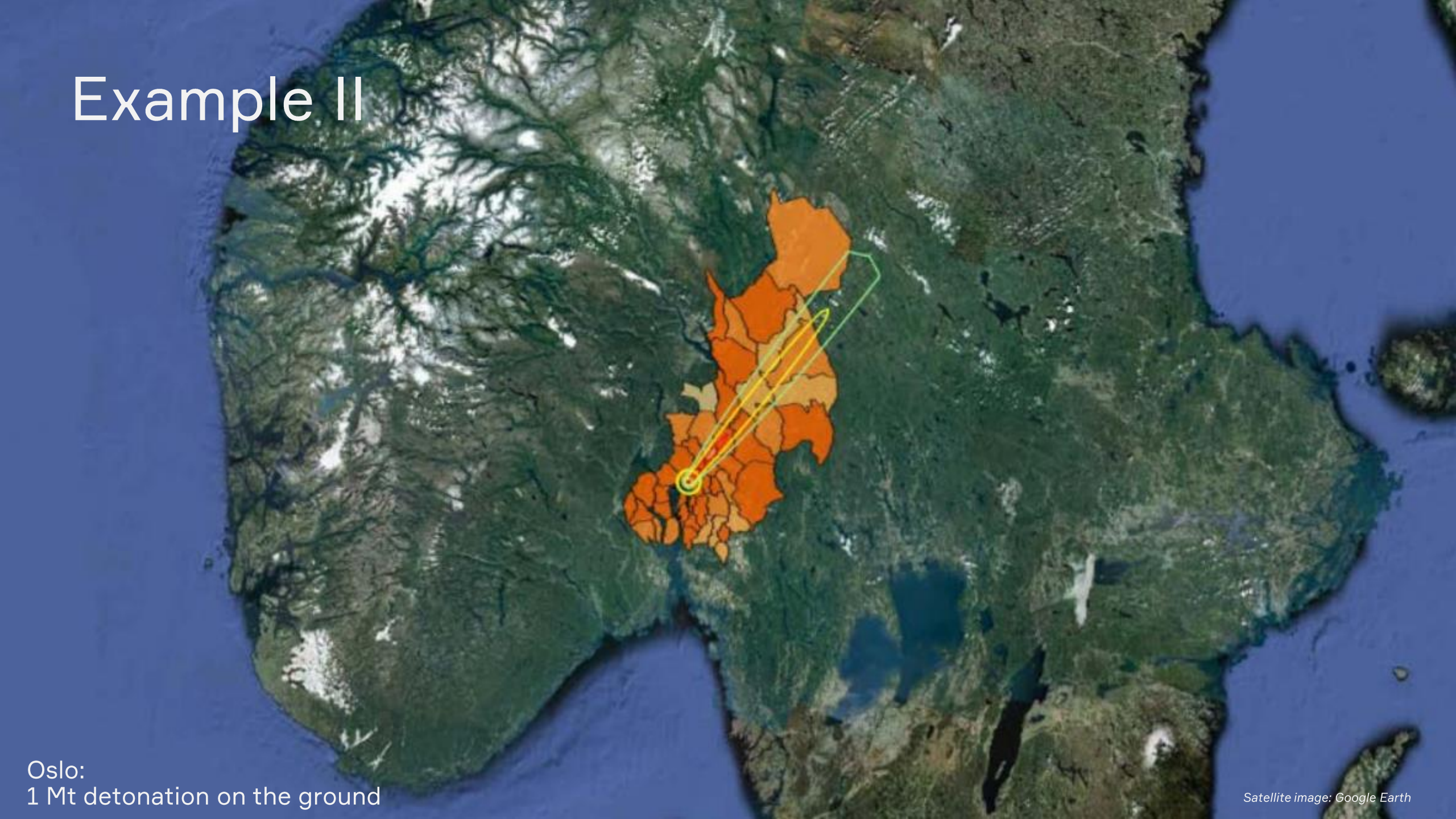
Oslo:
100 kt at 1,450 m altitude

Approx. 104,000 fatalities

Approx. 190,000 injuries

Source: NUKEMAP (nuclearsecurity,com/nukemap)

Example II



Oslo:
1 Mt detonation on the ground

Satellite image: Google Earth