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Sustainable Development of Industrial Parks

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Zoning for Land use Planning in Germany and Europe

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Dessau (FRG)*

Content (overview)

- Spatial Planning in European Union
- EU Seveso II Requirements on Land-Use-Planning
- German Policy on LUP
 - Zoning System
 - Generic Safety Distances
 - Case by Case Studies

Different Levels of Spatial Planning with Consideration to Environmental Factors



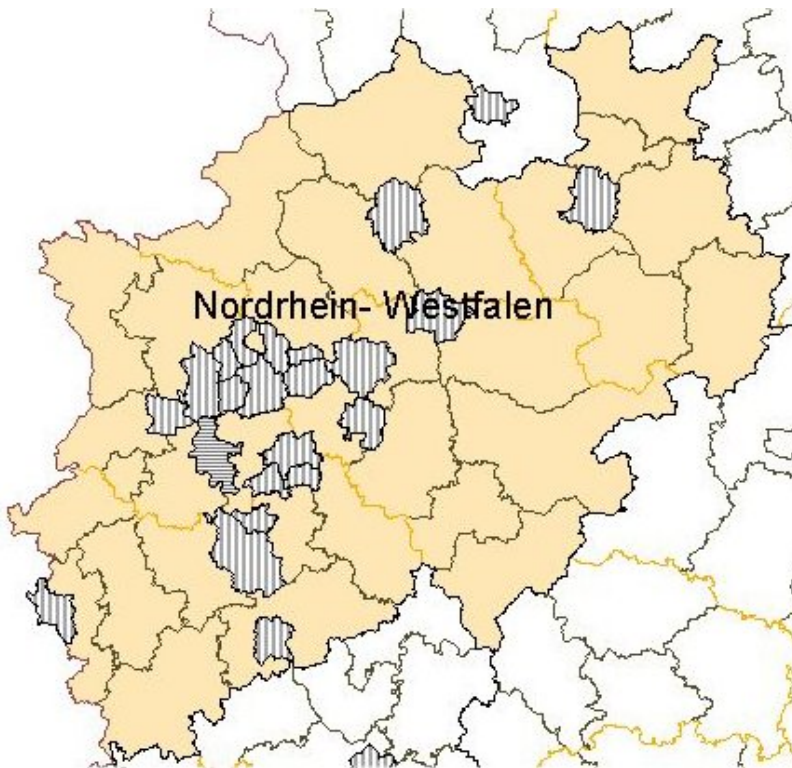
- European Community; bi-national and multinational contracts
- Development of common concepts and frameworks, programmes with effects to national planning; information exchange

Different Levels of Spatial Planning with Consideration to Environmental Factors



- Comprehensive national and regional planning
- Scale 1 : 100,000,000

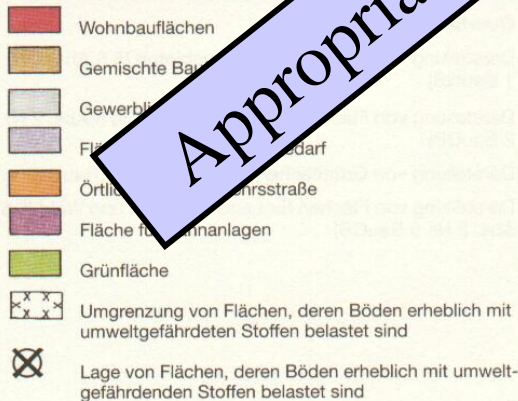
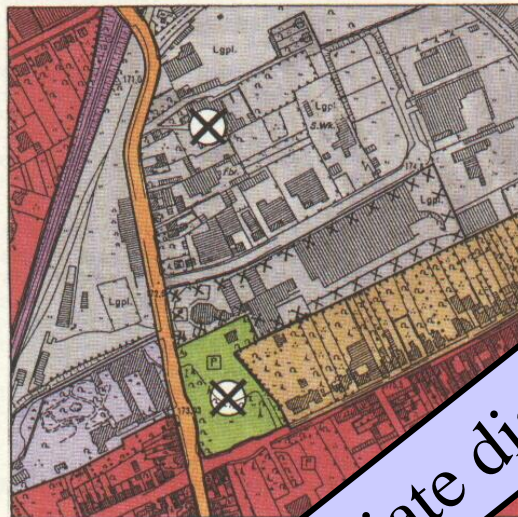
Different Levels of Spatial Planning with Consideration to Environmental Factors



- regional planning at the level of the *Länder*
- Scales:
 - 1 : 500,000
 - 1 : 200,000

Different Levels of Spatial Planning with Consideration to Environmental Factors

Darstellungsbeispiel

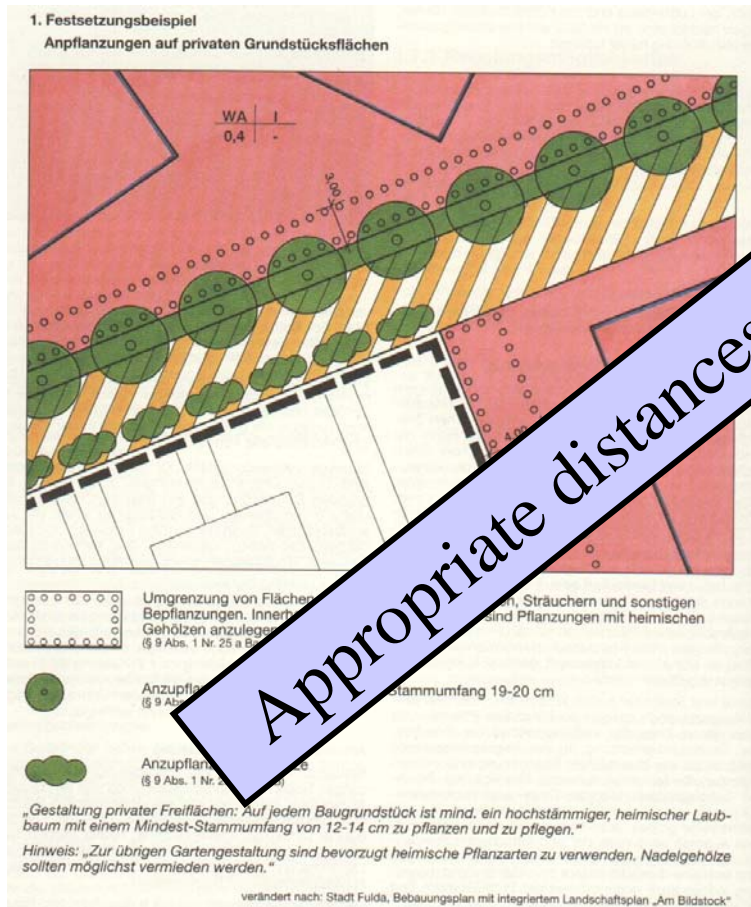


- pre-emptive land-use planning (for the territory or a local authority)

Land-use Planning

- Scales:
 - 1 : 50,000
 - 1 : 20,000
 - 1 : 10,000
 - 1 : 5,000

Different Levels of Spatial Planning with Consideration to Environmental Factors

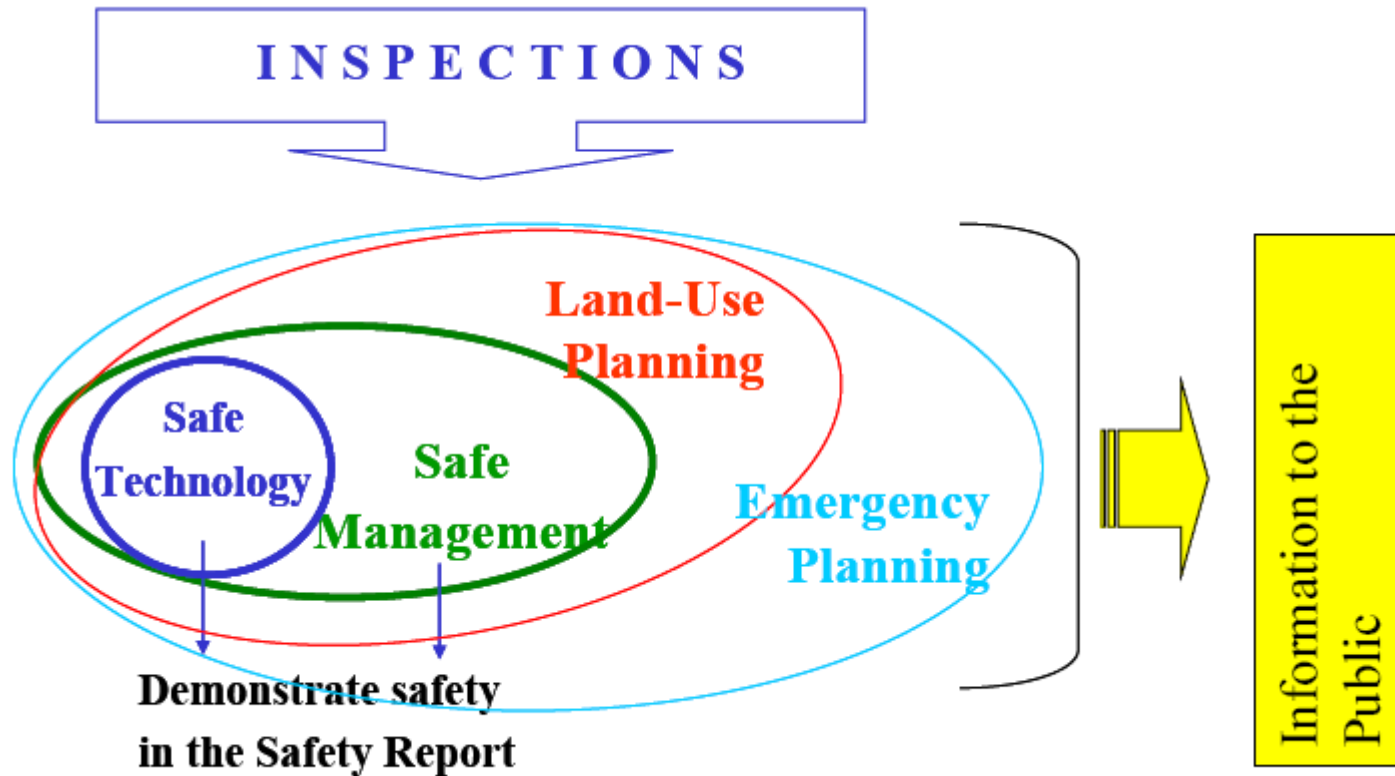


- local planning
• Regional plan
• Local development plan
- Scales:
 - 1 : 2,000
 - 1 : 1,000

Content

- Spatial Planning in European Union
- EU Seveso II Requirements on Land-Use-Planning

SEVESO Philosophy





Main Seveso II Requirements on Land-Use-Planning

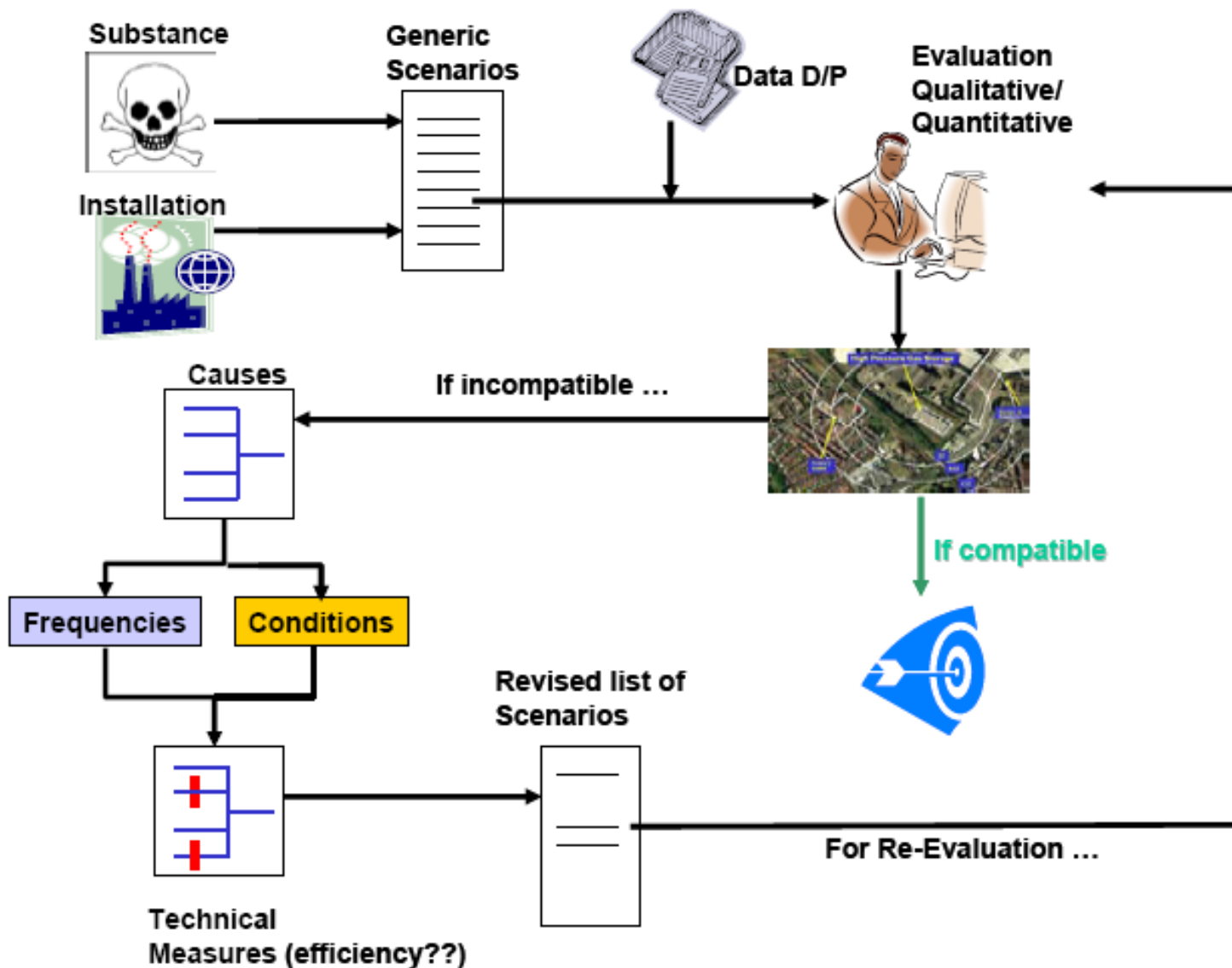
Target of Art 12 SEVESO II Directive (96/82/EC):

- Keep and maintain a sufficient Safety Distance (“appropriate distance”) between Major Accident Establishments and Residential Areas, Nature Reserves, etc.
- Effective Consultation Procedure between the involved Authorities

Guidance on Land-use planning (10/2006)

- **PART A - GENERAL ASPECTS**
 - Definitions, goals, Interpretation Art. 12
 - LUP and risk assessment
 - Best practice
 - Dealing with existing situations
 - Additional technical measures (ATM)
- **PART B - TECHNICAL ASPECTS**
 - Methods of risk assessment
 - RHAD Database
 - Selection criteria (scenarios, frequencies, endpoints)
 - Additional Technical Measures - Technical Considerations
- **PART C - ENVIRONMENTAL ASPECTS**
 - Methods for environmental assessment

European Database for LUP (RHAD)



Content

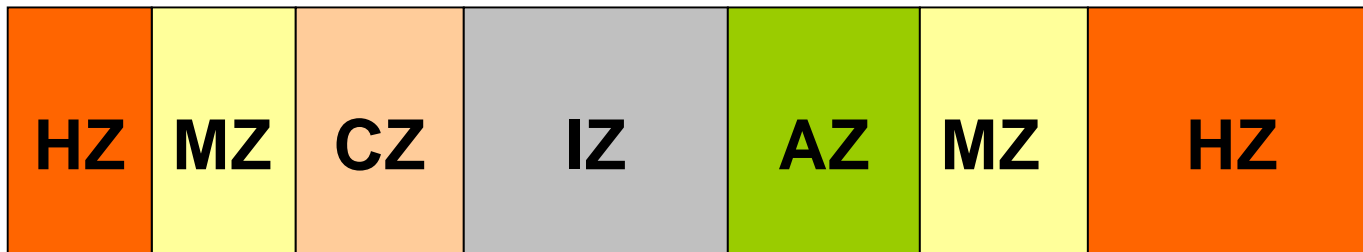
- Spatial Planning in European Union
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General Zoning According to Federal Building Law (BauGB)

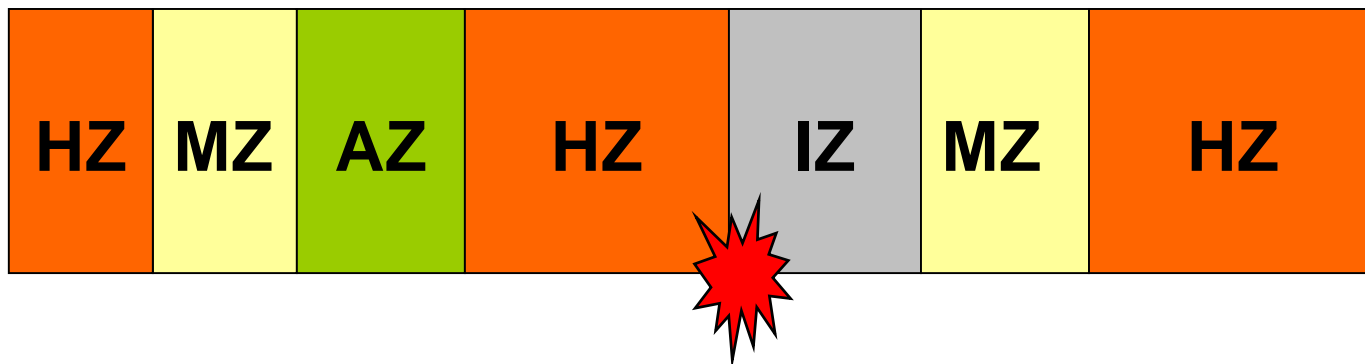
- **Industrial Zones IZ:**
 - Open for all industrial activities e.g. Chemical plants, Refineries, Larger Industrie (including **Seveso sites**), Large Volume Storage for Flammable Liquids, public utilities etc.
- **Commercial Zones CZ :**
 - Open for various commercial activities, warehouses, business- and administration buildings, sports etc.
- **Mixed Zones MZ:**
 - Residential buildings, Offices, Hotels, smaller commercial stores, social,-cultural,-church activities, health-care, garden centres, petrol stations etc.
- **Housing Zones HZ:**
 - Residential buildings, food-stores, restaurants, non disturbing commercial activities e.g. handcraft etc.
- **Agricultural Zones AZ**

Proposed and Forbidden Zoning acc. § 50 BImSchG (schematic)

Best Practice: graduated zones



Causes Problems (not allowed):



Content

- Spatial Planning in European Union
- Seveso II Requirements on Land-Use-Planning
- German Policy on LUP
 - Zoning System
 - Generic Safety Distances
 - Case by Case Studies

“Appropriate Distances”, three Cases:

A. Existing Establishments

B. New Establishments

C. Development (Change) in the

- Neighbourhood and

- Establishment

Existing Establishments & Development in Neighbourhood



- Known Substance
- Known Amount
- Known technical measures to limit consequences
- Likely Scenario
- Known Dispersion Conditions

- Threshold Concentration
- Vulnerability

New Planned Establishments

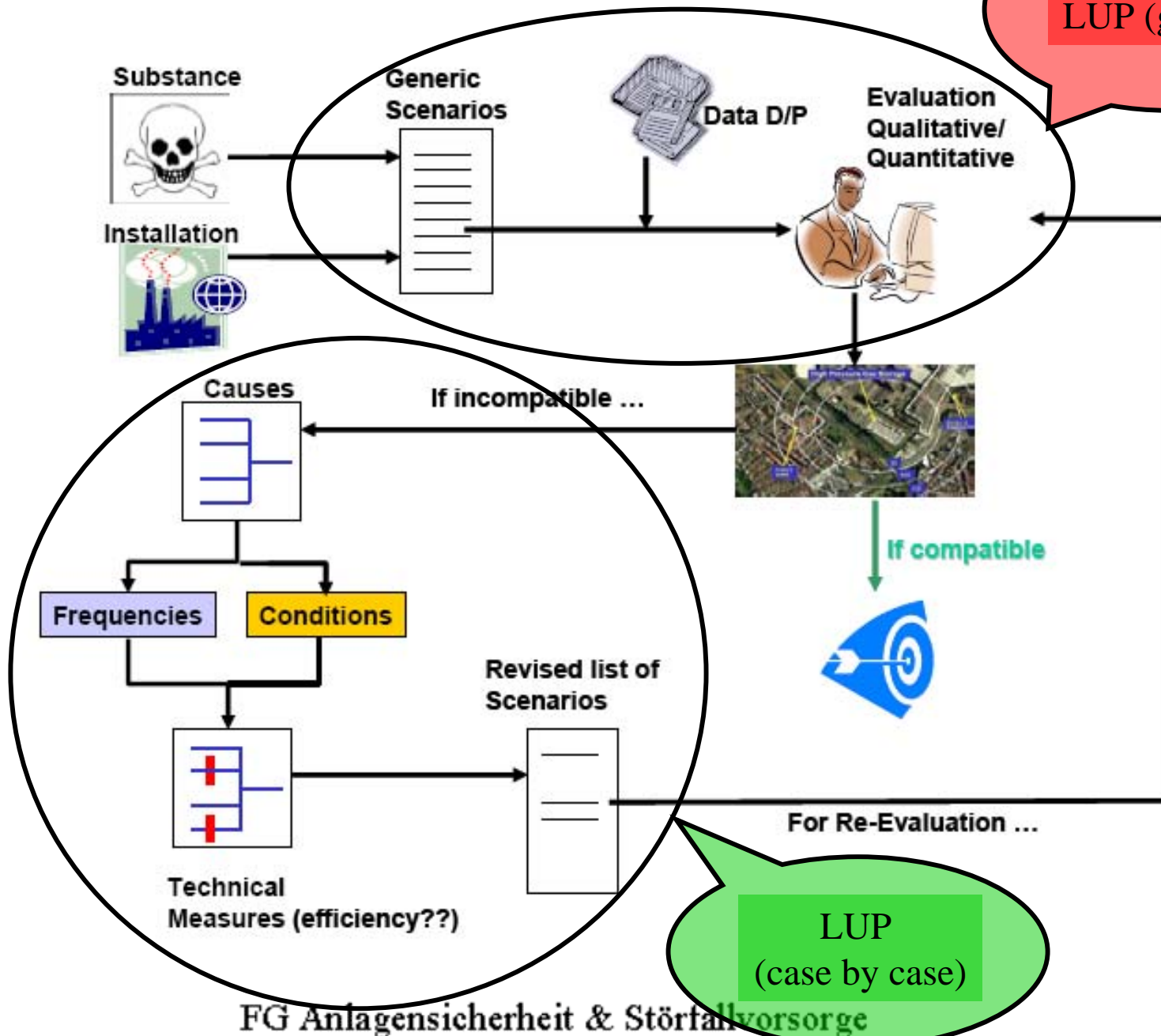


- Unknown Substance
- Unknown Amount
- Unknown technical measures to limit consequences
- Unknown Scenario
- Unknown Dispersion Conditions

- Threshold Concentration
- Vulnerability

RHAD – Concept 2006

LUP (generic)



German Guideline on LUP

SFK/TAA-GS-1 in www.kas-bmu.de

- 1 Principles of „Land-use-planning“
(Seveso Art. 12, BauGB, § 50 BImSchG)**
- 2 Scope of Regulation**
- 3 Recommendation for Generic Approach**
- 4 Recommendation for case by case
Procedure**

- Annex 1: Model calculation for typical substances, Past accident records by ZEMA
- Annex 2: Calculation basics and models
- Annex 3: Derivation of physical and toxicological endpoints
- Annex 4: Members and guests of working group

Conventions

- Calculation of generic source terms with typical substances
- Formation of distance - classes
- Calibration of used source terms with past accident recordings (ZEMA www.infosis.bam.de)
- Standard source term is a leakage from 490 mm² (DN 25)
- State of the art requirements and good safety management practice is fulfilled
- Exclusion of spontaneous vessel rupture and rupture of big pipes (no calculation of debris)
- Deviation from generic procedure according to specific process experience with Phosgene, Acroleine, Benzene, methanol, LPG.

Calculated Scenario

- **Fire**
 - Heat of radiation with big fires
 - No toxic effect calculation due to smoke
- **Vapour Cloud Explosion**
 - Blast wave, immediate ignition
 - No debris
- **Toxic Release**
 - Dispersion according VDI-Model RL 3783
 - Medium weather condition
 - Roughness: Industrial building situation

Proposed Endpoints

Effects	Endpoint	Comment
Heat radiation	1,6 KW m ⁻²	Start of harmful effect on human
Blast wave	0,1 bar	Destroys walls, tympanic membrane rupture human
Toxic Load	ERPG-2 (substance specific)	Start of irreversible health effects man

No recommendation for protection of environment so far!

Assumed Scenario conditions

ERPG - 2

Leakage DN 25
Flash & Pool

VDI 3783, No 1+2

Toxicity



Source term

Dispersion

Exposure



**Fire
Explosion**

Vapour pressure 20
°C, minimum. 2 bar
liquid,
Outflow: 0,62
10 minutes

Medium weather
wind speed 3m/sec
Minimum weather
wind speed 1m/sec

1.6 kW/m²

0.1 bar

Typical Hazardous Substances in Seveso sites (selection)

Ethyleneoxide

Formaldehyd

Sulfurdioxide

Oleum

Acroleine

Cyanhydrogene

Phosgene

Sulfurhydrogene

Ammonia

Acrylnitrile

Chlorine

Bromine

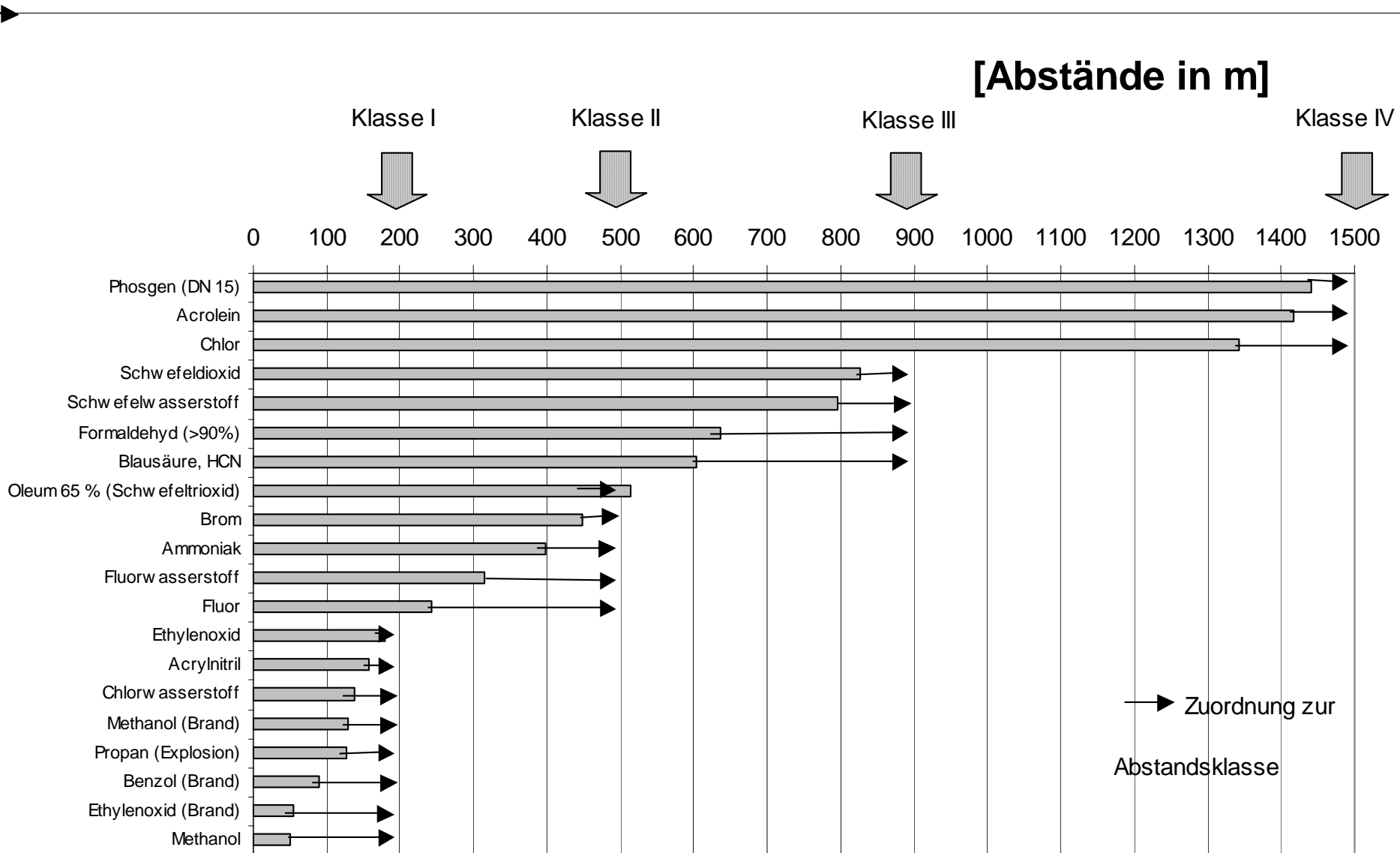
Fluorine

Chlorine/HF

LPG

Methanol

Generic Consultation Distances



Distance Classes

- Deviation according to substance specific parameters e.g. toxicity, vapour pressure, temperature
- Concept of generic substances
- In mixtures minimum amount to be considered according to column 4 Annex I German Störfall-Verordnung

Existing Establishments & Development in Neighbourhood



- Known Substance
- Known Amount
- Known technical measures to limit consequences
- Likely Scenario
- Known Dispersion Conditions

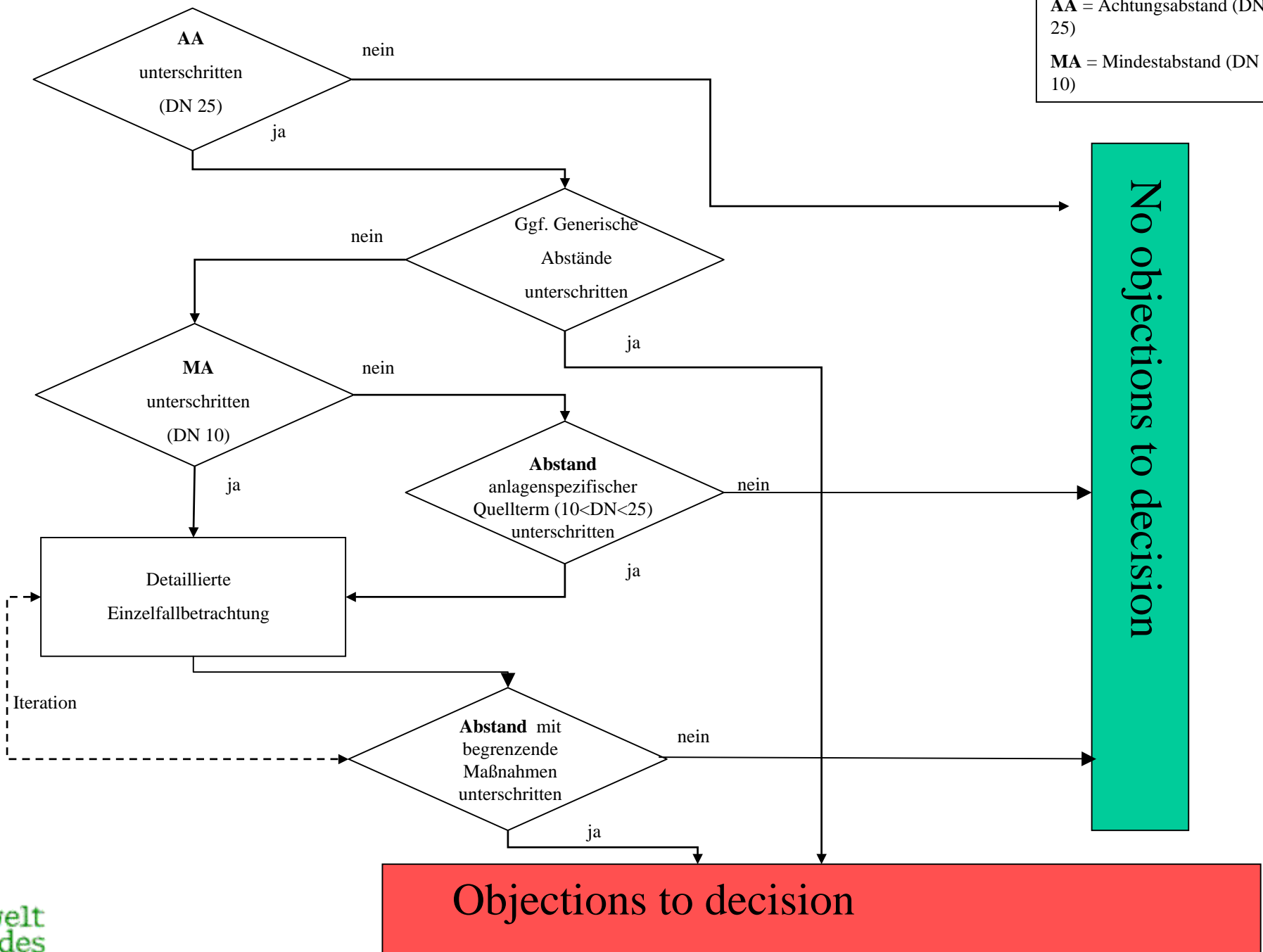
- Threshold Concentration
- Vulnerability

Distance may be calculated according to state of the art !

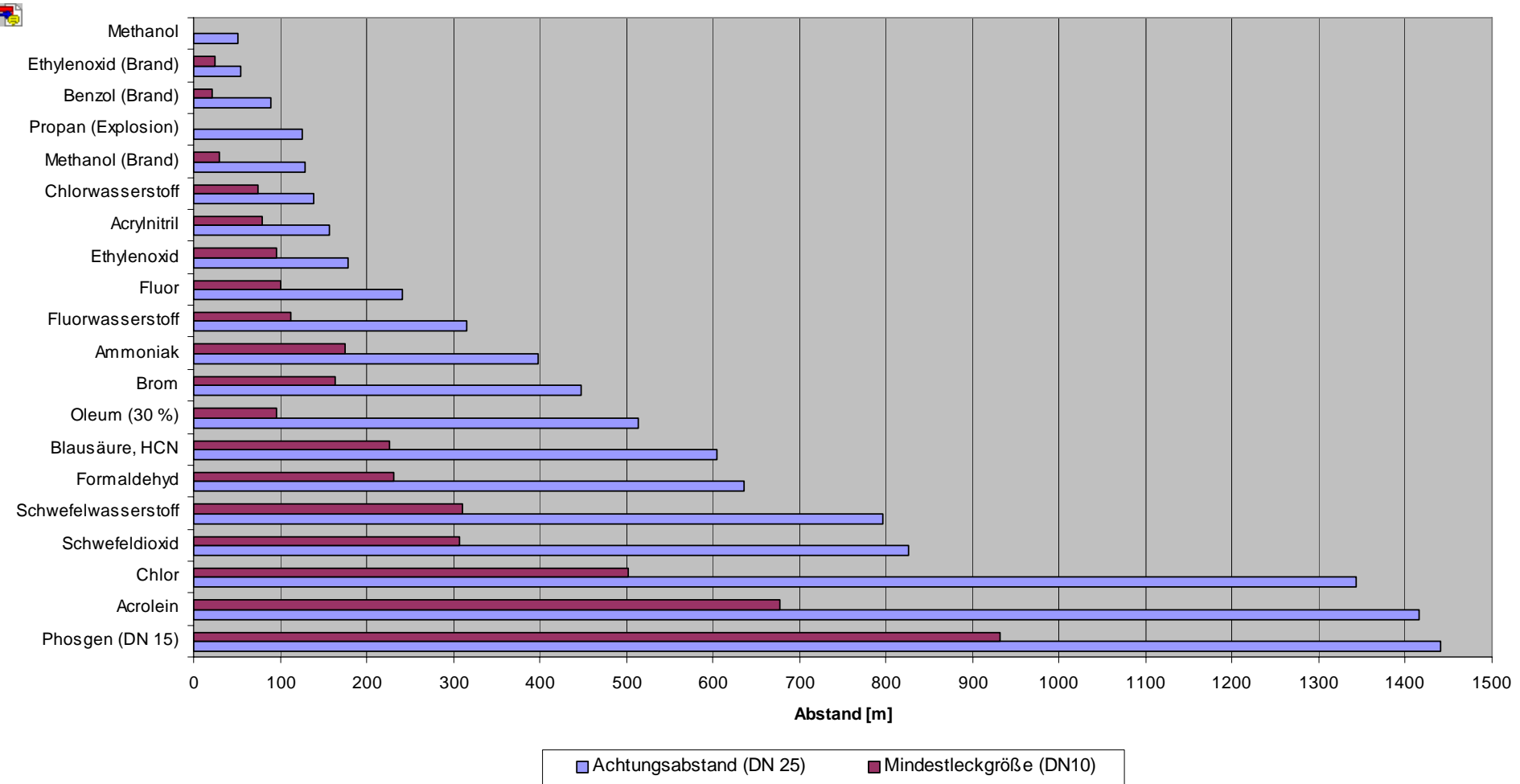
Recommendation for case by case Procedure

- **If actual distance < Consultation Distance → case by case procedure**
- **Generic regulation (z.B. explosives acc. SprengG) are to be considered first**
- **Recommendation for case by case Procedure :**
 - Exclusion of spontaneous vessel rupture and rupture of big pipes
 - In case of storage in bottles and drums release of full content
 - Leakage from pipe work, vessels and safety equipment, etc under following condition:
 - Leakage from 490 mm² (DN 25)
 - Taking into account the existing technical measures and equipment.
 - Calculating Minimal Leakage from 80 mm² (DN 10)
 - Taking into account mitigation measures.
- **Most likely weather condition**
- **Endpoints ERPG2 / 1,6 kW/m² / 0,1 bar.**

AA = Achtungsabstand (DN 25)
MA = Mindestabstand (DN 10)



Comparison Leakage standard (DN 25) and minimum (DN 10)



End

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www.umweltbundesamt.de/anlagen

www.umweltbundesamt.de/zema