Meeting on "Land Use Planning and Pipelines", 14/15 Dec. 2006, BAM, Berlin

Land-use planning practices in Germany with regard to major accident hazards (SEVESO II)

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Content

- Seveso II Requirements on Land-Use-Planning
- German Policy on LUP
  - Zoning System
  - Generic Safety Distances
  - Case by Case Studies
- Legal Requirements & Possible Application of Seveso Principles on Pipe Lines

Content

- Seveso II Requirements on Land-Use-Planning

Main Seveso II Requirements on Land-Use-Planning

Target of Art 12 SEVESO II Directive:

- 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

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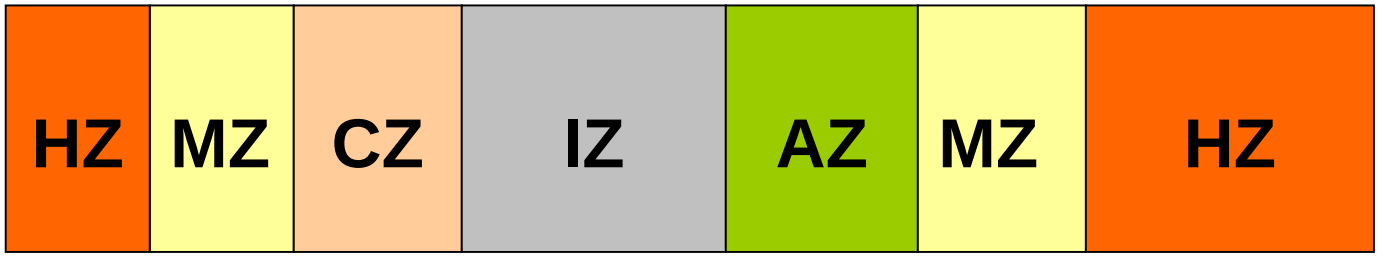
General Zoning According to Federal Building Law (BauGB)

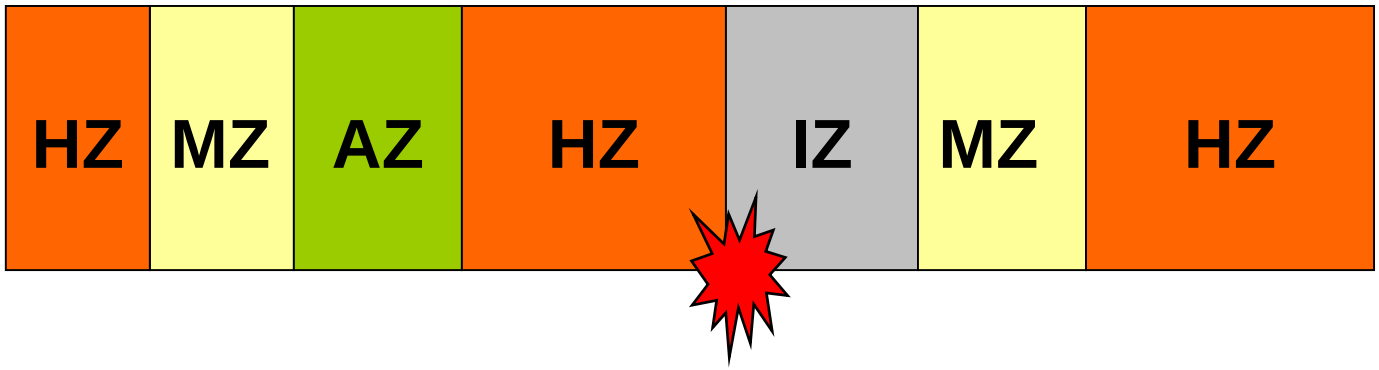
- ***Industrial Zones IZ:***
  - –Open for all industrial activities e.g. Chemical plants, Refineries, Larger Industrie (including Seveso sites), Large Volume Storage for Flammable Liquids, public utilities etc.
- ***Commercial Zones CZ :***
  - –Open for various commercial activities, warehouses, business- 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):



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“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

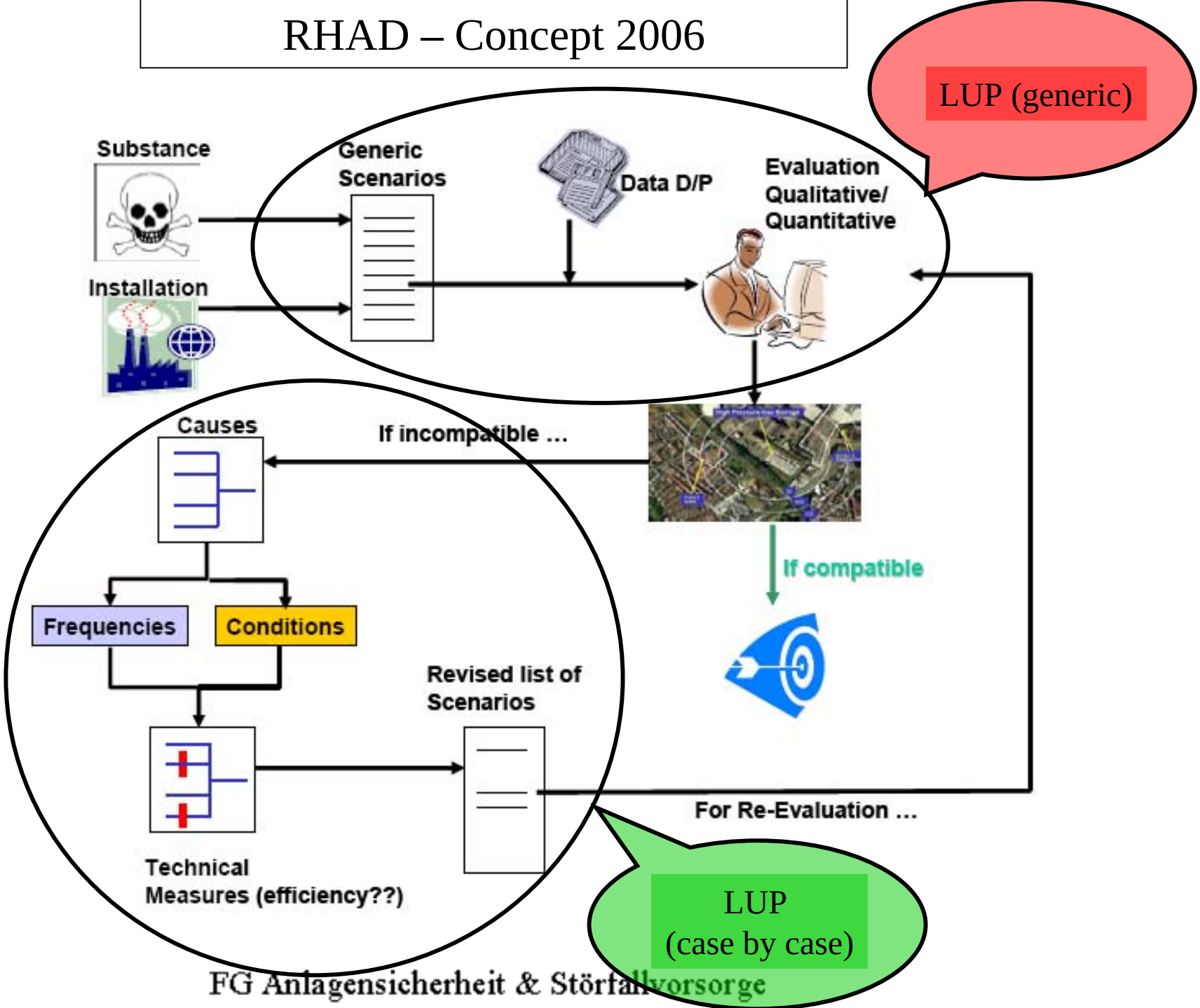
- Threshold Concentration
- Vulnerability

New Planned Establishments

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

- Threshold Concentration
- Vulnerability

RHAD – Concept 2006



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)
- 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**

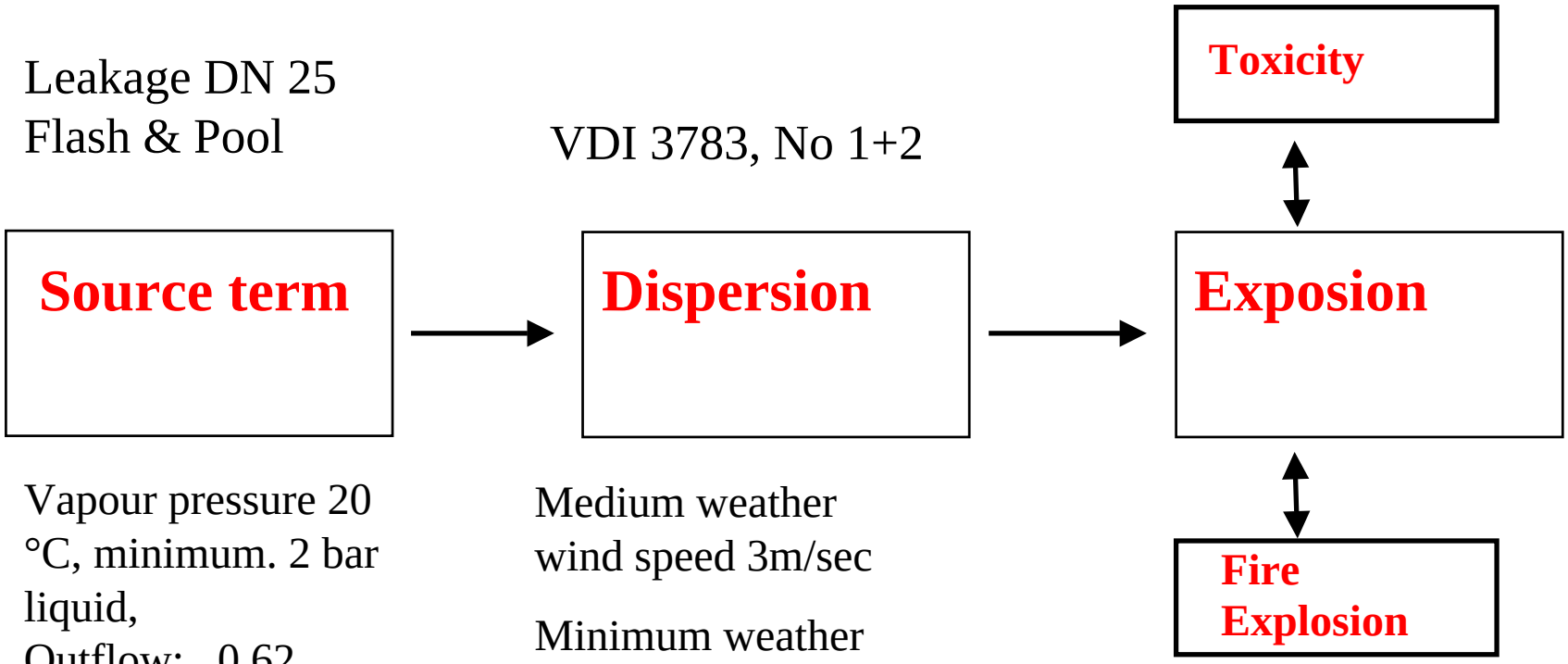
No recommendation for protection of environment so far!

Assumed Scenario conditions

ERPG - 2

Leakage DN 25
Flash & Pool

VDI 3783, No 1+2



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

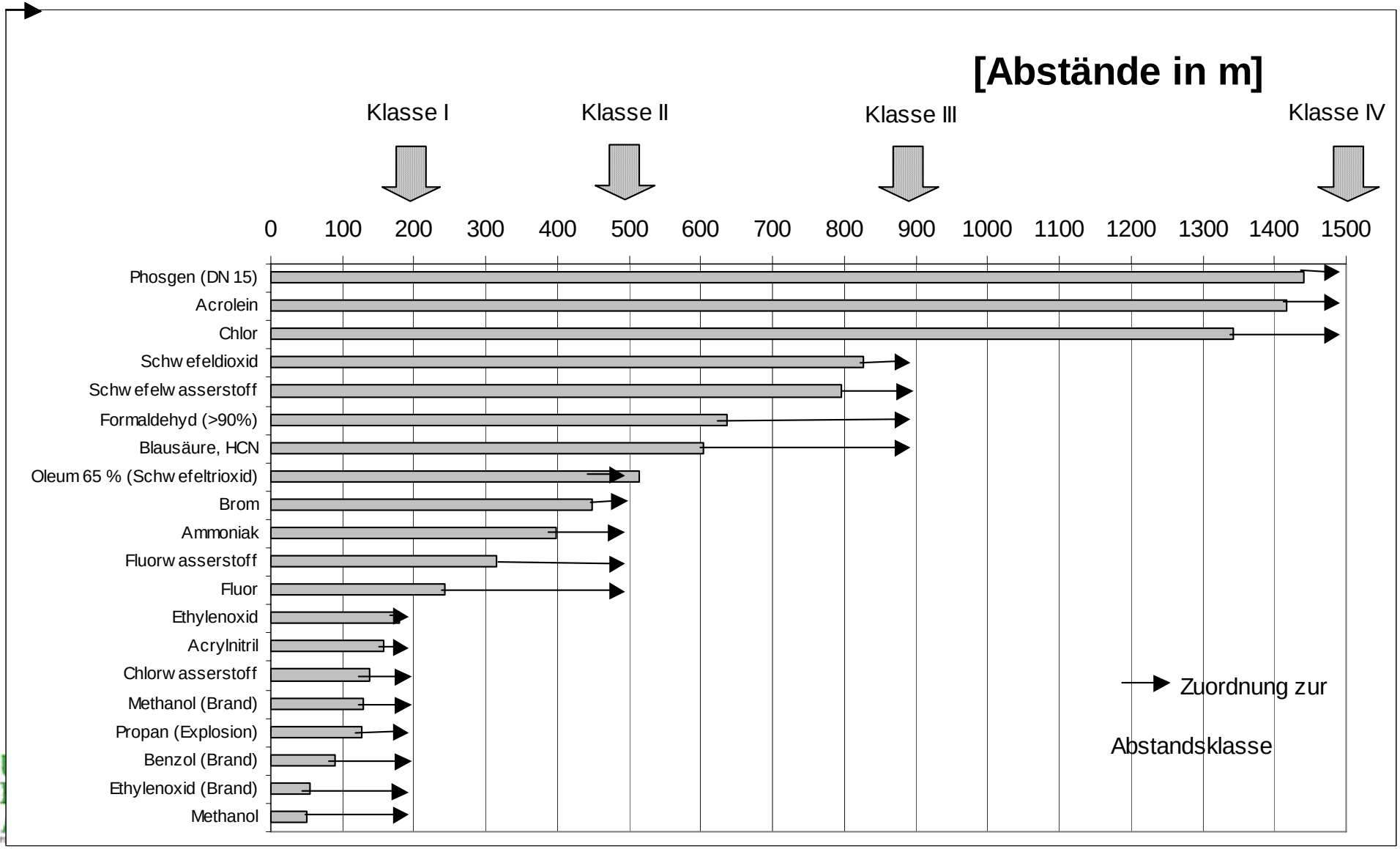
1.6 kW/m^2

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

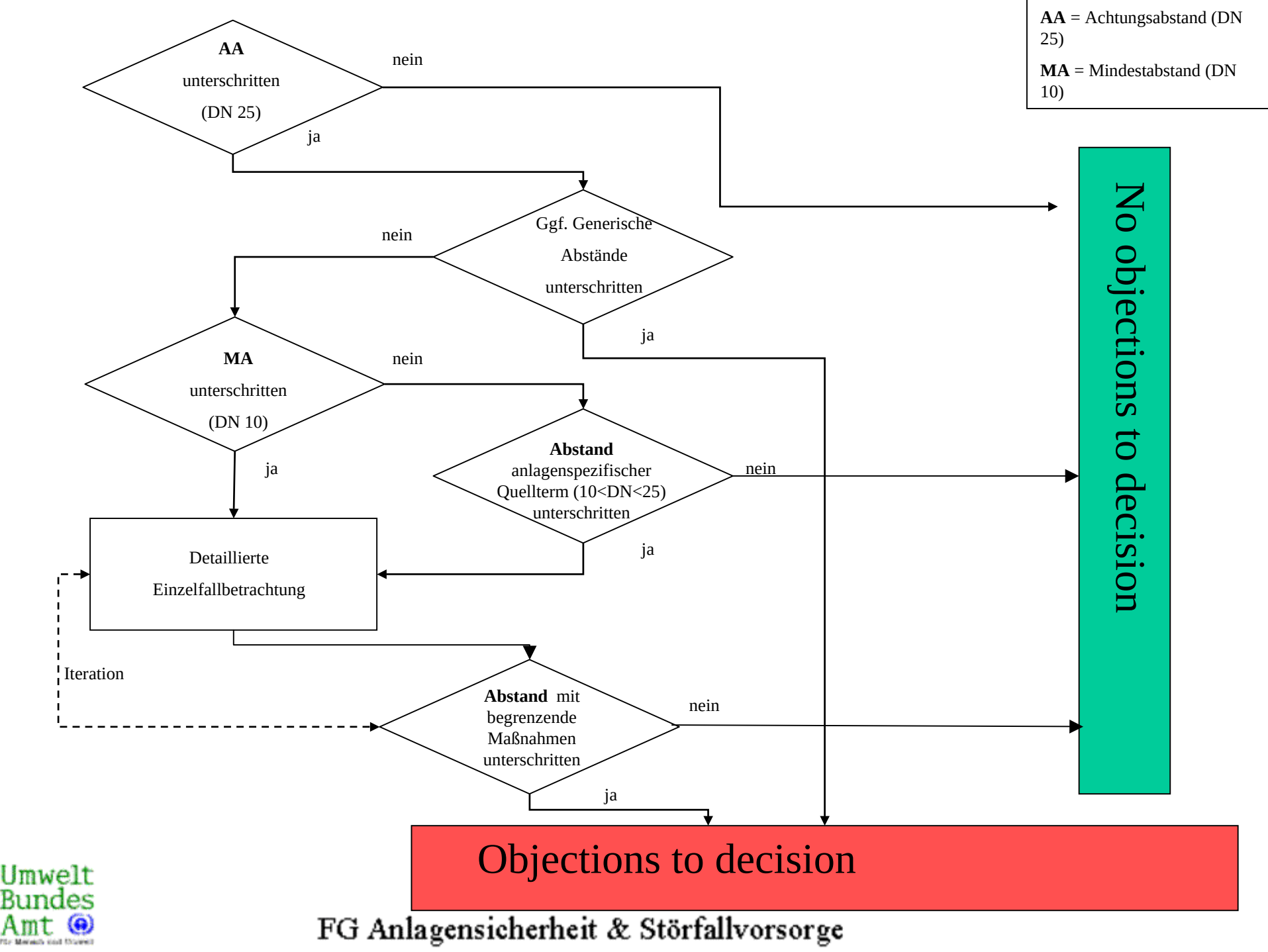
- Known Substance
- Known Amount
- Known technical measures to limit consequences
- Likely Scenario
- Known Dispersion Conditions

- Threshold Concentration
- Vulnerability

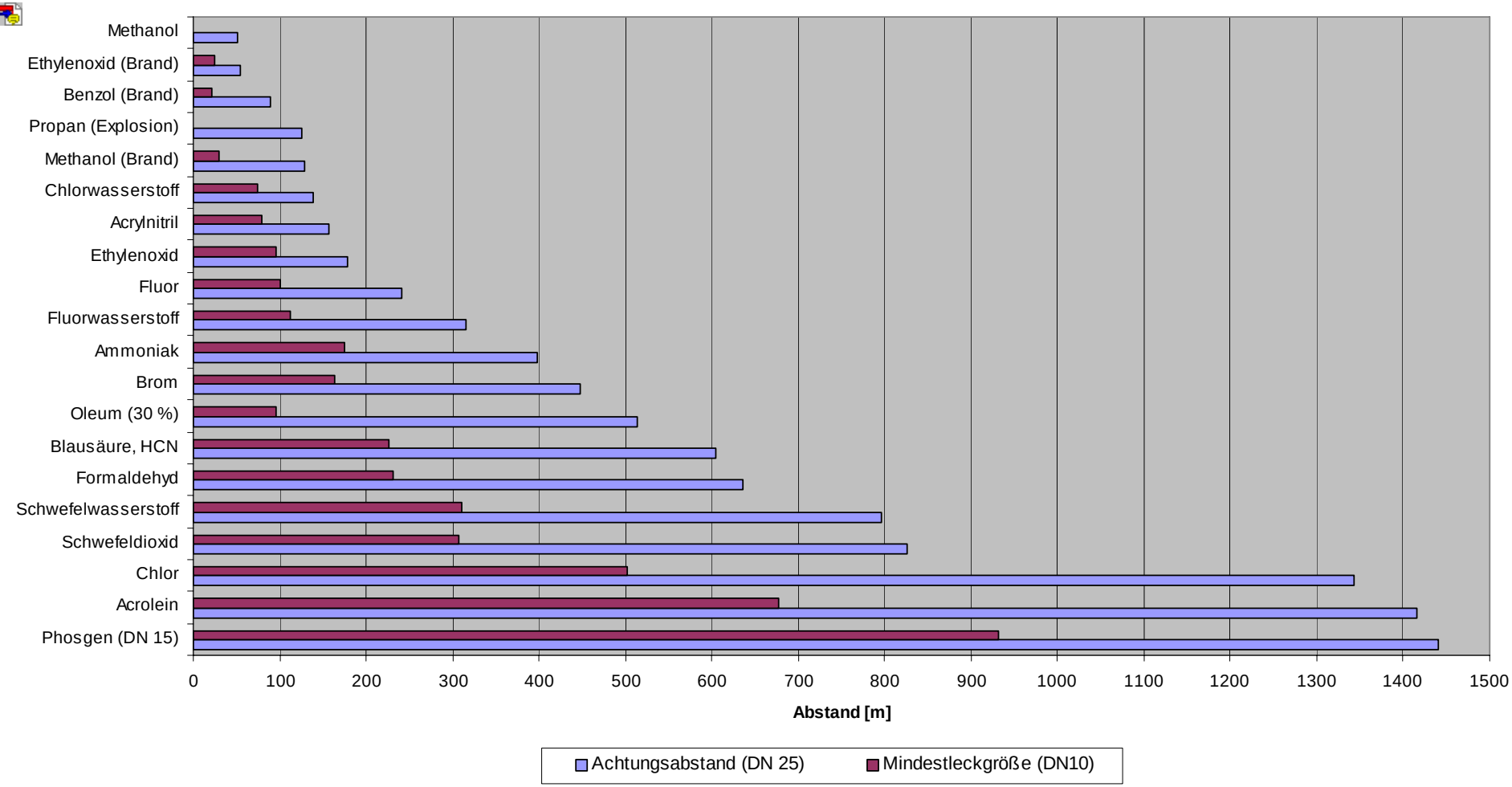
Distance may be calculates according to state of the art !

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)
AA unterschritten (DN 25)
nein
ja
Ggf. Generische Abstände unterschritten
nein
ja
MA unterschritten (DN 10)
nein
ja
Abstand anlagenspezifischer Quellterm (10<DN<25) unterschritten
nein
ja
Detaillierte Einzelfallbetrachtung
Iteration
Abstand mit begrenzende Maßnahmen unterschritten
nein
ja
No objections to decision
Objections to decision
Umwelt Bundes Amt
FG Anlagensicherheit & Störfallvorsorge

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



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Legal Requirements for LUP with Pipelines

- Track and over ground facilities both are subject to LUP Procedure
- Different area of regulation:
  - Track acc. to ROG, UVPG, BauGB, RohrLV (TRFL)
  - Pumping, maintenance station, etc. acc. to BImSchG, WHG, and others
- Seveso II applies not for PL but “Appropriate Distance” if required

Possible Application of Seveso LUP Principals on Pipe Lines (Recommendations)

- Exclusion of full rupture of pipe-line
- “Appropriate distance” around pumping and other on ground facilities according case by case procedure ➔ DN 10 leak as minimum
- Control of development in neighbourhood
- Emergency preparedness along track of PL

End

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www.umweltbundesamt.de/anlagen

www.umweltbundesamt.de/zema