Norwegian land-use planning and guidelines for QRA

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Budapest

Vibeke Henden Nilssen and
Jorunn Johannessen

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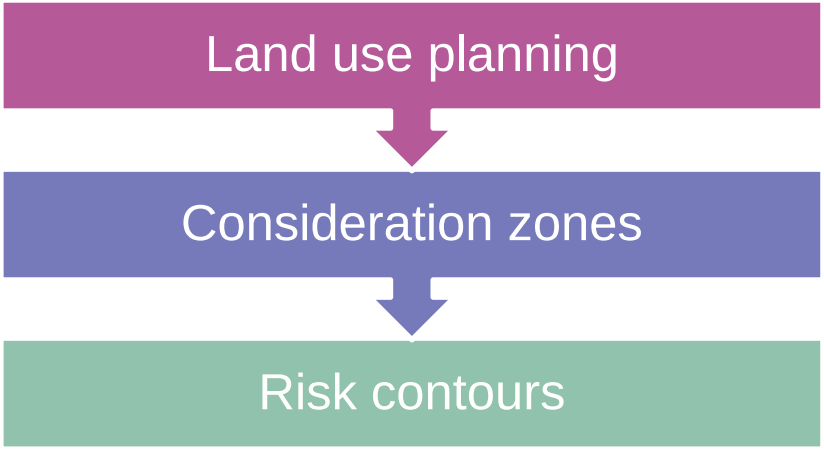
Introduction

Land use planning is the primary cause for the guidance on QRA and how to calculate risk contours.



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Land use planning, Art 13 and Art 15

- Have been working quite intensively with LUP system last years – before and after Seveso III
- No new national regulations – just guidelines - based on already existing regulation in the Planning and Building Act
- System of establishing Consideration zones in the municipal and the local plans based on the establishments risk

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Consideration zones

- DSB had already introduced a system for zoning.
- The zones should be based on individual risk contours.
- Criterias for acceptable risk to the different zones were given.

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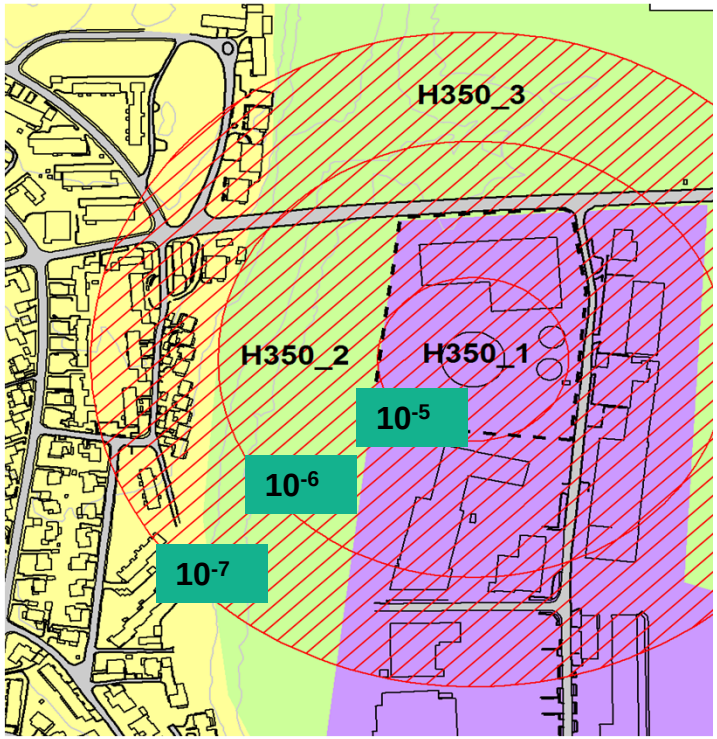
Consideration zones

- **Inner zone:** the major hazard site own area – only short term passing of third party population
- **Middle Zone:** public road, railway, quay, etc. and regular workplaces are allowed. No housing or other kinds of overnight stay.
- **Outer Zone:** Residential areas and areas for ordinary public use (shops, smaller hotels etc.)
- **Outside Outer Zone:** Schools, kindergartens, hospitals, nursing homes, large malls, hotels, concert and sport arenas.



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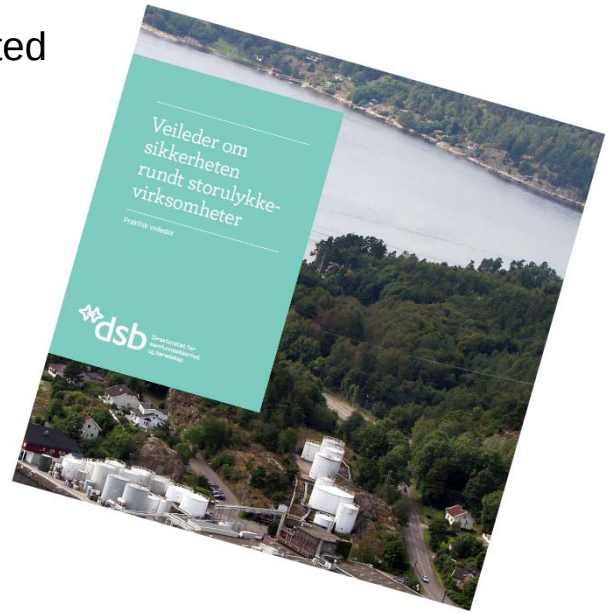
Guidance for local authoritieson the LUP around Seveso sites

Three types of issues or processes are particularly highlighted in the guidelines:

1. Maintain proper distance to the population around existing Seveso sites
2. New developments (changes) in the surroundings of major hazard sites
3. The establishment of new sites and changes in major hazard sites.



https://www.dsb.no/veiledere-handboker-og-informasjonsmateriell/veileder-om-sikkerheten-rundt-storulykkevirksomheter/

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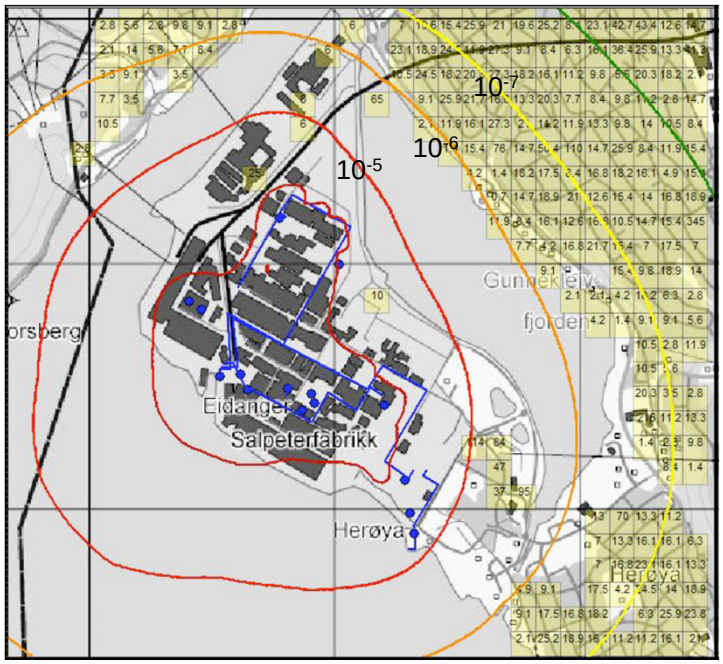
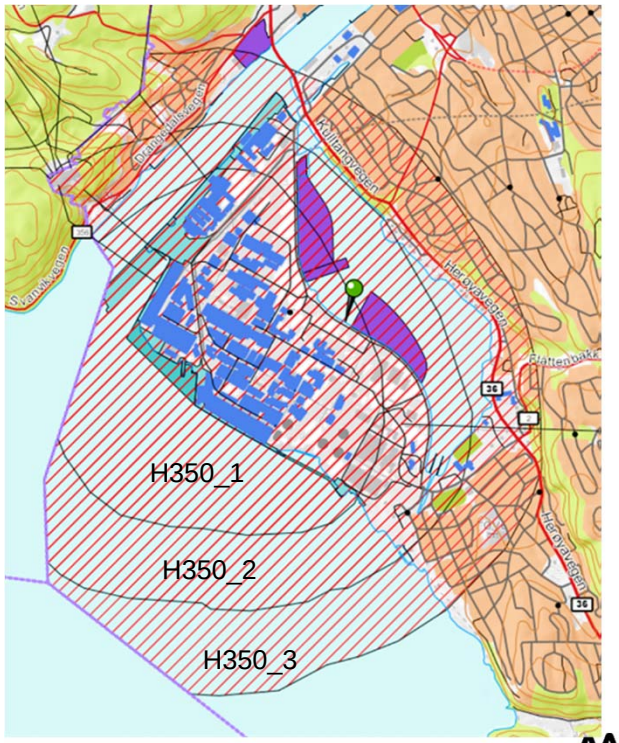
Going from risk contours to consideration zones





Municipality plan of Porsgrunn - Herøya Industrial park

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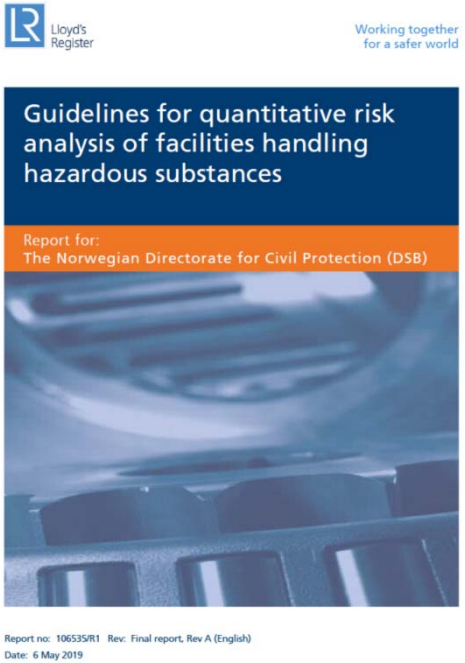
Guidelines on quantitative risk analyses for facilities handling hazardous substances

- Gives the basis for the consideration zones
- Directions (primary) on individual risk contours
- The main objectives of the guidelines are to reduce casual variation in the results (contours) due to data basis and methods
- Guidelines developed by Lloyds Register for DSB
- In Norwegian and English

https://www.dsb.no/rapporter-og-evalueringer/guidelines-for-quantitative-risk-analysis-of-facilities-handling-hazardous-substances/



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Jorunn fra her

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Preparation of the guidelines

- Loyd's Register wrote the guidelines on behalf of DSB.
- Close collaboration between Loyd's and DSB in the preparation of the guidelines.
- Workshop with broad participation from consultants, software developer, companies and authorities.
- Consultation (written) with the participants before the guidelines were published.

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Main content:

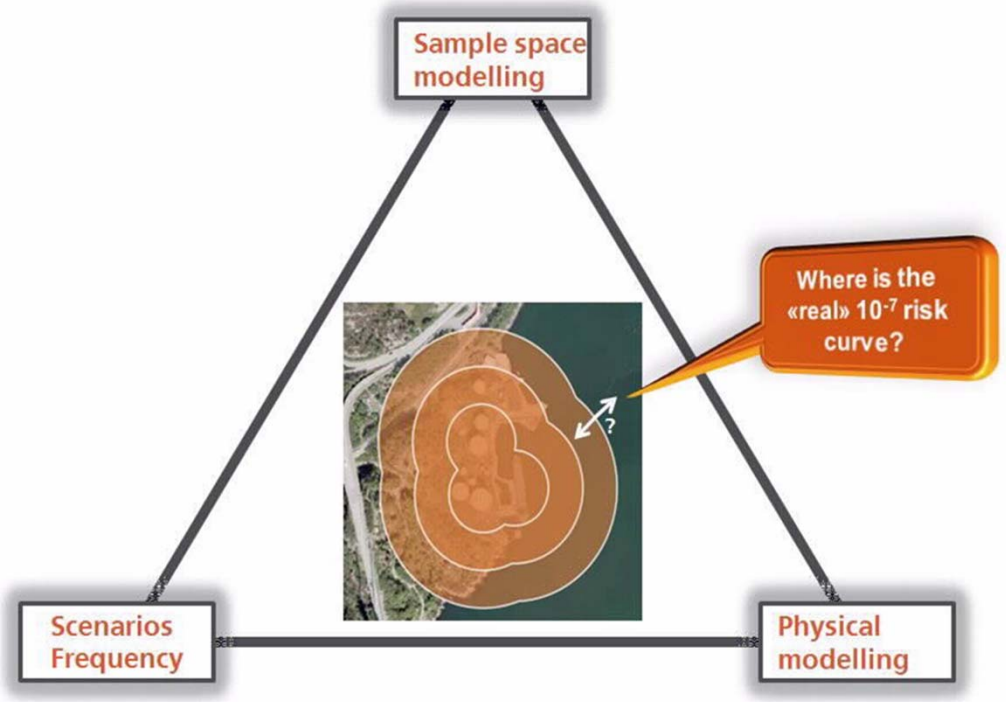
The guidelines are based on the Norwegian standard NS 5814.

They mainly focus on the factors that affect the risk calculation the most:

1. Scenarios – frequency

1. Modelling the physics

2. Predicting the relevant and most contributing scenarios



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1) Scenarios - frequency

- The selection of frequency for the top events will affect the calculated risk contours to a great extent.
- The leak frequencies used must be representative for the analysed plant.
- The guideline presents the most common models for leakage rates (RIVM, HSE, OGP, PLOFAM) and explains how they differ, and in what context they can and should be applied.
- The selection of ignition probability will also affect the results to a large extent. Three different ignition models are discussed.
- One criteria is given; If the gas cloud reaches areas without ignition control, the likelihood of ignition shall be set to 1.

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2) Modelling the physics

- How different scenarios should be modelled
  - Different types of fires, explosions, gas dispersion and BLEVE
- How different conditions related to the top event/loss of containment affect the calculation.
  - Fluid specification (leak rate, phase, thermodynamic state), surrounding conditions, near field/far field conditions etc.
- The scope of empirical and numerical modeling tools, and the limitations and uncertainties associated with each type of simulation tool.

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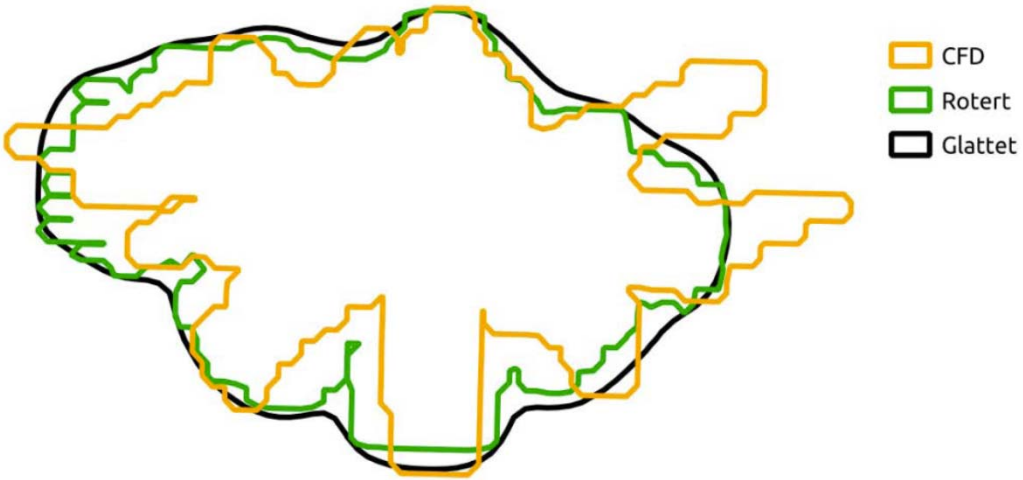
3) Sample space modelling

- Be sure to cover enough scenarios (describe all possible end-events (outcomes) a top event may have).
- The number of scenarios you simulate are of great importance to the risk contours.
- The guideline show the effect on the results when using too few scenarios. There is also given guidance on how to compensate for this with different mathematical approaches.



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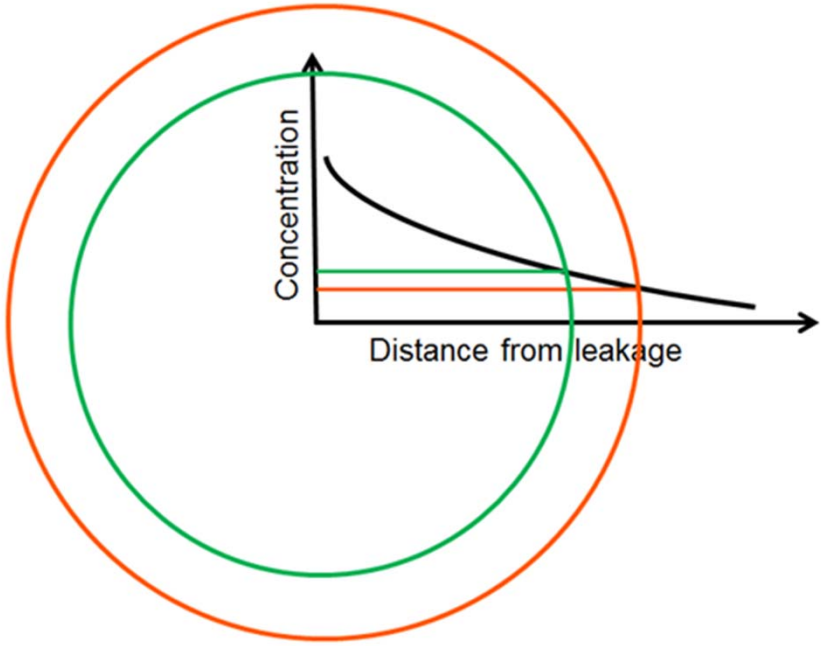
Vulnerability criteria

- The threshold values (exposure level) that are set for fatality will to a large extend affect the extend of the risk contours.
- The guidelines provide recommendations for the threshold values that should be used for;
  - thermal effects
  - explosion effects
  - toxic effects



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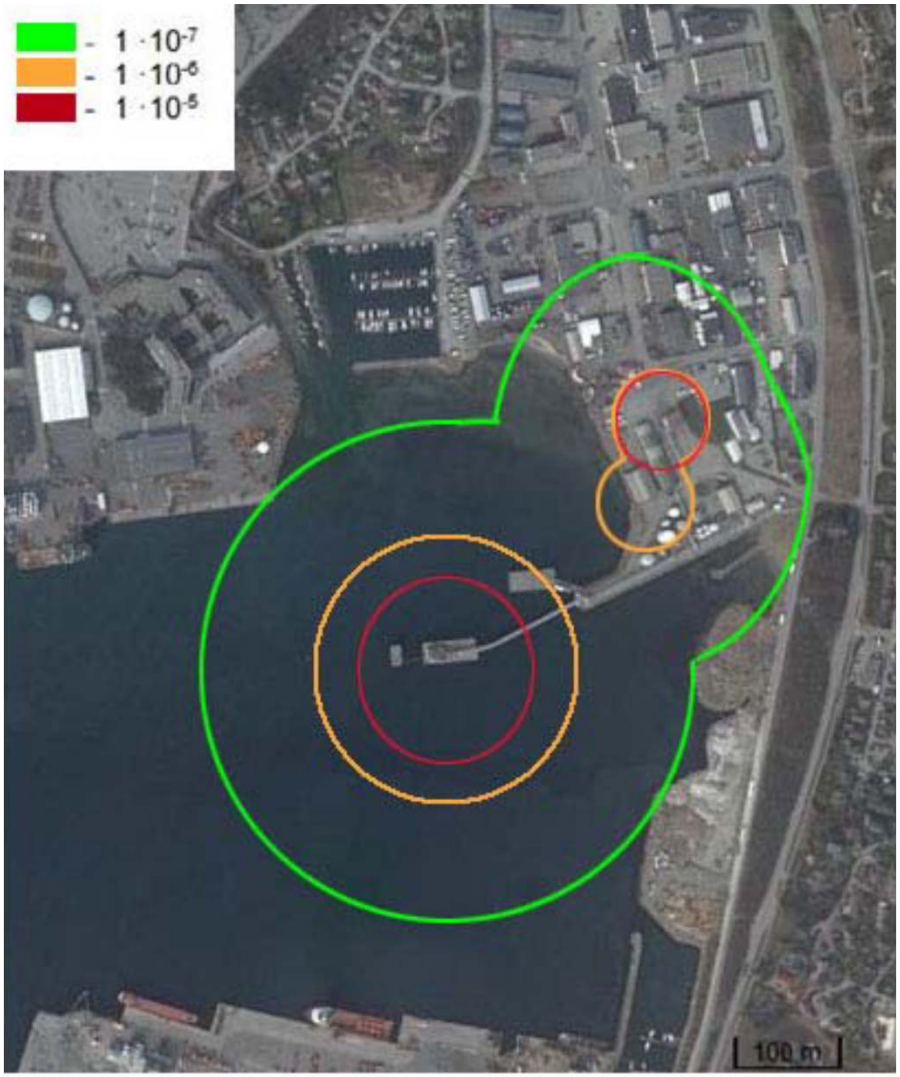

Developing the guidelines further

New workshop/meeting in November this year to get input and suggestions for improving the guidelines.

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