Centre of Environmental Research

Waste Management, Circular Economy and Environmental Security

WP 3.A Risk Assessment of Serious Accidents

Environment - Environment for Life
12. – 14. 9. 2022

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Project SS02030008 Centre of Environmental Research: Waste Management, Circular Economy and Environmental Security is co-financed with the state support of the Technology Agency of the Czech Republic as part of the Environment for Life Program.

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Use of Software Tools Newly Developed and Provided by the European Commission

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Aim of the Seveso III

Directive 2012/18/EU = protecting the **environment**, **health**, and our **economy**

Article 1

This Directive is aimed at the prevention of major accidents which involve dangerous substances, and the limitation of their consequences for man and the environment, to ensure high levels of protection throughout the Community consistently and effectively.

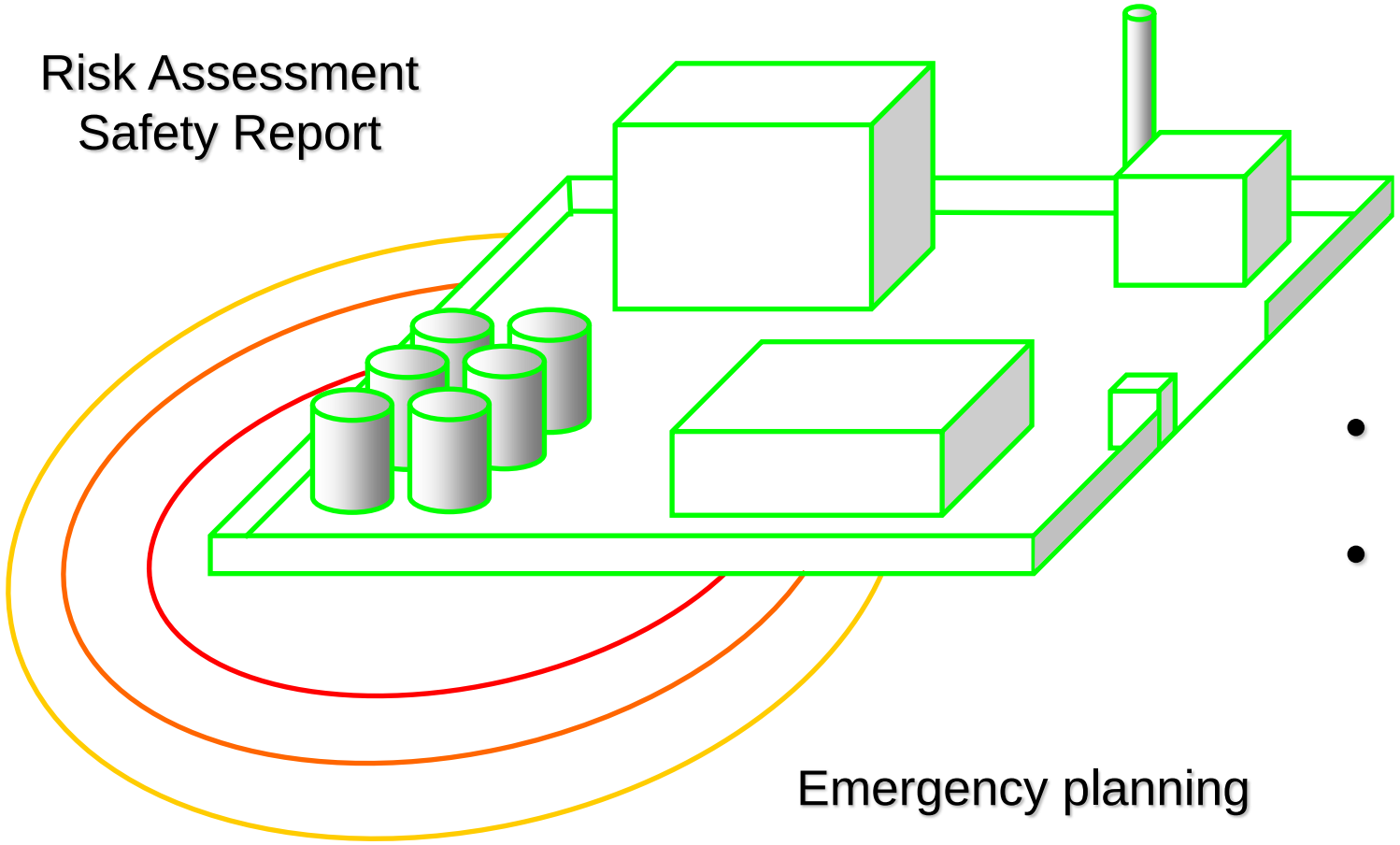
Fulfilment of the aim…

OECD Project on the Use of Safety Reports or Equivalent Documents in the Control of Major Accident Hazards. Report findings.

HSE, U.K.

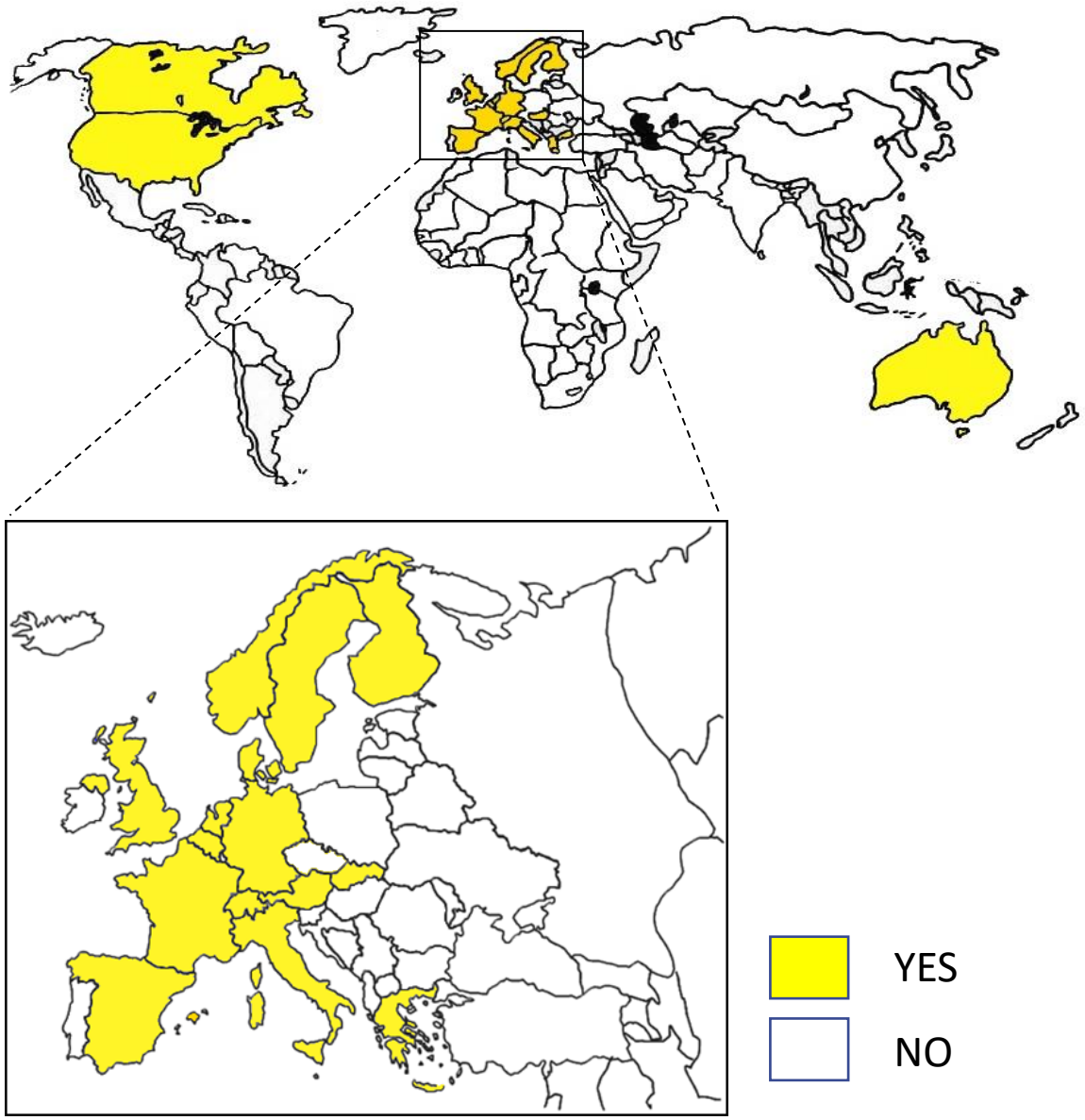
- OECD members operate very similar systems
- Safety documents are widely used
- Purposes are broadly similar
- Documents are assessed in detail by regulators
- Subsequent intervention plans are informed
- Basis of operators' demonstrations that all necessary measures have been taken

Why develop and provide SW tools?

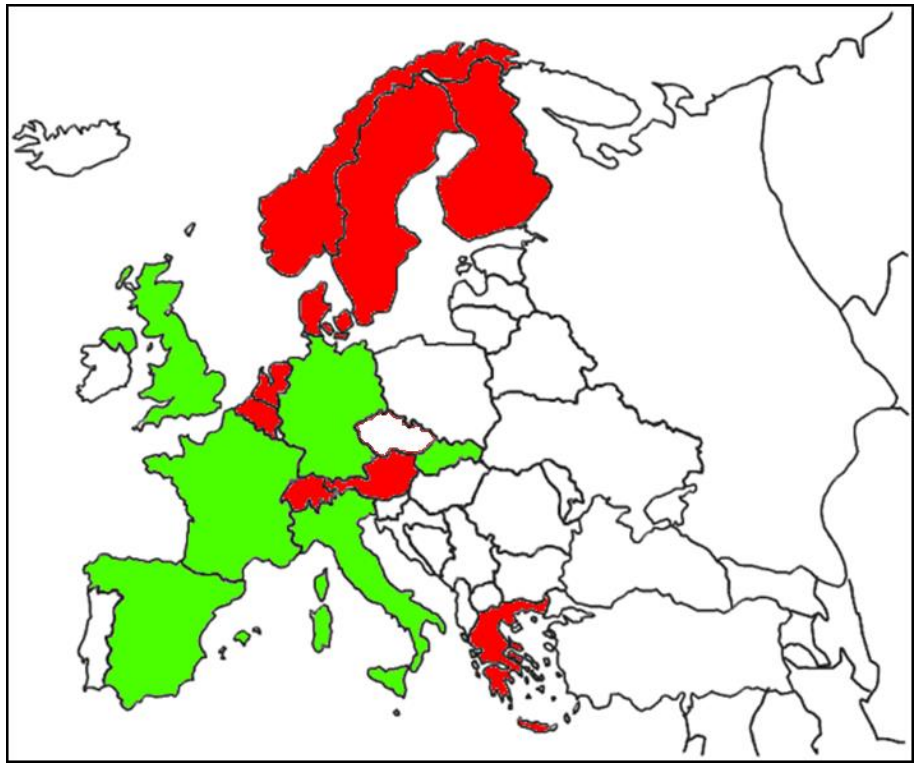


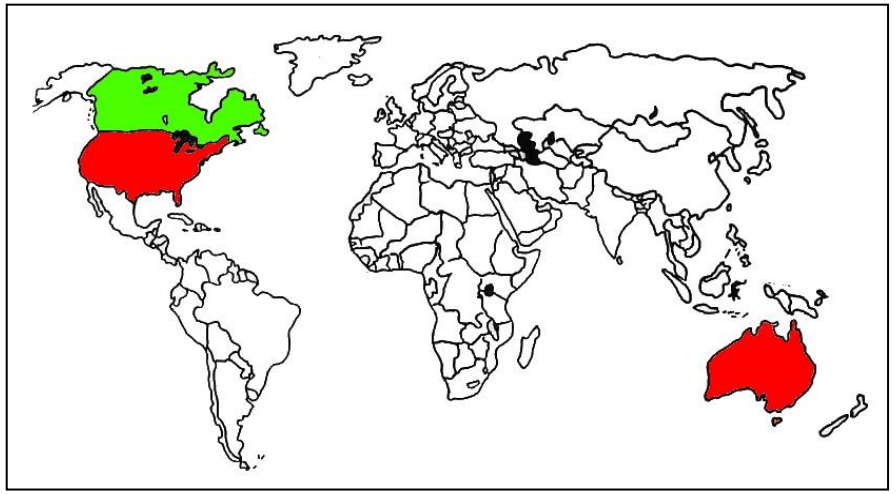
- ***Directive 2012/18/EU***
- ***OECD Project***

Commonwealth of Australia
Kingdom of Belgium
Czech Republic
Kingdom of Denmark
Republic of Finland
French Republic
Italian Republic
Canada
Kingdom of the Netherlands
Kingdom of Norway
Republic of Austria
Hellenic Republic
Slovak Republic
United Kingdom
United States of America
Federal Republic of Germany
Kingdom of Spain
Kingdom of Sweden
Swiss Confederation



Currently available software tools





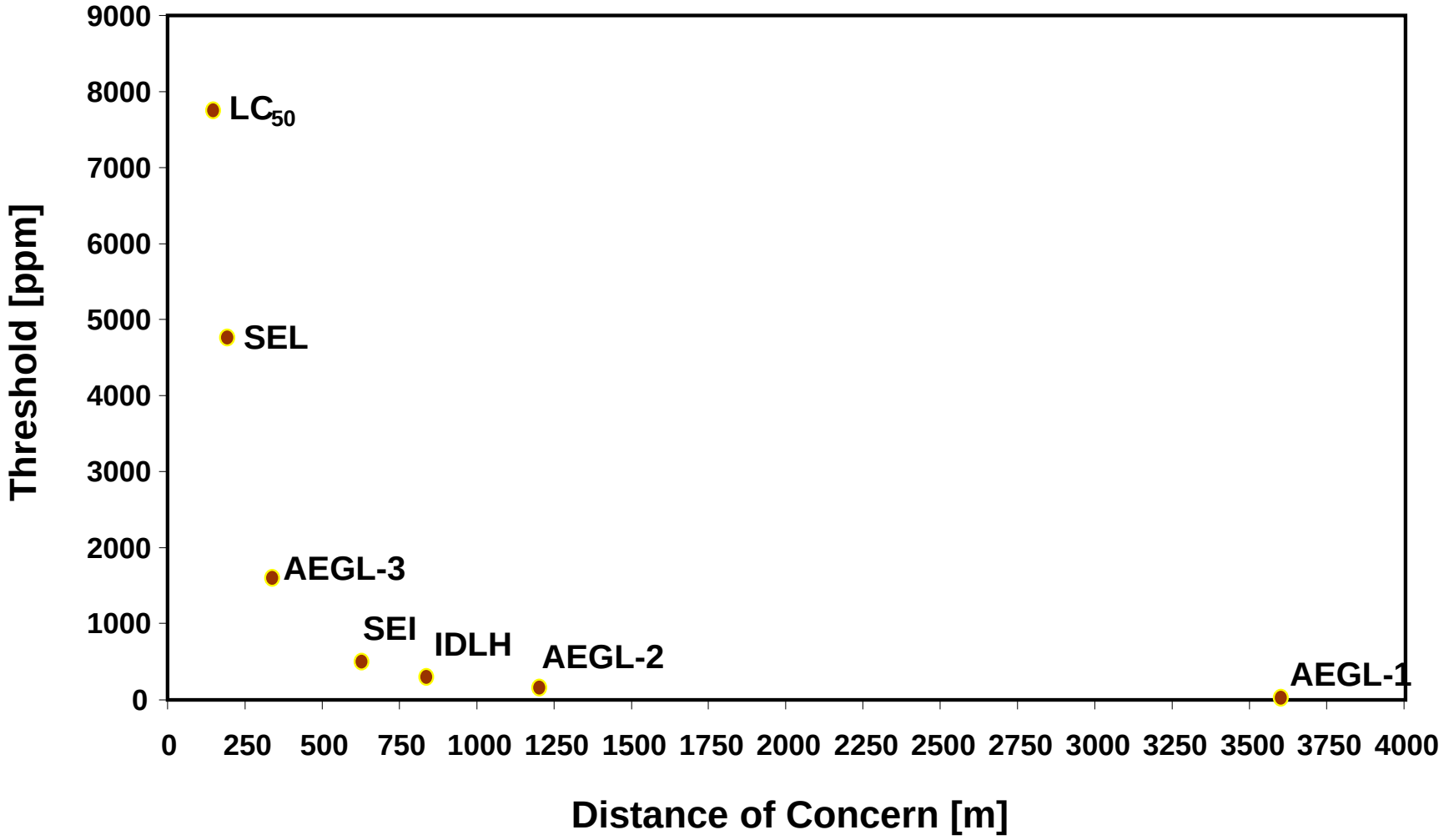
	Deterministic ("consequence - based") approach	**Probabilistic ("risk - based") approach**
Decision criteria	Consequences (harm, damage, etc. in absolute figures)	Risk of harm, damage, etc.
Initiating Events	Pre-selected events; Events beyond this closed list are not considered	Seeks to consider all potentially relevant events within the procedure
Failure Description	Single failure postulated	Multiple failures considered
Operator behaviour	Qualitative case-by-case consideration	Diagnosis/execution errors considered numerically
Analysis characterization	"Conservative" (precautionary principle)	Seeks to be as realistic as possible
Account of uncertainty	Fixed "Safety Factor" (discrete value)	Numerical evaluation of risk (Distribution of values)

Currently available model scenarios

- Scenario definition. Deterministic vs. Probabilistic.
  - No clear relation between efforts on safety and risk generated
  - Lack of data to define LOC frequency

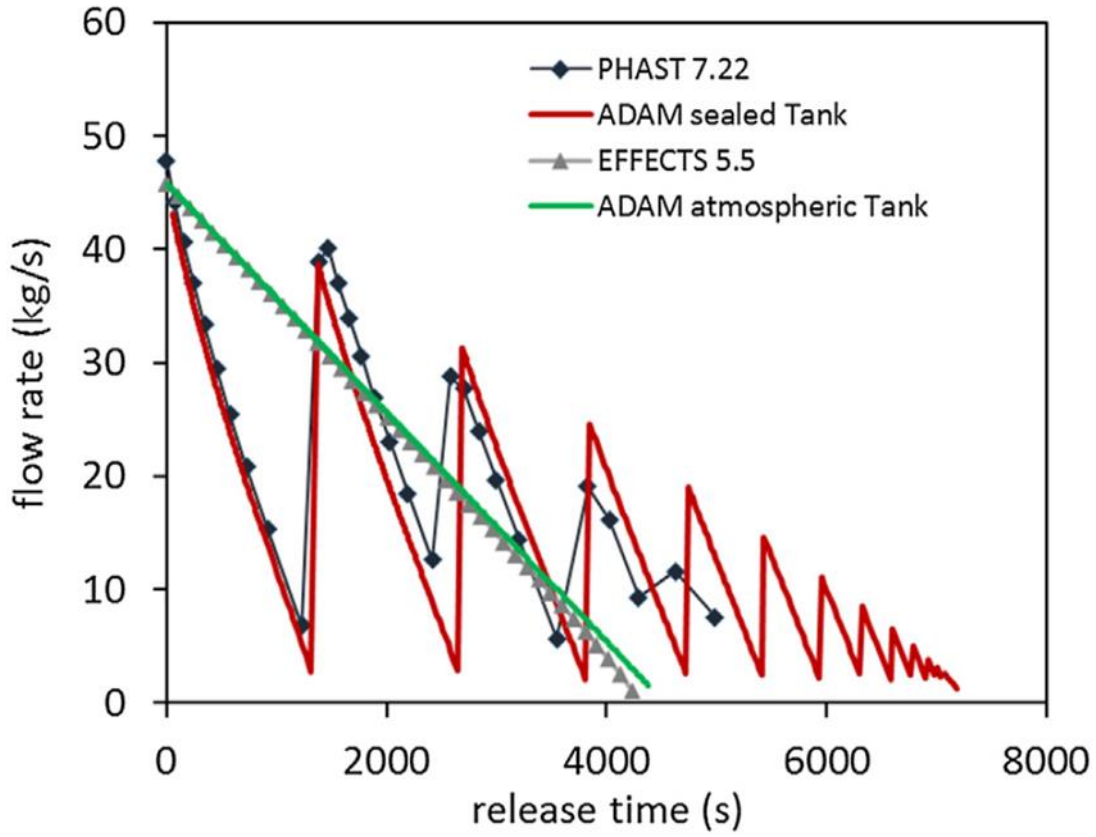
- Directive requirements not fully developed.
  - High population density vs. Land use planning
  - Generation of substances

Currently available model thresholds



Scientific evaluation of performance

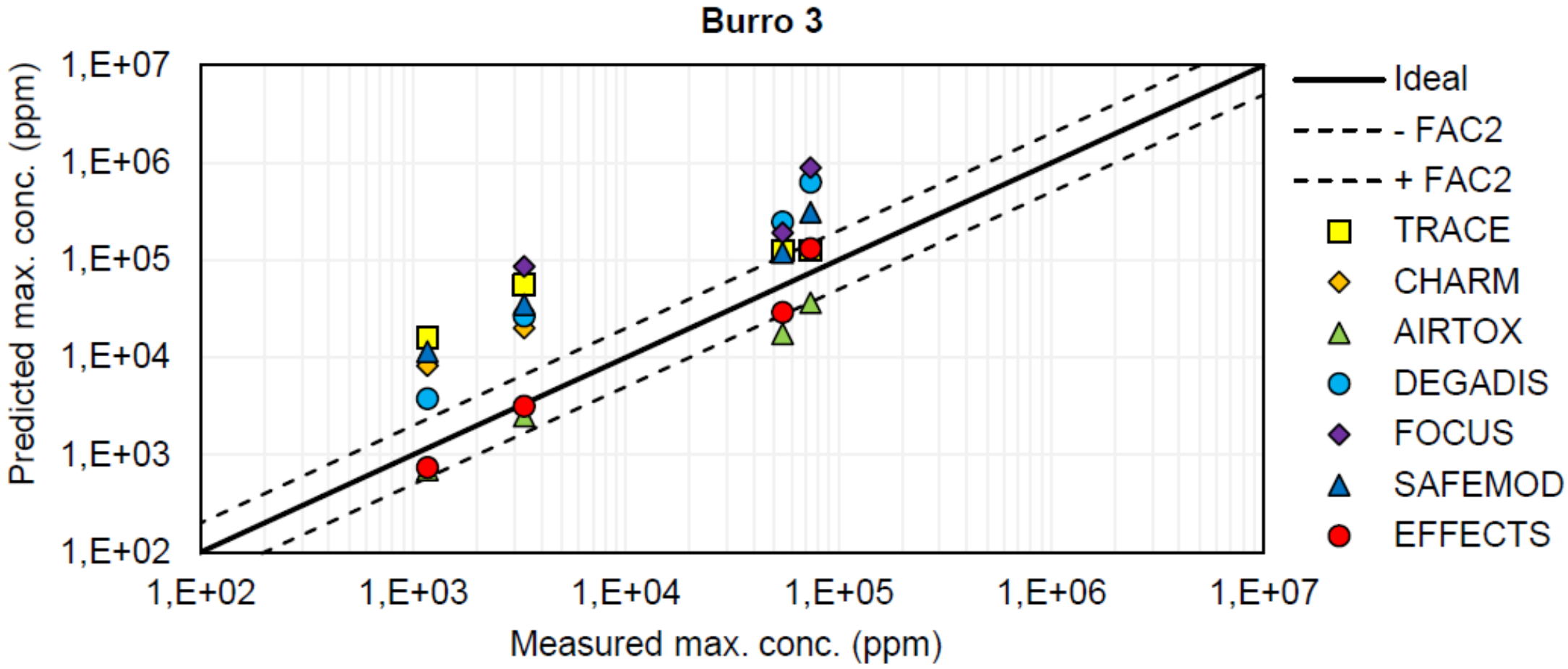
Input Parameter	*Value*
Substance	Benzene
Storage temperature	290 K
Storage overpressure	0 (atmospheric)
Tank	Vertical 10m height, 5m diameter, 70% filling (substance volume 137.45 m^3)
Pipe	Stainless steel (roughness 0.045mm, inner diameter 101.6mm mm)
Pipe length at rupture	100m
Release height from bottom	1 m
Losses in Pipe	None



Reliable or practical?
Consistent or real?
General or individual?

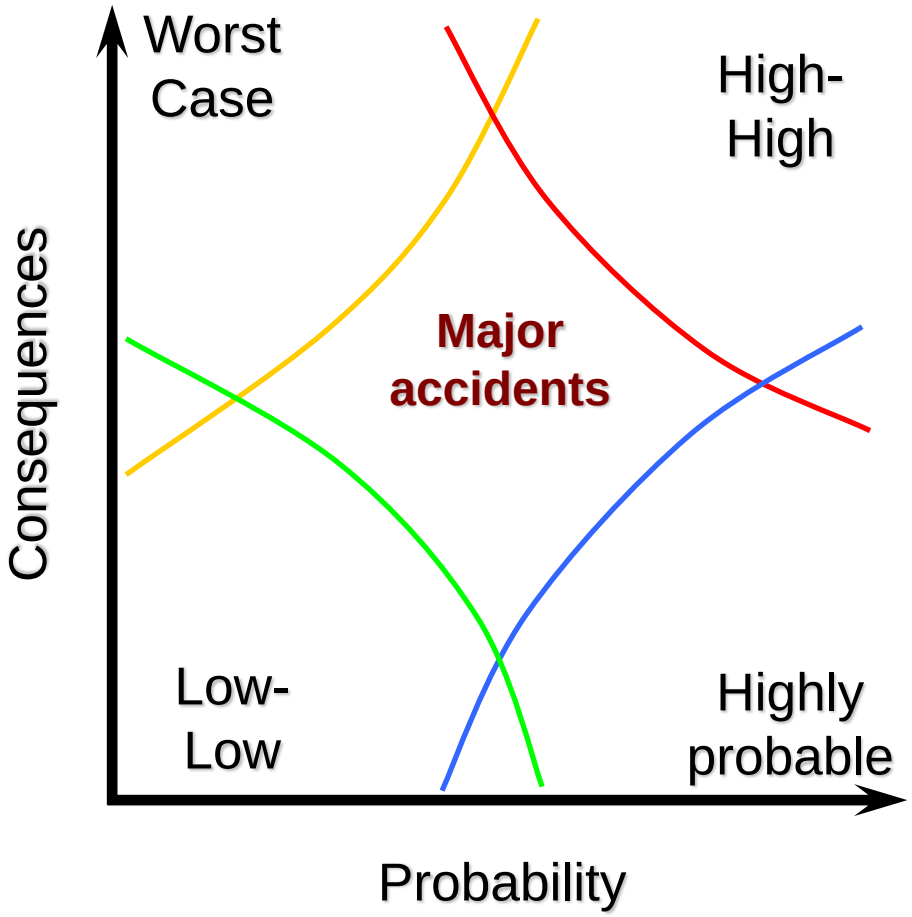

JACK RABBIT II 2016
TRIAL 8
INITIAL RELEASE
Aerial View- Plume Behavior
0 Degrees Up
UVU EMERGENCY SERVICES
UTAH VALLEY UNIVERSITY

Predicted against measured concentration



Conclusion

- reliability vs practicability
- consistenci vs reality
- general vs individual
- high population density vs. LUP
- worst case vs highly probable
- low cons.+prob. vs high cons.+prob.
- lack of data to define LOC frequency
- uncertanities and validation



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INSTITUTE OF CHEMICAL PROCESS FUNDAMENTALS OF THE ASCR

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VYSOKÁ ŠKOLA CHEMICKO-TECHNOLOGICKÁ V PRAZE

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

VÚV TGM

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